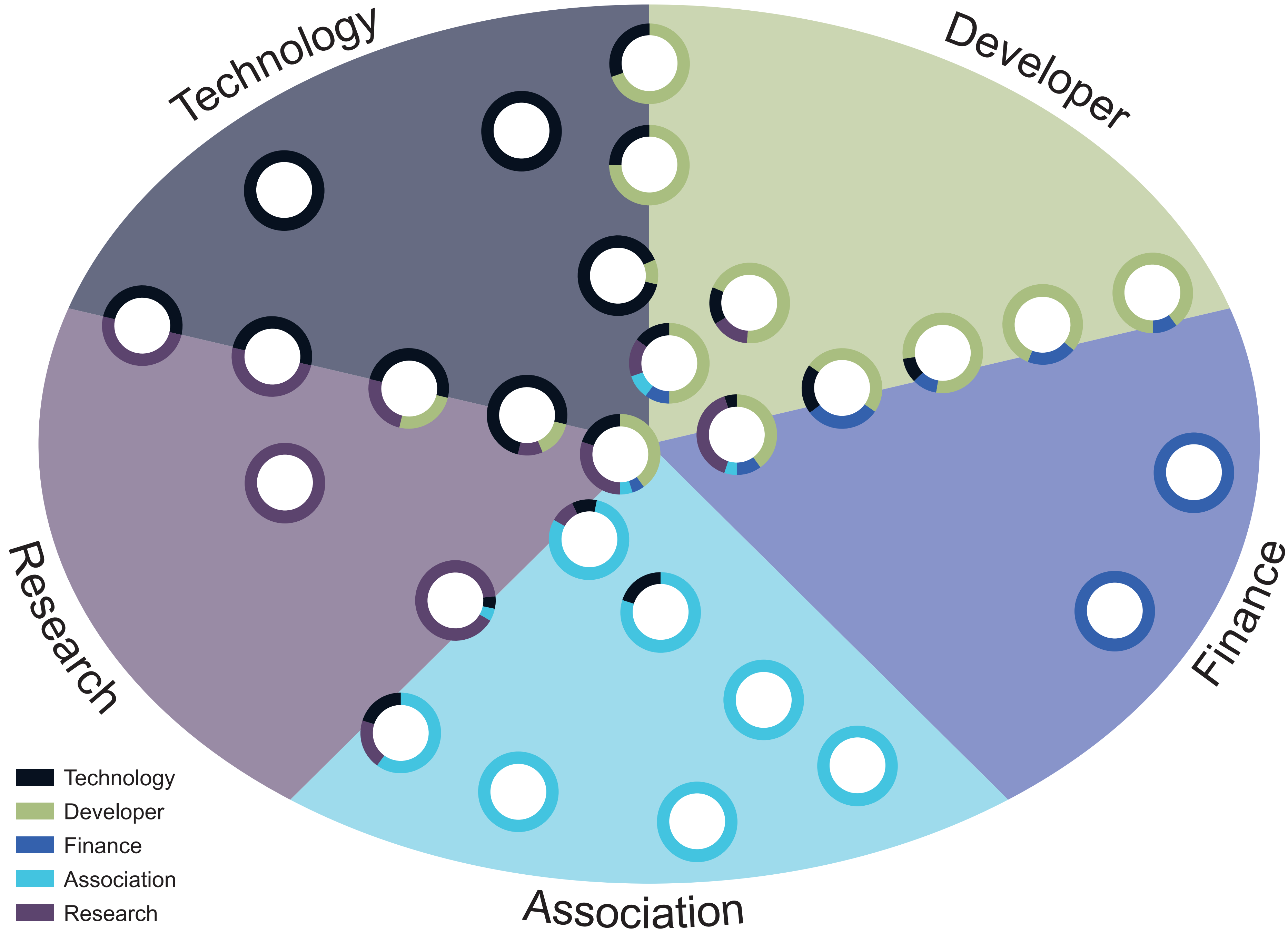
Responses to Request for Information: Long-Term Water Augmentation

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA

Name	Contact	Summary of Ideas
Asset Investment Management	Ronald Newcomb	Special purpose entity consdiering production of municipal water supplies in Baja California, utilizing Laguna Salada, through a comprehensive P3.
Association for the Improvement of American Infrastructure (AIAI)	Jonathan Hunt	Trade organization providing insight on best practices for P3s and describes how the Association could assist WIFA in our assessment process.
Audubon Southwest	Haley Paul	Nonprofit advocacy group expressing desire for focus on medium and long-term projects to augment existing supplies and improve reliability through conservation.
Cocopah Indian Tribe	Gary Magrino	Tribal entity describing delivery of 60,000 AF per year of tribal groundwater resources to supplement the Colorado River at Morelos Dam.
Deluge Tecnologies	Brian Hageman	Technology provider outlining various opoortunities for desalination utilizing a low-electricity pump to decreae the cost of conveyance.
E2Eden	Jason McBride	Technology startup providing information regarding evaporative desalination technology to reduce agricultural water use.
Energia y Agua de Mexico	Jose Garcia	P3 developer consortium describing seawater pumped storage energy and water supply solution located in Mexico.
Energy Transformation Investors	Alan Boyce	Investor group outlining seawater reverse osmosis desalination project in the Sea of Cortez, powered by adjacent solar power generation.
Generator H2O	Ryan Gravel	Suggesting creation of an incubator for water startups using WIFA resources as seed money.
Global Water Farms	Dan Bliss	Tech startup discussing desalination of salt-contaminated groundwater on the California Coast using a brine management solution to make marketable construction material.
IDE	Erez Hoter-Ishay	P3 developer consortium outlining solution for desalination of ocean water from the Sea of Cortez delivered to Arizona through direct conveyance.
NADBank	Jesse Hereford	Provides insight on leading binational coordination and leveraging financing solutions through P3s and other innovative solutions.
OceanWell	Jonathan Haswell	Collaborative working group discussing subsea reverse osmosis technology to desalinate using the natural hydrostatic pressure of the ocean for energy.
OneWater P3 Gurus	Sachin "Zak" Chawla	Advisory team providing insight on best practices for water projects and how the LLC could assist WIFA using its experience and expertise.
Phoenix Biometrics	Dr. Mark Whitten	Engineering, research and tech services company in collaboration with University of Arizona suggesting use of portable, low-energy desalination technology for brackish groundwater.
Resilient Infrastructure Group	Ben Vitale	Private market investment manager discussing potential augmentation opportunities from a coalition of finance and engineering experts.
SOURCE Global	Colin Goddard	Technology developer discussing atmospheric water harvesting technology to convert atmospheric water into drinking water.

Stantec, et al.	John Take	P3 consortium outlining options for successful partnerships, potential augmentation solutions, delivery methods, and market risks from a coalition of water infrastructure experts.
Sun Fresh Water LLC	Joseph "Jay" D'Alba	Suggests use of desalination systems relying on distillation technology to provide a purification system for brackish groundwater.
Superstition Vista Water Augmentation Group	Richard Carr	Introduces group of geological experts with interest in participating in a future procurement.
UArizona	Katharine Jacobs	Highlights research identifying possible options for in-state augmentation through enhanced recharge projects.
UmidaAg	Joseph Gallegos	Technology developer suggesting use of agricultural water infrastructure retrofit technology to reduce agricultural water use.
Water Train	David Rangel	Discusses delivery of water from the South and Eastern United States via rail car.
Water for Arizona Coalition	Morgan Ross	Advocacy group expressing desire for focus on medium and long-term projects with a focus on decreasing current use through conservation and management.
Wells Fargo	Richard Weiss	Discusses of possible funding and financing options and considerations regarding public-private partnerships.
Western Water Project	Patrick Madea	Outlines undersea pipeline solution for bringing water into Arizona from the mouth of the Colombia River.
Worley	David Stanley	Resource development company providing insight regarding options for importing desalinated water from the Sea of Cortez.
	Vincent Vahedi	Individual discussing desalination in the Gulf of Mexico (California) and creation of gravity-fed reservoir delivery.
	Mary Greenough	Individual expressing desire for focus on conservation of current water supplies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Asset Investment Management Respondent to AZWIFA RFI

David Beckham, Chairman
Water Infrastructure Finance Authority of Arizona
Via Electronic Mail

Dear Chairman Beckman and Board Members,

RE: RFI for LTWAF

Asset Investment Management LLC ("AIM") is honored to present this response to the RFI issued by WIFA on September 20, 2023, and request a meeting with staff to discuss our methodology, concepts, and plans. We also appreciate this format and the ability to contribute our perspective on the challenges faced by WIFA and the southwestern United States as we deal with the long-term need to augment the water supply in Arizona.

AIM brings more than thirty years of government defense contracting experience, fulfilling highly technical engineering contracts worldwide for all branches of our military and friendly foreign forces.

This is about water security. The methodology best suited for this production of municipal water in Mexico is with P3 under the Federal Acquisition Regulations ("FARs"), using a design, build, operate, and maintain contract that will reduce the cost and the risks associated with a corporation controlling a vital asset.

We provides a solution that limits the profit margin and controls the cost outcomes which is critical for effective municipal water management.

Our goal is to reliably deliver significant quantities of high-quality water at the lowest price possible on a perpetual basis, and AIM has spent a decade developing the plans and the political will needed to move forward with a water supply solution in Baja California and presents a highly qualified team of experts, and the required political will for this project exists today.

While on Faculty at SDSU College of Science and as P.I. to SDSU Research Foundation, investigating new desalination technologies, we uncovered the natural resources available at Laguna Salada including the environmental benefits of inundating Laguna Salada, and also large untapped geothermal resources.

Once understood, we believe you will agree with senior government officials in Baja California, that this is the preferred plan and a highly viable solution with widespread impact.

Sincerely,

Ronald A. Newcomb,
Chairman, Asset Investment Management LLC

THE PROJECT

Figure 1 Laguna Salada 1984

OVERVIEW

Under a P3 we will fully restore Laguna Salada, Baja California, Mexico, to its original condition by building a canal from the Sea of Cortez, building a self-powered 300-400MGD MED-ZLD facility at the northern tip of the lagoon, a delivery pipeline from that facility to the DOI Desalting Facility at Yuma, or to other terminal destinations per the final contract TBD. This will be a design, build, operate, and maintain contract under the Federal Acquisition Regulations ("FARs").

The contract will be for fifty years with automatic renewals exercisable by the company with standard terms and conditions, conditions of default, and operational guarantees, dispute resolution, etc.

The project will include two acre-feet of desalinated water per day delivered to Baja California at Water Pumping Station Zero on the Rio Colorado Tijuana Aqueduct in response for allowing the project to move forward and to help make up for deficits in treaty obligations under the 1944 United States-Mexico Treaty.

WATER SECURITY: THE RESPONDENT'S PERSPECTIVE

If the Government does not control the ownership of the facility, then it is a purchaser of water and not a producer of water; it does not control the infrastructure it requires for secure operations of the water infrastructure.

Cetaris parabus, MED uses one-third of the energy of RO.

The water needs of the region are permanent. This project and the other projects suggested are intended to operate perpetually.

The critical factor is water security. If a foreign entity controls the water and does so in in a foreign country, there is a higher risk of loss than the management structure we suggest. That risk should not be acceptable.

As government contractors, this is how we approach this, not as a business seeking profit per se, but rather as government contractors seeking a long-term, secure solution with a profit potential limited by law, providing the best, least expensive model possible.

Most Likely Course of Action

Contract Methodology

A P3 with a qualified government contractor using a structural configuration wherein the facilities and their operations are not at risk of loss if there is a disruption in the contract (fail-safe) creates the highest level of water security for any government entity.
This mechanism can be used to lock in a negotiated profit margin that is set regardless of future operational costs.

Partnering with Mexico

Mexico is a vital partner in a similar physical location and is affected by similar supply needs. At every location Mexico allows, operating with a win-win philosophy, project success is assured with partners that mutually benefit from the project. Gifting water to each Municipality is the best way to show our appreciation for their assistance.
Additionally, creating a scalable situation where they could add onto any facility under similar contractual terms is a generous means of expressing gratitude and assuring continued cooperation.

State of the Art Technology

While we often misinterpret the term “State of the Art” to mean the newest technology, it means the best technology. MED is state-of-the-art.
The utilization of seawater for drinking purposes is limited by the high specific energy consumption (kW-h/m^3) of present desalination technologies. The data shows the energetic benefit of MED.

kW/m3:

Property	MED	MSF	SWRO	ED
Electrical Energy Used	2-2.5	2.5-5	7-13 or 4-6 with ERD	0.7-5.5

Advantages of MED

At 1KW/m3, MED is thermal efficient, requiring low electrical input compared to other desalination technologies. With no moving parts beyond the pumps used, MED is highly reliable, durable, and low maintenance. Because a single unit can create up to 18MGD, a smaller footprint can be used.
MED is a low-temperature process (below 158°F (70°C)), which helps avoid corrosion and scaling, a significant issue in the higher saline waters of the Sea of Cortez, and produces high-purity distillate, which is beneficial for facilities management and the salinity, again, which can be adjusted as needed for the conveyance and delivery specifications.
In our case, we then take the heavy brine produced by the MED process and dewater it to arrive at Zero Liquid Discharge.

The Riskiest Courses of Action

Water As A Service ("WAAS") is the riskiest possible contractual arrangement for provisioning a municipality with water. It is the difference between a fail-safe and fail-unsafe contract. Multiple risk factors exist within this model. The cost of water will be high. It works with software, not with commodities.

Technologies unproven in a relevant environment is also an unacceptable risk to a government project. If a new technology is not proven to work on a site at least as saline as the Sea of Cortez, or, if using this lagoon as a location, 20% higher TDS, then accepting it as viable carries significant risk. (This describes DoD Technology Readiness Level 8: Technology has been proven to work in its final form and under expected conditions. MED is at TRL9, Actually proven through successful mission operations.)

Environmental Considerations

Restoration of Laguna Salada

Laguna Salada presents an unprecedented opportunity for a large-scale desalination plant close to the U.S. Border and simultaneously to restore a large coastal lagoon system of significant regional consequence, including a very large carbon sink and air quality improvements for Mexicali and the Imperial Valley.

This restoration is one aspect of the project that piques senior officials in Baja California to have such encouraging comments about this plan.

A century ago, Laguna Salada had a thriving fishery (Orcutt, C.R., 1891, A visit to Lake Maquata: Western American Scientist, v. 7, p. 158-164). By managing the lagoon hydrology, Laguna Salada will be restored to its original condition, increasing the viable habitat area of the Sea of Cortez, and creating extensive wetlands on the western side where more than fifty square miles will be less than ten feet deep.

Carbon SInk

All of the lagoon waters will be in the phototrophic zone. The entire lagoon will produce phototrophic plankton, taking carbon dioxide from the air and water for photosynthesis, feeding the life forms up the food chain. The lagoon's aquatic habitat restoration will be favorable to migrating seabird populations in the Pacific Flyway to benthic filter feeders and the entire food chain above the planktonic life. This recreates the lagoons reported thriving fishery. Every step of this food chain requires organic carbon formed during photosynthesis.

Construction Site Ecology

The desalination facility project site is part of the local xeric desert scrubland ecology. Creosote bushes dominate the site, which has a strong negative allelopathic relationship with most desert shrubs and often appears as an isolated plant. It competes for moisture and nutrients against forage plants and exudes oils that are toxic to the roots of most other plants in the ecosystem, reducing the plant population significantly. Limited amounts of desert mallow, brittlebush, desert burr sage, and both hedgehog and cholla cactus in the plot chosen for the facility have been identified, but these are suppressed by the negative allelopathic relationship of creosote bush.

Sustainability

Sustainability, in this case, has two aspects:

1) The durability and reliability of the technologies themselves, which is critical to a municipal desalination system and the success of the economy and population of those communities served.
2) The long-term ability to reuse or recycle the materials used in a facility.

To the first count, MED technologies rate at the high range of the desalination sustainability spectrum on both counts. MED is a carrier gas (atmospheric gas) hydration/dehydration process requiring a temperature differential for the adsorptive condensation of water, augmented by reduced atmospheric pressure, so this is classified as a distillation process, the condensate being the product. That differential or ΔT ("delta-T") is not extreme, and so the stress on the metal device is not severe but exists and eventually weakens the metals used. It is low pressure and so requires less energy and experiences less pressure stress than membrane systems. This results in increased reliability. MED uses far fewer moving parts than highly pressurized membrane systems, making them more sustainable with lower maintenance costs.
To the second, MED facilities are mostly steel, and nearly every part of an MED plant can be recycled. This is not the case with R.O. technologies, which use tons of plastics, requiring disposal in landfills after use.

PROJECT DURATION

There are two metrics regarding duration:

1) How long ought the project produce water?
2) How long should the contracts last?

To the first point, this facility should be operational until the rainfall increases in the long term to levels that can sustain the increased population of the southwestern United States. This won't happen. Long-term solutions solve long-term challenges. The project must be considered perpetual in duration.
To the second point: The contract we will request will be for fifty years with automatic renewals, assuming there is no irreparable breach of the contract by the company, or, at a minimum the duration of any debt taken on by the company.

P3 Under FARs

Because we suggest a Federal P3 using the FARs, using Federal funds will likely require the water or water rights to be made available to help other states (Congressional Districts) in the Basin area. Because of its location and California's inability in Imperial County to take this quality of water, Arizona is the best delivery location. It would fall to Arizona and the other states to work out payment and water transfer rights.

The company is not here to tell any government how much water it needs, who will pay for it, or where it is to be delivered. These are decisions the various governments need to make in the design stage of the project development.

AIM is intimately familiar with the constraints and requirements of operating contracts under FARs, including Government Contract Accounting, and believes the only appropriate manner of creating a desalination facility in Mexico is the use of FARs (or similar State regulations) and operating under a P3, regardless of whether that is executed by the State of Arizona and/or the Bureau of Reclamation ("Reclamation").

The P3 allows the Government to retain control of the entity by contract, determine and control the product specifications, control the applicable profit margins, and regularly monitor the company's books to ensure compliance with the contract specifications.

Considering the cost of energy under CFE, Mexico's Government electrical utility company, building this as a "self-powered" desalination facility is the most beneficial, significantly lowering the water cost.

The additional benefit to our governments (State and Federal) is that we can produce wholesale energy and use it to convey the water to its various delivery points, further reducing costs.

Operating using CFE energy and, in the U.S., retail electricity necessitates a higher-priced end product. Our plan is about meeting government needs, reducing risks, and maintaining low costs into perpetuity.

This also detaches the facility from possible power outages from CFE, again, increasing water security.

Funding

A P3 with the Federal Government would come with the funding needed. The negotiated agreement would provide funding for development and legal costs, the EP (engineering, procurement, construction) contract for the facility, and for operations and maintenance.

The agreements will define the facility specifications and determine the funding milestones, including CPI provisions and other typical contract terms and conditions.

CONSTRAINTS

Zero Liquid Discharge

This plan requires a ZLD facility because it would otherwise return heavy brine to the Sea of Cortez more than 90 miles away and then across 15 miles or more of the shallow delta area for dispersion, which is an engineering issue of some magnitude, followed by environmental concerns about dumping salt into an environmentally sensitive area.

Economically, this is expensive both from the CapEx and OpEx side. From an engineering viewpoint, the distance and delta material would complicate that effort. From both economic and environmental views, this is unwise.

Geology

This seismically active area will necessarily cross a major right-lateral stepped faulting zone that is the eastern edge of the earth's largest tectonic plate, the Pacific Plate. Pipelines crossing this are unavoidable, but there are mechanical solutions in seismic pipes that will take the most frequent, small seismic events.

On April 10, 2010 a relatively large, 7.2M quake that our own Professor Eric Frost stated was overdue in 2005 occurred in this area. We expect the next will be 135 years from that event, that is, about 2145AD.

Two other aspects of geology deserve consideration. First, the sub-sea-level nature of the lagoon allows us to inundate the lagoon through the canal. Second, the path needed for the canal is more or less flat desert delta alluvium. Other than the highway itself, the entire pathway crosses several thousand vertical feet of alluvium. It is all Colorado River Delta material. This is exceptionally good material for canal excavation.

Hydrology Management

Professor Frost is a world-class geographer with expertise in this geographic area, and Professor Carrillo, a world-class oceanographer, with expertise in the issues required to keep the lagoon healthy but also a key player in establishing one of the world's largest biological reserves in the State of Quintana Roo. Professor Newcomb has studied biological filtration and produced innovative solutions to biological filtration for forty years, some of which are now used in the industry, from aquariums to large salmon farms, and understands the biology of the lagoon.

Managing the hydrology of Laguna Salada is critically necessary for this project. It will require the creation and maintenance of a (TBD) 300-foot wide, open, unlined canal and the use of the second-highest tidal range in the world at the tip of the Sea of Cortez to maintain the elevation of the lagoon between 9-12 feet above nominal sea level. At the same time, it must allow for water ingress and egress without eroding the walls, built at a 1:3 slope.

The surface of the lagoon will evaporate approximately 884,400 acre-feet of water each year, leaving 42,452,000 tons of salt annually. Maintaining a biologically active lagoon requires a large, daily exchange of water from the gulf.

A 1:3 slope can be easily scaled should an animal or human enter the canal.

The canal stream bed needs to be at sea level to maintain the volume required for sufficient ingress and egress for the lagoon's salinity.

The only infrastructure that needs alteration is the two-lane Federal Highway 5. The area has no other infrastructure, buildings, pipelines, or electrical lines.

Pipeline Route

The route specified is to cross Highway 2 and follow the highway east over the pass at El Centenella, then directly to Baja California's Pump Station Zero on the Rio Colorado Tijuana Aqueduct. At that point, the route crosses into California and follows the border until jogging north to West 2nd Street to avoid various developments. It then follows this road eastward across El Centro until it rejoins the border. Once it crosses into Arizona, it will connect to the Yuma DOI Desalting Facility, where another pump station can be installed. The suggested route to Phoenix would follow the Gila River bed to prevent the disruption of roads as much as possible and for ease and speed of installation. The alluvium in a river bed tends to be nearly ideal for protecting the pipe.

Seismic pipe must be used because this route crosses numerous faults at right angles to the pipeline. The entire segment of California and part of Arizona the pipeline will traverse is a large right-lateral slip fault zone, including the San Andreas fault system (the Imperial fault at that point).

Pipeline routes running through the City of Mexicali are not acceptable.

If we were to route a pipeline into San Diego. It would be better to run it through Baja California as opposed to California. Better still, convey power to Tijana and build a facility there (q.v.).

Financial Challenges

WIFA/State Borrowing Capacity

Because of the specific structure, we are suggesting that Arizona borrow the funds, which would reduce the financial burden to the taxpayer. If a corporation borrows funds, it will necessarily recoup through water sales the cost of acquiring those funds, the cost of accounting, and interest plus a profit. If Arizona wants to keep this debt off of its books, AIM would, after contracts are signed, borrow the funds to build the required facility.

Parallel P3

The suggested configuration we believe is the best use of funds for Arizona is to have the United States build the canal and lagoon, say, a 200MGD-300MGD plant, and pipeline to Yuma, where all Colorado River Basin States, including Arizona, can purchase water, and then build a separate facility with a separate P3 for Arizona to augment that water, adding, say, 100MGD-200MGD to the feed, then add a pipeline to Phoenix. (Various configurations and volumes are possible.)

This has multiple benefits specific to Arizona.

Pumping water is expensive, so the shortest distance to the end user should be followed, and water delivered with water transfers to support other States (but this is a complex issue). While this seems common sense, the implications for Arizona become profound. If we do the suggested configuration, Arizona nets 100MGD from its facility plus 300MGD of much higher quality water from the river. This reduces treatment costs from such irritants as particulate matter (turbidity), algae, bacteria, and fungi, the resultant odors and taste.

While this is a geologic and geographically favorable location, it crosses numerous national and international borders, and the state boundary is the Colorado River, which is under DOI Bureau of Reclamation’s primary authority.

We understand that there are issues at play that may not fit this scenario and that Arizona may wish to fund the project itself and so have control over the water.

Political Will

The State of Baja California has indicated that this plan is the preferred plan of those examined for the region and offered their direct assistance at several levels. The political will exists for this project. The Secretary of Infrastructure (SIDURT) is requesting we bring in officials from the United States to discuss this plan with the Governor, Marina del Pilar Ávila Olmeda.

With a previous version of these plans, SEMARNAT staff (Secretariat of Environment and Natural Resources) stated that in 45 years of looking at plans, ours were the first that they would have accepted because we understood the salinity issue in the lagoon.

When we discussed the plans with the Federal Water Authority, CONAGUA, they stated that they were there to help the State (BC) in any way they could, and since the State liked this plan, they would help us achieve the goals as determined and requested by the State.

Because a major component of the plan is the restoration of Laguna Salada we believe a large part of their approval relates to this restoration. This will bring the world’s attention to Baja California in a very positive manner.

Social Challenges, Optics

We must also consider the environment. R.O. plants are receiving pushback from the community. The one recently proposed for Orange County, California, at Huntington Beach was rejected because of its carbon footprint and other aspects of the facility. These are legal battles, and any good attorney will argue every salient point he can think of. Large disposable plastic membranes are part of that arsenal. The long-term impact of periodically discarding large plastic membranes is yet to be addressed. In the United States, we are concerned about the use of plastics. The smaller RO plant in Carlsbad contains 16,000 plastic RO membranes for 50mgpd. A large plant such as this would require 96,000 large plastic membranes needing periodic replacement and disposal, with Mexico being on the receiving end so the U.S. can have clean water.
The optics are not good.
Compare this to the optics of the United States restoration of a 246-square-mile lagoon and the use of a simple, energetically conservative evaporation/condensation loop with no discarded plastic membranes to provide water to the two nations.
The optics are outstanding.

Regulatory Issues

First, we must use U.S. construction and equipment standards under the FARs.
Second, political issues can arise when there is political difficulty between the rival Mexican political parties, but when a facility such as this is operated under the authority of the Governor and the International Boundary and Water Commission's authority, with Presidential permits from both countries, we would expect full cooperation. We are discussing how we can also partner with Baja California at the same location for other aspects, and so tie them in directly.
We will have more regulatory issues in crossing the Colorado River and proceeding up the Gila River than the issues we will have in Mexico.
Third, no chemical regulations exist when using a hydration/dehydration condensation mechanism. However, the recipients can designate the desired TDS of the water.
Wastewater discharge from desalination faces regulation hurdles when returned to the oceans. But this is avoided with a ZLD facility.
Most regulations we will face are border crossings, river crossings, temporary road disruptions, and pipeline and canal permitting. We will request State help for those issues.

OTHER AUGMENTATION OPPORTUNITIES

In every way possible, the location discussed above is superior to any other, except in brine disposal. Because this must be ZLD, there is a practical limit to the volume we could produce, and we believe that to be about 400mgpd of product water.

Colorado River Water Offset Option (Fed)

The water treaty of February 3, 1944 for the "Utilization of waters of the Colorado and Tijuana Rivers and of the Rio Grande," set agreements for the volume of water to be passed from the U.S. to Mexico. The U.S. has not met that goal in many years.
Here, we are suggesting that the project provides the basis for WIFA and the International Boundary and Water Commission (IBWC) to further discuss and potentially agree to swap the desalinated water delivered to Mexico with Colorado river water, and those rights could be bought by any river basin state. Unquestionably the condition of the water Mexico would receive would be an improvement to the lower Colorado River Water it now receives.
We do not know the logistics of an aspect of the lower Colorado River Delta restoration, but that can also play into these calculations, considerations, and conditions.

Puerto Penasco (WIFA)

Another potential location for a regional desalination facility is Puerto Penasco, Sonora. The entire coastline of the upper Gulf of California is geothermally warm. The eastern edge of the Pacific Plate follows the San Andreas from San Francisco to the Salton Sea and then south into the gulf, then continuing south to the southern tip of the Baja California peninsula.
This type of stepped right lateral slip faulting tends to energetically enhance the area as mantle material moves toward the surface.
The data from Mexico indicates a heat flow of 120-150mW/m^2 in the region, and SMU temperature maps would indicate a temperature of 150-175ºC in that area at 3km depth. That is sufficient heat to drive a geothermal plant.
In Baja California, Geothermal energy is available and can reduce cost. California is demanding carbon-free energy be used for all purposes by 1945. But there is a natural gas main under that property, so both are available. In Sonora, there is the issue of whether they have sufficient natural gas to power the plant. This alternative does not stress their energy grid.
Geothermal supply to a desalination project here is feasible. We could use that same energy source and follow the pipeline path with powerlines to supply energy to the pump stations needed for conveyance and delivery, and so save both U.S. and Mexico's existing energy infrastructure by providing energy from a renewable source.

Replacing the Water As A Service (WAAS) concept with a P3 contract using a typical brine dispersion technique, we could significantly reduce the cost of water delivered first because we would generate our own energy potentially lowering costs as opposed to purchasing energy from CFE.
Creating self-powered desalination plans works on multiple fronts. MED-TVC desalination would use 1/3 the power. We would suggest giving Puerto Penasco two acre-feet of water per day for allowing the project, and then offer any help they may request (including a separate P3) to meet their needs. What has been clear for the past twenty years is that the economic growth of this area is limited by its water supplies.
By starting with the lagoon project, the Governor of Sonora could immediately understand the benefits of a duplicate facility in Sonora.

Tijuana San Diego Production (SDWA/FED)

Another large facility can be established in Tijuana, with similar partnering, providing water to the Municipality.
The only difference from the Puerto Penasco plan outlined above is that the delivery point is the San Diego area, and the energy can be generated by geothermal at the Laguna Salada and wheeled to Tijuana by the existing high-tension power lines already present at the planned site for the lagoon, and we have brine disposal.
Here, we would need to get CFE permits for the connections required to wheel the energy, and they would be compensated for that.
The benefit to Arizona comes partly in the magnitude of multiple plants, reducing competition between the states for the water available from the lagoon, and increased cooperation between all parties. California does not need to take water in its southeast; it needs it for the coastal cities.
All of southern California has water issues. Overcoming these issues and objections will require Federal intervention, but those are easily overcome when the question is," who wants water?"
If both SDWA and the MET receive more water, both would be on board with the plan. This is accomplished with renewable energy; the Governor would be expected to back this plan fully when using geothermal energy.

CONFORMATION TO GOVERNMENT NEEDS

Our job as a government contractor is to provide the governments involved with what is required to make the project successful for the Government. There will be differing needs from different government entities wanting different things.

Our job is not to determine what is needed and then offer it to the Government without options. That is a reversed hierarchy.
The final design and implementation needs to be a government-driven P3 contract where the contractor is working for the various state and Federal Governments to fulfill their respective needs as closely as possible.
This is one area where a WAAS model fails. It views the Government as one of its potential customers. That model is to develop a water supply and then sell that water to customers. To restate the water security issue, customers can change in this model, specifically when dealing with differing governments in the country of origin.
Also, however, with this model, the change of something happening to the company that terminates water services is increased. There are risks at several points.

OPTIMIZATION OF FUNDS EXPENDED

We will suggest the best use of Arizona funds would be to bring in the Federal Government on the same P3 basis to build a 300-400MGD facility for all Colorado River Basin States, creating the lagoon and rights of way, where Arizona could also purchase water from them and then also piggy-backing a P3 making a separate facility for Arizona where it is guaranteed at least that volume of water produced in its facility. In doing so, the United States Government (likely Reclamation) financially develops several large aspects, significantly optimizing the funds expensed by Arizona.
This highest water volume scenario for higher volumes would be for the United States to fully develop the P3 at Laguna Salada, again, for all basin states, Arizona to develop the facility at Puerto Penasco at the size of its choosing, and then for California to enter with the Tijuana-San Diego facility powered by the geothermal energy in the lagoon.

RISKS

Certain risks that can be reduced or eliminated. This plan reduces the following risks:

1) Political Risks are always a challenge, both in establishing and continuing operations. Here, the political will already exists, and they are requesting officials come to visit with the Governor. The ongoing political risk is eliminated by our management structure (Q.V.), and by being a water provider to local governments.
2) The company could lose the facility to Mexico confiscation for their own use. This will not happen with a PPP and when we provision them with water.
3) Social dissatisfaction due to the use of plastic membranes could derail plans. No plastics are used in MED.

4) Financial risk of overpaying for energy from CFE by the use of a self-powered plant.
5) The risk of stressing resources in Mexico and therefore being denied, canceled, or stopped after completion. This is acute when discussing energy and water. Constellation Brands was forced to move a $1B facility nearing completion, out of Mexicali by the President because they would use too much water.
6) The risks associated with new technology: If the technology is less than DoD Technology Readiness Level 8 (TRL8), there is a risk of failure, making the project insecure. (MED is above TRL9.)
7) The risks associated with inexperienced government contractors.

PLAN BENEFITS:

It is a paradigm shift required by the current direction of annualized rainfall and population growth that requires the Southwestern United States to partner with Mexico in creating new water resources, but we need to be a true partner we need to respect their needs, rights, and government.

MED is the desalination system that receives significant attention for its high efficiency, operational and maintenance simplicity, the feasibility of using alternative low-grade waste heat, and economic sustainability. When integrated with a thermal vapor compressor system, the economic advantages of MED-TVC are higher thermal efficiency with lower energy requirements, a small condenser size, and reasonable production costs.

With more than thirty years of government contracting experience and the ability to provide the most environmentally beneficial project and water at the lowest price possible, we can reduce Arizona’s water stress and water security concerns.

The ability to duplicate similar projects in other locations allows for large-scale projects that can impact the entire Southwest and do so in a manner that secures the water supply.

Costs of the project:

MED is the most thermodynamically, ergonomically, and financially efficient process known for desalinating seawater and avoids using tons of plastics used in membrane-based desalination.

Using our methodology, the Government sets the standards, the delivery location, and the quantity, builds the project through us, and oversees the costs.

Like the hundreds of government contracts we have fulfilled in the past, the books are audited, and we will use only the highest qualified subcontractors for equipment and construction in Mexico and the United States. Every step in the process will be inspected to ensure specifications are met or exceeded.

The project's cost-effectiveness far exceeds membrane technologies in both CapEx and OpEx. Every effort will be made to reduce the OpEx of the project since that is the long-term or ongoing cost that will exceed the CapEx in several years.

Long-term Water Security

Water Security is low where there is the possibility of the loss of facilities component such as when operated by a for-profit company and operated in Mexico. Our contract methodology avoids the first issue and significantly reduces the risk of loss by confiscation by Mexico, especially through the International Boundary and Water Commission work.

Best management practices:

Construction has issues that need inspection to prevent, more so in Mexico. It is known that materials can be replaced after delivery so that one quality will be delivered and documented, and then at night, it is replaced with a lesser quality item. In a concrete slab, dimensions can be compromised to reduce the cost to the contractor on a set price bid. Similar things can happen with every material and with every dimension. The quality of a component, such as a bolt, can be reduced, the quality of the sand being used in concrete, and so on.

AIM's inspection protocol is that every dimension, material, and step is checked. Modern construction software can now be used to track this with photographs and become part of a permanent record of the construction. This reduces liability to all parties concerned and ensures the completed facilities match requisite specifications. Only the best equipment will be used in the project's construction, and best practices will be applied at every stage. This entity is not the construction entity; it is the project manager per se, then the operations administrator. Entities must be established in Mexico for the operations, thus the P3 structure.

Project Feasibility:

The company has the management experience to execute this project from decades of experience in all contracting classes. The entire range of the required supply chain is already known to the company, and the company has dealt at some level with many of them in the past.

MANAGEMENT STRUCTURE

We are most concerned with the water security of the State and/or Federal supply of water. This adds one layer of entities to the structure: a U.S. entity that acts as a Special Purpose Vehicle, or SPV which owns the equipment but also owns and operates the Mexican entity, a Sociedad de Responsabilidad Limitada ("S. de R.L."), and the Government can, with cause, and by contract, cojointly separate the membership (ownership) by the contracted entity without disruption of the water supply. At the beginning, new entities will be formed to reduce complications or other entanglements. AIM will hold its interest in Renewable Energy Development LLC (WY) ("RAD") when formed.

RAD will hold the membership in the U.S. SPV, which will own the Mexican assets, that is, the desalination facilities and equipment and the S. de R.L. to perform business operations in Mexico, to pay employees, and perform other services. Each desalination facility created should have its own entities established.

If they are not separable, then the Government can be held, to some degree, to the power of the entity controlling the facility.

RAD will act as a members and Board of Directors of the SPV. Professor Newcomb will be the Chairman. Professor Frost will be the Director of Geology. Enrique Sanchez Director of Human Relations, expanded here to deal with all stakeholders involved. Professor Enrique Carrillo will be the Director of Mexican Operations. Mike Evans will be the Director of Development.

APPENDIX 1 TEAM MEMBER CV BRIEFS

Ronald A. Newcomb (respondent)

(619) 501-1800 (v) (619) 501-1801 (o) professornewcomb@gmail.com
1992-Current Chairman, Assset Investment Management LLC.
2002-Current developed detailed technical and legal plans for the natural resource developments and mixed-use developments in Laguna Salada, Baja California, MX
2000-2015 CEO Autek LLC, Chief Engineer, Electronics Defense Contractor, R&D:
Contract Administrator for Boeing FIRST program (Suppliers, F/A-18)
Contractor, Design Engineer, U.S. Navy Autek Models 14-36 High-Speed R.F. Switch series.
Contractor, Raytheon repair for MilStar
July 2005-July2010: Professor, San Diego State University College of Sciences, Adjunct Faculty. P.I. (Principal Investigator (Chief Scientist)) for SDSU Research Foundation.
Principle Investigator Autek Geothermal Closed Air Loop Desalination Device. (Design, Build, Install, Test).
Principal Investigator Autek-Firestone Waste Energy Hot/Cold Closed Air Loop Desalination Device. (Design, Build, Install, Test).
Principal Investigator Firestone-Newcomb Closed Carrier Gas Atmospheric Pressure Evaporation/Condensation Desalination Device. (Design, Build, Install, Test).
Principal Investigator World Wide Assets Delta T Geothermal Desalination Device.
Principal Investigator CITI Delta T Desalination Testing Program. (Design, Build, Install, Test).
EDUCATION:
Ph.D. American College of Nutrition
M.S. American College of Nutrition
MBA Studies with Herriot-Watt University (incomplete)
B.S. Management Columbia Pacific University
A.S. Law Miramar College

Enrique Carrillo Barrios Gómez

Experienced educator with a demonstrated and fruitful record of leadership in higher education and as an independent consultant. Skilled in the development of a results-oriented vision as well as its goals, strategies, costs, a timeline towards completion, and effective collaborative teamwork to coordinate, supervise, follow up and evaluate results. Ability to liaise and partner with institutions, programs, and governmental, non-governmental, and private agencies and organizations in the US and Mexico towards the development of international programs and linkages.
Led noteworthy educational, research and cultural events in a wide, multinational geographical region encompassing the Caribbean, the upper Gulf of California, and the

California-Baja California Transborder region towards the development of strategic international alliances in higher education, Transborder security and public safety, and on towards international participation and commitment for the study of biodiversity, the conservation of natural resources, and the establishment of protected areas and sustainable development

He currently serves as a consultant, and as Adjunct Faculty at SDSU's Graduate Program in Homeland Security, where he has helped develop educational and training programs focused on bi-national public safety and cross-border security in the California-Baja California Transborder region.

Luis Enrique Sanchez Ramirez

Aa a citizen of Mexico, and raised in San Diego where he received his J.D., Dr. Sanchez brings a wealth of legal expertise to the project and has worked with plans for Laguna Salada since 2007.

His legal expertise and social skills combined with his speaking both languages fluently and his deep understanding of the needs of people have been important aspects of dealing with governments and stakeholders in the development of this project.

Eric Frost

Homeland Security Master's Degree Program
+1 (619) 417-2982
San Diego State University (SDSU)
5500 Campanile Drive, MC-1012 eric.frost@sdsu.edu
San Diego, CA 92182-1012 https://homelandsecurity.sdsu.edu

Academic/Professional Appointments

2012-present, Professor, Geological Sciences, SDSU
2018-present Co-Director, Homeland Security Graduate Program
2009-present Director, Visualization Center (Viz Center)
2013-2018 Director, Homeland Security Graduate Program
2005-2009 Co-Director, Center for Homeland Security Technology Assessment
2003-2013 Co-Director, Homeland Security Master's Degree Program
Co-Director, SDSU Center for Information Technology and Infrastructure (CITI)
2003-2006 Co-Chair, Sensor Networks Special Interest Group (SIG), San Diego Telecom
2000-2009 Co-Director, Visualization Center (Viz Center)
1983-2012 Associate Professor, Geological Sciences, SDSU;
1980-1983 Assistant Professor, Geological Sciences, SDSU
Frost (Viz Center) Projects in Mexico

Mike Evans

Principal, Garnet Energy Consulting Inc.

Mike brings over 40 years of project development and electric industry experience, having started with gas turbine design at Solar Turbines, power plant development and construction with Sithe Energies, either years with SDG&E working on the development of the California ISO and PX tariffs, and bidding, dispatch and settlements in Fuels and Power Supply. At Shell Energy, he led the development of 5 peakers and a combined cycle power plant in Mexicali which included a water treatment facility to treat make up water to the plant, led efforts to expand 500 Kv and 230 Kv transmission needed for portfolio management, and negotiated fuel supply and offtake agreements. As General Manager, Regulatory Affairs, he led regulatory efforts in the west region, including testifying before FERC and the CPUC, intervening and participating in FERC and CAISO proceedings, and directing trading and origination activities for regulatory compliance.

Mike has formed Garnet Energy Consulting, Inc. where he contributes to the Laguna Salada Desalination Project.

EDUCATION

BSME California Polytechnic State University, San Luis Obispo 1976-1981
MBA San Diego State University 1981-1987
Professional Engineer, Mechanical, State of California

AIAI Association for the Improvement of American Infrastructure

Water Infrastructure Finance Authority of Arizona
100 N. 7th Ave. Suite 130
Phoenix, AZ 85007

RE: September 20, 2023, Request for Information (RFI) – Long Term Water Augmentation

To whom it may concern:

Please see below, AIAI's responses to WIFA's recent Request for Information.

The Association for the Improvement of American Infrastructure (AIAI) is a national not-for-profit association focused on best practices for the use of public-private partnerships (P3s) for public infrastructure projects of all types.

AIAI's membership includes over 100 of the world's leading designers, builders, financiers, and operators, many of whom have worked in Arizona on public infrastructure projects of all sizes and scope.

Through AIAI's P3Direct program, the Association shares information, provides education and promotes best practices for the use of P3s to hundreds of elected officials across the country. As interested stakeholders in helping solve the challenges facing Arizona and its long-term water needs, AIAI and its Water Committee members are eager to collaborate with WIFA, the State and any other relevant entities that may be seeking information on the use of P3s.

Please feel free to contact me directly at 516-495-0560 with any questions.

Sincerely,

Association for the Improvement of American Infrastructure

Lisa Buglione

Lisa Buglione
Executive Director

A. General Information and Experience

Association for the Improvement of American Infrastructure (AIAI)

- Members of AIAI's Water Committee
- AIAI Board of Directors Members
- AIAI Staff and Advisors

The Association's membership includes organizations responsible for the design, build, finance, operation and maintenance of water, wastewater, water resources, desalination and energy projects across the country and around the world using both alternative and traditional procurement delivery methodologies.

More information about AIAI and its members may be found at www.aiai-infra.org.

B. Potential Augmentation Opportunities

1. WIFA is seeking to develop a list of potential water augmentation opportunities that result in new water supplies for the state of Arizona. Augmentation opportunities that include new or augmented supplies within the state and from outside the state will be considered. Please provide a general description of potential water augmentation opportunities that you have identified or believe may be valuable for WIFA to consider.

   AIAI Response: There are many water augmentation strategies in use by many jurisdictions around the US and abroad; the implementation of which have both positives and negatives. Studying the successes and lessons learned from those implemented ideas could be beneficial to Arizona as they contemplate and work to address their own challenges, needs, and proposed outcomes. AIAI offers the opportunity to bring industry experts together for a thought-based leadership discussion on best practices and water augmentation implementation, supported in part by the best practices outlined in AIAI's Water Toolkit developed by the Association's Water Committee. It may be accessed at www.aiai-infra.org/water-toolkit/.

2. WIFA may consider a variety of delivery and/or ownership models for augmentation opportunities, including long term purchase contracts, a variety of P3 agreements (ref A.R.S. § 49-1211), or other models. Please provide information on factors that will positively or negatively influence your consideration of various potential delivery models. Does an alternative delivery or P3 agreement make the identified water augmentation initiatives more or less attractive business opportunities?

AIAI Response: AIAI can share best practices for the use of the P3 procurement model, as the Authority seeks to understand the value created by various alternative delivery methodologies. AIAI believes it is imperative for all owners to understand different delivery models to bring different private organizations to the market. Decisions driving the choice of procurement model are nuanced, and therefore identifying the project and delivery method in advance through value for money analyses, a rigorous business case analysis, and market sounding opportunities could provide the Authority invaluable insight into its decision making. Ultimately, AIAI and its members want to support the Authority in its efforts to determine what would provide best value in order to meet the overall objectives and provide taxpayer value.

3. Given constraints on funds available for water augmentation projects, are there recommendations on how to best prioritize, finance and pay for proposed WIFA augmentation opportunities including those utilizing P3 agreements?

    AIAI Response: The Authority should undertake a full assessment of what funding may be available as well as opportunities to bring non-traditional sources of funds that may not be currently considered under more traditional procurement models. Federal funding and financing initiatives may be identified, notably EPA's WIFIA loan program. Additionally, private investment can help leverage that public funding and assist in driving the initiative forward in a more innovative and expedient fashion.

4. Are there any practical market capacity constraints to deploy water augmentation plans (e.g., physical construction limits, current water pipeline manufacturing and delivery capacity in a given year, other supply chain constraints, labor or any other constraints that may impact the capacity to deliver a total augmentation plan)?

    AIAI Response: The Association can offer insight into this point via applicable case studies or through discussions on current market conditions.

5. If Respondents have perspectives on challenges (financial, political, social, regulatory) that may not be project/program specific, they are invited to share opinions that may aid WIFA in analyzing potential responses.

AIAI Response: AIAI members have been part of many of these efforts in the United States and globally. The Association would be happy to host a complimentary workshop to bring these insights to you.

Audubon | SOUTHWEST

3131 S. Central Ave.
Phoenix, AZ 85040

602.468.6470

Re: Water Infrastructure Finance Authority (WIFA) Long Term Water Augmentation Fund (LTWAF) Request for Information (RFI)

The National Audubon Society (Audubon) protects birds, and the places they need, today and tomorrow using science, advocacy, and on-the-ground conservation. Audubon Southwest is the regional office of Arizona and New Mexico of the National Audubon Society. We appreciate the opportunity to provide comments to the WIFA LTWAF RFI.

Broadly, Audubon believes that before we embark on large-scale and long-term projects to import water into Arizona from out of the state or out of the country, we must manage the water we already have more wisely. Currently, the state of Arizona does not manage groundwater supplies in more than 80 percent of the state, nor has it completed the General Stream Adjudications (which will determine who has the rights to what surface water in the state), nor have we updated the rules governing Active Management Areas for quite some time, nor have we settled water rights claims or come to agreement with 11 Tribes in the state over water. Improving our water management and getting our water house in order must be acknowledged as a key component of securing our water future. We cannot simply add more water on top without addressing these underlying concerns. Please see the Arizona Water Security Plan for more details.

However, Audubon also understands the need to adapt and innovate, even while the work continues on the aforementioned concerns. That is why we are supportive of the efforts of WIFA's Water Conservation Grant Fund and will be strong advocates for more funding for that program once the initial tranche of $200 million is fully allocated. This fund is helpful in resourcing near-term projects that offer immediate water savings. While the decision-makers of this fund face tough choices about what to fund and what not to fund, longer-term projects that improve overall water reliability (versus directly conserving water) may be less likely to receive funding due to longer project implementation horizons and less direct water savings.

Therefore, for medium and long-term projects that augment existing supplies or boost water reliability, WIFA's LTWAF should be considered available for funding. Audubon suggests that a focus on in-state augmentation and water reliability projects should be prioritized under the initial projects considered by the LTWAF. Examples include: wastewater recycling projects, septic-to-sewer conversions, groundwater recharge, direct potable reuse, advanced water purification, forest and watershed health, and improving existing infrastructure to increase water reliability.

For water importation projects WIFA considers and explores in this process that involve desalination in the upper Gulf of California in the country of Mexico, we believe that WIFA should consider these factors:

- The existing binational process and relationship with the country of Mexico must be respected and maintained. The Minute 323 Binational Desalination Work Group has done preliminary work and analysis on this topic.
- The impacts to the restoration sites in the Colorado River Delta, the marine health in the upper Gulf of California, and other potentially impacted environmentally sensitive sites must be considered.
- The necessary energy resources, siting, impacts, and location must be addressed.

- Any attempts to reboot the Yuma Desalting Plant must consider the impacts to the Cienega de Santa Clara—a 40,000 acre wetland in Mexico in the footprint of the Colorado River Delta fed by agricultural runoff from the United States, and important to hundreds of species of birds.

Thank you for your consideration of our ideas and concerns, and we look forward to staying involved throughout the process as the LTWAF begins to consider ideas for augmentation and improving water reliability for the state of Arizona and its communities.

Sincerely,

Haley Paul

Arizona Policy Director
Audubon Southwest | National Audubon Society

COCOPAH INDIAN TRIBE
BUSINESS DEVELOPMENT
14515 S. Veterans Dr.
Somerton, Arizona 85350
Telephone (928) 627-2102 Ext. 7540
Fax (928) 627-3173

November 13, 2023

Via email to: LTWAF@azwifa.gov

Re: Cocopah RFI Designation for Long Term Water Augmentation Funding

Dear WIFA Assistant Director Chelsea McGuire,

On behalf of the Cocopah Indian Tribe ("Cocopah"), please accept this response to your RFI for LTWAF proposals. The Cocopah are proposing an augmentation project wherein it would deliver the Tribe's groundwater resources (non-Colorado River water) to the mainstream of the Colorado River above Morelos Dam. That water could then be used to fulfill Mexican treaty obligations, reducing the volumes of necessary releases from Lake Mead.

The Cocopah have retained a hydrogeologic consultant, Montgomery & Associates, to conduct initial hydrologic and water quality studies. The Cocopah have also engaged an Arizona law firm, Gammage & Burnham, to advise on the legal considerations. These efforts resulted in the Cocopah applying to the Bureau of Reclamation's Lower Colorado River Basin System Conservation and Efficiency Program in July 2023. A copy of the Cocopah application is enclosed, detailing the hydrologic, legal, and financial aspects of this project.

Pending feasibility studies, the Cocopah proposed delivering up to 60,000 acre feet of water annually to Morelos Dam for a period of at least 10-years, at an estimated cost $176,800,000 (including $3,300,000 of feasibility costs). The application contemplated that this delivered water could be used to retain water in Lake Mead as system conservation, but a variant through WIFA could involve an exchange to deliver water elsewhere in Arizona.

The Cocopah would welcome the opportunity to discuss this project with WIFA and to explore potential exchange opportunities. Thank you for your time and consideration.

Sincerely yours,

By: Gary Magrino
Business Development Director
Cocopah Indian Tribe

CC: Sherry Cordova, Chairwoman, Cocopah Indian Tribe
Michael J. Pearce, Gammage & Burnham
Juliet M. McKenna, Montgomery & Associates

Cocopah Tribe Groundwater Project

Lower Basin System Conservation and Efficiency Project Proposal

Title of Proposed Activity: Cocopah Tribe Groundwater Project (the "Cocopah Project")

Submitting Entity: Cocopah Tribe of Arizona (the "Cocopah")

- The Tribe has not previously participated in existing conservation programs or "Bucket 1" of the Lower Colorado Basin System Conservation and Efficiency Program.

Confidentiality: The Cocopah consent to this proposal being made public. Portions of this proposal reference other reports or presentations. The Cocopah are happy to share these complete documents with Reclamation to supplement this proposal, but ask that they remain confidential.

Proposed Project Location: Within Yuma County, Arizona, at and south of Morelos Dam. ***Exhibit A*** is a map of this area. Specifically, the Cocopah Project calls for withdrawing groundwater from a wellfield on the Cocopah Indian Reservation (the "Cocopah Reservation") and then delivering it to Morelos Dam via a northerly pipeline or canal along the Colorado River.

Background

The Cocopah are proposing to deliver groundwater (the "Cocopah Groundwater") to Morelos Dam to offset Mexican treaty obligations, allowing Reclamation to retain more Colorado River water in Lake Mead. Consistent with Reclamation's Yuma area accounting procedures, operating wells on the Cocopah Reservation would not require a Colorado River entitlement because of the area's southerly groundwater flows. Withdrawing the Cocopah Groundwater would also be consistent with United States treaty obligations to Mexico, including Minute 242. The United States is already using groundwater to fulfill a portion of the Mexican treaty obligations, so the Cocopah Project would just be adding to those preexisting deliveries.

The Cocopah could deliver up to 60,000 acre feet ("AF") of groundwater annually to Morelos Dam for a period of at least 10-years; totaling 600,000 AF over the project duration. The Cocopah Groundwater could then be delivered to Mexico, leading to quantifiable and verifiable reductions in deliveries of Colorado River water. This offset water could then be retained at Lake Mead. Depending on salinity conditions, Reclamation could also benefit from having Cocopah Groundwater to control the salinity of water at Morelos Dam in accordance with Minute 242. Reclamation could also adjust deliveries in a given year depending on drought conditions.

The Cocopah estimate that the project will cost $176,800,000 including all feasibility and capital investment costs. The Cocopah propose that Reclamation fund the initial $3,300,000 of feasibility costs as a grant. This includes (i) hydrogeologic investigation to install a pilot production well and monitor wells, aquifer testing, and modeling, and (ii) engineering services for a Design Concept Report and power supply study for the conveyance infrastructure. If the results are positive, then Reclamation could fund the $173,500,000 of capital investments half as grants and half as loans. If Reclamation agrees to pay $400 per AF for 600,000 AF of groundwater over the project duration, that revenue would cover annual operation, maintenance, and repair ("OM&R") costs, loan repayments, and also compensate the Cocopah for the use of Tribal resources. With Reclamation's financial support, the Cocopah could construct the wellfield and pipeline. The Cocopah are prepared to consult with experts such as hydrogeologic consultants and engineers as necessary. Together, the Cocopah and these experts can meet the project's initial technical requirements and ongoing OM&R activities.

Reclamation could easily monitor the Cocopah Project to ensure that the system benefits are realized. Meters could be installed on the wells and the pipeline or canal delivering the Cocopah Groundwater to Morelos Dam. The risk of inaccuracies or system losses would be low.

Technical Project Description

Legal Components

Withdrawing the Cocopah Groundwater does not Require a Colorado River Entitlement

Article V of the Consolidated Decree of the United States Supreme Court in *Arizona v. California et al*. 547 U.S. 150 (2006) requires the Secretary of the Interior to maintain records of "[r]eleases of water through regulatory structures controlled by the United States."[1] Because of the unique conditions in the Yuma area, groundwater use within portions of it do not affect the Colorado River mainstream and thus are not 'controlled by the United States.' Significantly, the eastern and western portions of the Cocopah Reservation are both downstream from Morelos Dam and are situated in an area with southerly groundwater flows towards Mexico.[2]

Reclamation has adopted detailed procedures for recording Colorado River water use in the Yuma area (the "Accounting Procedures").[3] Beginning with calendar year 2003, Reclamation has employed the 'Arizona Preferred Option' for these procedures. Under the Accounting Procedures, the Colorado River mainstream is only affected by groundwater withdrawals from the portion of the Yuma area north of a delineated groundwater divide, underneath which groundwater flows north or northwest.[4] Effectively, this only considers pumped groundwater to be Colorado River water if that water would have otherwise reached the Colorado River above the Northerly International Boundary ("NIB") at Morelos Dam.[5] Wells pulling from southerly

[1] Reclamation notes the source of this obligation in its annual Colorado River Accounting and Water Use Report. In the 2022 Report, it is listed on page 8 (page 14 of the PDF), available at: https://www.usbr.gov/lc/region/g4000/4200Rpts/DecreeRpt/2022/2022.pdf
[2] A June 2022 groundwater elevation map prepared by Reclamation illustrates this southerly flow of groundwater in the area. It is available at: https://www.usbr.gov/lc/yuma/programs/YAWMS/Groundwater/YA202206.pdf
[3] Reclamation summarized these procedures in a January 2006 report, which is available at: https://www.usbr.gov/lc/region/g4000/4200Rpts/YumaWtrAcct.pdf
[4] Page iv of the Accounting Procedures (page 5 of the PDF).
[5] Pages iv, v of the Accounting Procedures (pages 5-6 of the PDF).

groundwater flows are not considered diversions of Colorado River water.[6] The Accounting Procedures also specifically note that groundwater use from the west and east portions of the Cocopah Reservation are not diversions of Colorado River water.[7]

Withdrawing the Cocopah Groundwater is Consistent with Minute 242

Through the International Boundary and Water Commission ("IBWC") Minute No. 242 agreement ("Minute 242"), the United States and Mexico agreed to cooperate on how their water uses affect the salinity of the Colorado River.[8] Under Section 5, each country agreed to limit their groundwater use within five miles "of the Arizona-Sonora boundary near San Luis" to 160,000 AF annually. Under Section 6, each country agreed to consult with the other prior to undertaking new development of groundwater "in the border area" that might adversely affect the other.

The Cocopah Project would comply with Minute 242 Section 5 because the Cocopah Reservation is outside of the 5-mile boundary area. A Reclamation map of its Yuma Valley Well Field shows that this 5-mile area is measured from just the southern border, not the western border.[9] Thus, the Cocopah Reservation is entirely outside of this area. Furthermore, the United States appears to be well below the 160,000 AF limit imposed by Section 5. A November 2016 IBWC report notes that from 2004 to 2013, the United States was consistently ~100,000 AF below the limit each year, while Mexico was consistently at or only ~30,000 AF below the limit.[10] Similarly, a May 2016 Central Arizona Project brief notes that the United States only withdraws 28,500 AF per year through its Yuma Valley Well Field.[11]

The Cocopah Project should also comply with Minute 242 Section 6. Section 6 applies to groundwater development "in the border area." This could be construed to mean only the same 5-mile area identified under Section 5. Regardless, if Reclamation did choose to consult with Mexico about the Cocopah Project, it could emphasize that the United States is currently using much less groundwater in the border area than Mexico. Given these circumstances, withdrawing the Cocopah Groundwater would be both permitted and equitable under Minute 242.

The Cocopah Groundwater Could Offset Mexican Treaty Obligations

Through the Mexican Water Treaty of 1944, Mexico is allotted 1.5 million AF of Colorado River water annually. That treaty is administered by IBWC, and its terms have been

[6] Page v of the Accounting Procedures (page 6 of the PDF).
[7] Page 23 of the Accounting Procedures (page 36 of the PDF).
[8] The English text of Minute 242 is available at: https://www.ibwc.gov/files/minutes/min242.pdf
[9] Reclamation's map of its Yuma Valley Well Field is available at: https://www.usbr.gov/lc/yuma/facilities/yao_wellfields_map.html
[10] Tables 7 and 8 to IBWC's November 2016 Report on Colorado River Salinity Operations, included on pages 9 and 10. The Report is available at: https://www.ibwc.gov/Files/Annual_Salinity_Report_2013.pdf
[11] Page 1 of the May 2016 Central Arizona Project Board of Directors Action Brief, available at: https://library.cap-az.com/documents/meetings/2016-05-05/1567-3f.%20242%20well%20field%20expansion.pdf

modified by Minute 242. Minute 242 Section 1 calls for the United States to deliver 1.36 million AF annually to Mexico at the NIB near Morelos Dam, and up to 140,000 AF annually near the Southerly International Boundary ("SIB") near San Luis. Through preliminary outreach, the Cocopah understand that it is not viable to deliver Cocopah Groundwater to Mexico at the SIB, but that Reclamation has capacity and interest in receiving it at the NIB.

The Cocopah Groundwater could be delivered to Morelos Dam and then used to offset Mexican treaty obligations to retain even more Colorado River water in Lake Mead. After accounting for reduced evaporation and system losses, Reclamation could then retain even more than 600,000 AF of Colorado River water in Lake Mead. It is significant that the United States already uses groundwater to offset portions of the Mexican treaty obligations.[12] The Cocopah Project would just be offsetting more of it.

Physical Components

The Cocopah Groundwater Could be Delivered to Morelos Dam via a Pipeline or Canal

The Cocopah initially considered whether Cocopah Groundwater could be delivered to Mexico at the SIB. In April 2023, the Cocopah's representatives met with Reclamation's Yuma Area Office to discuss the Cocopah Project.[13] Based on that meeting, the Cocopah understood that: (i) current infrastructure at the SIB could not support deliveries under the Cocopah Project, but (ii) if the Cocopah could deliver significant quantities of groundwater, of a sufficient quality, to the NIB, then Reclamation might be interested in the Cocopah Project.

The Cocopah Groundwater could be delivered to Morelos Dam from the western portion of the Cocopah Reservation. ***Exhibit B*** is a map showing a proposed pipeline route that follows the route of the Colorado River north, using existing easements and rights of way. Additional pipeline would also be required to connect wells in the contemplated wellfield to the main pipeline. Alternatively, the wellfield could connect to a short pipeline and discharge to a canal that conveys the water north. Although constructing this pipeline or canal would require up front investments in construction and permitting, operating it would be straightforward.

Hydrogeologic Modeling of Groundwater Availability

The Cocopah have retained a leading hydrogeologic consultant, Montgomery & Associates ("M&A"). As an initial step in evaluating the Cocopah Project, the Cocopah wanted to assess whether the Yuma area aquifer could produce large quantities of groundwater and if the resulting drawdown would impact any nearby shallow groundwater users. In 2021, M&A performed a simple groundwater modeling analysis to simulate withdrawing 60,000 AF annually

[12] In 2018, pumped groundwater was approximately three percent of the water delivered to Mexico at the NIB, per slide 11 of this May 2021 Reclamation presentation: https://ibwc.gov/Files/CF_CR_IBWC_Overview_Yuma_Water_Ops_051921.pdf

[13] At this meeting, Reclamation shared a presentation titled "Colorado River Basin – Overview of Yuma Area Water Operations" dated April 11, 2023. Reclamation also shared salinity data for groundwater withdrawn from its Yuma Valley Well Field.

from a hypothetical wellfield spread across the eastern and western portions of the Cocopah Reservation for a 10-year simulation period, for total withdrawals of 600,000 AF (the "Model").

The Model used data from previous studies by the U.S. Geological Survey ("USGS") and the Arizona Department of Water Resources ("ADWR"). It noted that the aquifer system consists of three distinct units. In order of depth, they are: (i) an upper fine-grained unit; (ii) a coarse gravel unit; and (iii) a deeper zone made up of undifferentiated lower units (the "Deeper Zone"), which is over 2,500 feet thick near the western portion of the Cocopah Reservation. The Model simulated having the wells withdraw groundwater from this Deeper Zone. The Cocopah are interested in pumping groundwater from the Deeper Zone to minimize the impacts to surrounding shallow groundwater users and to target low salinity groundwater.

Exhibit C is a series of maps showing the locations of these wells and the resulting drawdown. The Model indicates that the aquifer could support the 60,000 AF annual withdrawals for the 10-year period and that the resulting drawdown would be no more than 20 feet near the well locations in the Deeper Zone, with less drawdown in the shallower zones. The Model also indicated that withdrawing groundwater from the Deeper Zone may induce downward movement of higher-salinity groundwater from the shallower aquifer, which could eventually impact the salinity of the Deeper Zone. Although the Model results are promising, and suggest that the Cocopah Project would not adversely impact nearby groundwater users or Mexico, additional testing and modeling is necessary to: (i) assess aquifer properties, (ii) finalize wellfield design to minimize impacts on nearby groundwater users; and (iii) evaluate the potential salinity migration to the Deeper Zone. The Cocopah have begun that salinity analysis, which is discussed below.

The Cocopah Groundwater Could Comply with Salinity Requirements

Groundwater delivered to Morelos Dam must comply with salinity standards set by Minute 242. These salinity standards are based on the concentration of total dissolved solids ("TDS") in parts per million ("ppm"). Minute 242 requires the salinity of the water delivered to Mexico at Morelos Dam to be within 145 ppm of the salinity of the water at Imperial Dam.[14] Pursuant to these standards, Reclamation meticulously monitors and adjusts its operations to account for salt influxes from agricultural return flows, groundwater pumping, subsurface drainage, and other sources of salinity in the Yuma area. In recent years, the TDS at Morelos Dam has generally been around 800 ppm, which is ~140 ppm higher than at Imperial Dam.[15]

The Cocopah understand that it has been increasingly difficult for Reclamation to meet these standards because of decreasing salinity levels in the water arriving at Imperial Dam. Thus, Reclamation's interest in, and ability to actually receive the Cocopah groundwater depends on its salinity. The Cocopah Groundwater could be a valuable tool for Reclamation to offset salt load influxes from the Yuma Area. Due to its location, the Cocopah Project could allow Reclamation

[14] Section 1(a) of Minute 242 requires the water delivered to Mexico at Morelos Dam to have an annual average salinity of no more than 115 ppm, +/- 30 ppm, above the salinity of the waters at Imperial Dam.
[15] Reclamation shared a slide showing this data with the Cocopah at their April 2023 meeting.

to influence the salinity at Morelos Dam by adjusting Cocopah Groundwater deliveries in real time. Thus, the Cocopah Project could also provide significant operational benefits.

M&A first evaluated available salinity data for the Yuma area aquifer by compiling TDS data from the USGS National Water Information System database. ***Exhibit E*** contains maps of the project area showing the locations of wells, the most recently measured TDS concentrations, and which aquifer unit they are pumping from. Most of this data is of limited use for this project, because it is several decades old and from wells withdrawing groundwater from shallower or multiple aquifer units.[16] However, the Cocopah have a test well on the western portion of the Cocopah Reservation (the "Cocopah Test Well") that is screened exclusively in the Deeper Zone.[17] ***Exhibit D*** is a graph of the TDS measurements from the Cocopah Test Well. Additionally, M&A also reviewed a 2017 Reclamation study that utilized electromagnetic ("EM") surveys to estimate groundwater quality.[18] That EM study suggests that much of the western portion of the Cocopah Reservation may have low salinity groundwater.[19]

Although additional testing is still necessary, the data suggests that a wellfield on the western portion of the Cocopah Reservation that draws from the Deeper Zone may provide groundwater with TDS levels meaningfully below the current salinity at Morelos Dam. TDS levels may improve in the Deeper Zone due to its isolation from agricultural runoff. The low TDS levels from the Cocopah Test Well, ~400-500 ppm at depths >400 feet below land surface, are promising. That data, combined with M&A's analysis and the EM study, suggests that a wellfield on the western portion of the Cocopah Reservation could produce groundwater of a sufficient quality for the Cocopah Project to be a worthwhile investment for Reclamation.

These initial results are promising, but the Cocopah recognize that additional testing is still necessary. There is a chance that the Cocopah Test Well is drawing from an isolated area of higher-quality groundwater. There is also a chance that as greater amounts of Cocopah Groundwater are withdrawn, the downward migration of higher salinity groundwater to the Deeper Zone could increase the Cocopah Groundwater salinity levels. Having considered those risks, the Cocopah believe that this initial groundwater modeling and salinity analysis justifies further investigation of the Cocopah Project. The Cocopah propose that Reclamation fund this further testing and the eventual infrastructure necessary to operate the Cocopah Project.

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[16] The USGS designation of "Lower Aquifer Unit" includes the Coarse Gravel Unit and the salinity levels of deeper production wells with long screen intervals likely represent a blend of aquifer units, rather than just pulling from the Deeper Zone.

[17] The Cocopah Test Well is drilled to a depth of 638 feet and was completed with a 40 foot well screen between 590 and 630 feet below land surface.

[18] Reclamation's *2017 Technical Memorandum 85-833000-2017-13 Yuma Groundwater Study: Geophysical Surveys and 3D Groundwater Quality Estimates using Airborne Electromagnetics, Lithology and Water Quality Data*.

[19] The Cocopah acknowledge that the ability to draw meaningful conclusions from EM surveys decreases with depth and in areas with high clay and silt content.

Conservation Description

The Cocopah Project could deliver up to 60,000 AF of groundwater annually over at least 10-years, totaling 600,000 AF. The Cocopah propose that Reclamation fund the initial feasibility studies as a grant. If proven feasible, the parties could then negotiate a System Conservation Implementation Agreement ("SCIA") to fund the infrastructure construction and arrange $400 per AF payments for the Cocopah Groundwater. Excluding OM&R costs, the Cocopah estimate that the project will cost $176,800,000. That equates to ~$294.67 per AF for 600,000 AF of groundwater. The difference between the $400 per AF payment and the OM&R costs would cover the loan repayments and would compensate the Cocopah for the use of Tribal resources.

1 – Methodology for Consumptive Use Reductions and Economic Explanation

The Cocopah Groundwater could offset Colorado River water deliveries to Mexico. Reclamation could then retain that offset water in Lake Mead. Offsetting releases of Colorado River water would also reduce evaporation and system losses from the water traveling from Lake Mead to the NIB. The Cocopah Project would have little to no system losses because of the significantly reduced transport distance. Thus, Reclamation could retain Colorado River water in Lake Mead at a greater than 1:1 ratio to the delivered amounts of Cocopah Groundwater.

The Cocopah believe that the $176,800,000 budget is reasonable, but caution that it is just an estimate based on informal consultations with experts. This includes $3,300,000 of feasibility costs to confirm the viability of the project (the "Feasibility Activities") and $173,500,000 of capital investments to construct infrastructure (the "Capital Investments"). This estimate is based on the cost of a steel pipeline. The Capital Investment costs may be lowered considerably. For example, an engineering study could show that the pipeline could be constructed from less expensive material, like PVC, or the pipeline could be partially replaced by a concrete-lined canal. Precise estimates for these cost-saving alternatives require an engineering study. For now, these costs are rough estimates. Tables summarizing the projected costs and timeframes for these Feasibility Activities and Capital Investments are attached as ***Exhibit F***.

2 – Verification and Documentation of Consumptive Use Reductions

By installing meters on the wells or the pipeline/canal, Reclamation could easily monitor how much Cocopah Groundwater is withdrawn and delivered to Morelos Dam. Based on those meter readings, Reclamation could then adjust its releases from Lake Mead to account for the delivery of the Cocopah Groundwater. Through a SCIA, Reclamation and the Cocopah could agree to the precise terms for how those meter readings will be taken and then reported to Reclamation. Reclamation would also have to quantify the amount of avoided system losses. The Cocopah are eager to work with Reclamation to ensure that the reporting is accurate.

3 – Amount of Time Required Before System Conservation Begins and Duration of Benefit

As noted on ***Exhibit F***, the Cocopah believe that the Feasibility Activities will take approximately 30 to 36 months. Depending on the exact specifications of the proposed wellfield and future supply chain conditions, the Capital Investments may take several years to complete.

The Cocopah appreciate that the Cocopah Project is a longer-term investment for Reclamation. Accordingly, the Cocopah are willing to enter a SCIA of at least 10-years to deliver 600k AF of groundwater to Morelos Dam. That 10+-year duration makes the investment worthwhile.

<u>4 – How the Project Will Ensure that the Amount of Conserved Water Will Not be Ordered</u>

The Cocopah do not believe that any third-party consents or forbearance agreements are necessary for the Cocopah Project. Reclamation has the existing authority to use the Cocopah Groundwater to offset portions of the Mexican treaty obligations. Delivering the Cocopah Groundwater would not affect the Cocopah's existing entitlement or other water uses.

<u>5 – Additional Information re Project Duration and Delivery Amounts</u>

The Cocopah appreciate that due to unpredictable drought conditions, Reclamation's need for Cocopah Groundwater may vary each year. Accordingly, the parties could account for variable deliveries through a SCIA. For example, the SCIA could be drafted to provide for the delivery of a total 600,000 AF of Cocopah Groundwater. Up to 60,000 AF could be delivered each year, for a period of at least 10 years. If Reclamation would like to receive less than 60,000 AF in a given year, the parties could opt to extend the project duration beyond the initial 10-year period. Among other things, the SCIA would then also have to account for adjusted loan repayment provisions. The Cocopah are willing and eager to negotiate such provisions. The Cocopah Project's flexibility is part of what makes it appealing for Reclamation's operations. But for now, this proposal assumes annual deliveries of 60,000 AF for a 10-year duration.

Technical Proposal Considerations

Consideration A – Quantifiable Water Savings

<u>1 – Anticipated Consumptive Use Reduction</u>

The Cocopah could deliver 60,000 AF of groundwater to Morelos Dam annually for a 10-year period, for a total of 600,000 AF. The Cocopah Groundwater could then offset the use of Colorado River water for Mexican treaty obligations. As noted above, Reclamation could retain Colorado River water in Lake Mead at a greater than 1:1 ratio to the delivered amounts of Cocopah Groundwater due to the reduced system losses from evaporation and seepage.

Again, the Cocopah caution that these are preliminary terms that may be subject to change based on the results of the Feasibility Activities. Depending on Reclamation's interest, the Cocopah could enter a SCIA that funds just the Feasibility Activities, with the option to adjust the project duration or other details depending on the results and future conditions.

<u>2 – Impact on Downstream Users</u>

The Cocopah Project would not materially impact downstream users. South of Morelos Dam, the Colorado River does not generally flow. Withdrawing the Cocopah Groundwater does not require an entitlement because of the southerly groundwater flows in the area. As long as the Cocopah Groundwater complies with the salinity standards set by Minute 242, Mexico or other users receiving water from Morelos Dam would not be affected. If anything, the Cocopah Groundwater may benefit downstream users by helping control salinity levels at Morelos Dam.

3 – Verification of Reduction in Consumptive Use

Through a SCIA, the Cocopah could implement procedures for Reclamation to monitor deliveries of Cocopah Groundwater via meters on the wells and pipeline/canal. Based on reported deliveries, Reclamation could adjust its releases of Colorado River water from Lake Mead. The Cocopah are eager to cooperate with Reclamation on accurate reporting.

4 – Innovation in Project Approach

The Cocopah Project could develop a new water source. By capturing groundwater that would otherwise be unused, the Cocopah Project would provide augmentation rather than just conservation. This is precisely the sort of Colorado River system augmentation that the Secretary of the Interior was tasked with investigating under the 1968 Colorado River Basin Project Act ("the "1968 Act").[20] This augmentation could alleviate drought-induced shortages.[21]

The Cocopah Project could also provide Reclamation with a valuable tool to control the salinity at Morelos Dam. Depending on the salinity of the water at Imperial Dam and return flows, Reclamation could adjust the deliveries of Cocopah Groundwater on a real time basis. Thus, the Cocopah Project could not only generate system conservation, but could also give Reclamation a valuable tool to fulfill the Minute 242 salinity requirements.

5 – Reduced Dependency on Colorado River Water

The Cocopah Project would allow Reclamation to fulfill Mexican treaty obligations while using less Colorado River water. This benefit could exist for years beyond project's initial 10-year duration and provide a valuable interim solution while longer-term solutions are negotiated.

Consideration B1 – Cost Effectiveness

1 – Total Estimated Construction Costs by Year

At this time, the Cocopah can only provide the estimated costs and durations for the Feasibility Activities and Capital Investments, as noted on ***Exhibit F***. Those estimates are subject to change depending on the Cocopah obtaining formal quotes. The largest Capital Investment cost, the ~$122 million cost to construct the pipeline, may be significantly lower if the pipeline can be constructed using cheaper materials or partially replaced by a canal. Through a SCIA, the parties could account for the precise timing, details, and costs of the Capital Investments.

[20] Section 201 of the 1968 Act calls for the Secretary of the Interior to investigate and develop a general plan to meet the future water needs of the Western United States. Among other things, the plan should seek to augment the water supply of the Colorado River system. The 1968 Act is available at: https://www.usbr.gov/lc/region/g1000/pdfiles/crbproj.pdf
[21] Section 606(g) of the 1968 Act defines augmentation as increasing "the supply of the Colorado River [by introducing] water into the . . . system, which is in addition to the natural supply."

2 – Total Estimated Costs to Plan and Design the Project

The Cocopah estimate that the Feasibility Activities will cost $3,300,000. The Capital Investment estimates contemplate that all of the necessary permitting for the Cocopah Project will cost approximately $1,500,000. Together, these estimates total $4,800,000.

3 – Year the Cocopah Project Will Begin to Conserve Water

The Cocopah estimate that the Feasibility Activities will take roughly 30 to 36 months, and that the Capital Investments may take years to complete. Depending on the final timing and specifications of these activities, the Cocopah Project may take several years to begin conserving water in Lake Mead. The Cocopah and Reclamation could account for this timeline in a SCIA.

4 – Projected Duration of the Cocopah Project

The Cocopah propose a 600,000 AF volumetric total for the project over an initial 10-year duration, with up to 60,000 AF delivered annually. That total or duration could be changed.

5 – Projected Duration that the Cocopah Project Is Expected to Conserve Water in Lake Mead

The Cocopah Project would conserve water in Lake Mead for its duration.

6 – Anticipated Savings in AF Per Year to Remain in Lake Mead

The Cocopah are proposing to deliver up to 60,000 AF of groundwater annually to Morelos Dam for an initial 10-year period. Reclamation could retain Colorado River water in Lake Mead at a greater than 1:1 ratio to the amount of groundwater delivered because of avoided evaporation and system losses as water travels from Lake Mead to the NIB.

Consideration B2 – Environmental Benefits

The Cocopah Project is a single purpose activity that would deliver Cocopah Groundwater to Morelos Dam. Reclamation may evaluate how the Cocopah Groundwater could provide environmental benefits by helping to control salinity conditions at Morelos Dam. Reclamation could also credit the Cocopah Project for the environmental benefits due to improved elevations at Lake Mead from the offset Colorado River water releases.

Consideration C – Disadvantaged Communities

The Cocopah Project is an ideal opportunity to advance environmental justice and equity. The Cocopah Reservation is spread across two tracts of the Climate and Economic Justice Screening Tool ("CEJST").[22] Both tracts are disadvantaged. Separately, CEJST methodology would automatically designate the Cocopah Reservation as disadvantaged to fulfill federal trust

[22] Tract Number: 04027011501 contains the eastern and western portions of the Cocopah Reservation. Tract Number: 04027011000 contains the northern portion of the Cocopah Reservation. See: https://screeningtool.geoplatform.gov/en/#11.07/32.5943/-114.7191

responsibilities. The Cocopah Project would also benefit geographically dispersed disadvantaged communities because not all Cocopah members live on the Cocopah Reservation.

The Cocopah Project would further EO 14008 and EO 13985 because it would compensate the Cocopah for the use of Tribal resources. After covering OM&R costs and loan repayments, the remainder of the project revenue could be invested in social services and economic development. Withdrawing the Cocopah Groundwater would not negatively impact the Cocopah or any of the surrounding landowners—it would just be capturing water that would otherwise be unused. Although parts of the revenue would be used to cover payments for services from third parties, the bulk of the money would directly benefit the Cocopah. The Cocopah expect to receive well above the 40 percent threshold of overall benefits set out in EO 14008. Thus, the Cocopah Project would benefit disadvantaged and geographically dispersed communities by providing the Cocopah with revenue while imposing few downsides.

Consideration D – Cost-sharing/Partnerships/Obligations

1 – Partnerships Involved with the Cocopah Project Proposal

M&A has assisted the Cocopah with its groundwater modeling analysis and initial water quality analysis. The Cocopah have also engaged an Arizona law firm, Gammage & Burnham PLC, to advise it on the legal considerations of the project and to assist with this proposal. These entities, plus an engineering firm, could assist the Cocopah with negotiating a SCIA.

2 – Cost-Sharing

The Cocopah propose that Reclamation fund the Feasibility Activities and Capital Investments. The funding for the Capital Investments and the precise Cocopah Project details could be tied to the results of the Feasibility Activities. Pending those results, the Cocopah propose that Reclamation pay $400 per-AF for 600,000 AF Cocopah Groundwater (up to 60,000 AF annually for an initial 10-year period)—totaling $240 million.

Reclamation could fund the $3,300,000 of Feasibility Costs as a grant. If the Cocopah Project is feasible, then Reclamation could fund the $173,500,000 of Capital Investments half as loans and half as grants. The annual revenue for delivering 60,000 AF of groundwater at $400 per-AF would allow the Cocopah to cover OM&R costs, repay the $86,750,000 of Capital Investment loans, and compensate the Cocopah for the use of Tribal resources.

3 – Support for Reclamation's Legal and Contractual Obligations

The Cocopah Groundwater could be a valuable tool for Reclamation to comply with the Minute 242 salinity standards. Reclamation could adjust its operations to alter its releases from Lake Mead and the Cocopah Project wellfield to account for salinity conditions in real time. This could prove extremely valuable as salinity levels at Imperial Dam continue to decline. The Cocopah Groundwater would also offset the Mexican treaty delivery obligations.

Funding the Cocopah Project would compensate the Cocopah for the use of Tribal resources. The Cocopah could use that revenue to provide social services and make other economic development investments. Indirectly, it would assist with fulfilling federal trust obligations. This could facilitate the Cocopah investing in its own separate water infrastructure. The project wellfield could also be repurposed for other Tribal uses after project.

Consideration E – Readiness to Proceed

1 – Tasks Necessary to Complete the Cocopah Project

The Feasibility Activities and Capital Investments, which are noted on ***Exhibit F***, are required for the Cocopah Project to proceed. The Feasibility Activities will verify that the Cocopah Groundwater can be delivered in sufficient quantities and at a high enough quality to make the Cocopah Project worthwhile for Reclamation. The Capital Investments will construct the infrastructure necessary to deliver the Cocopah Groundwater to Morelos Dam.

2 – Required Permits or Other Administrative Approvals

Permits for pipeline/canal and delivery of groundwater to Morelos Dam: Constructing the pipeline/canal and delivering Cocopah Groundwater to Morelos Dam would require various permits and environmental assessments under the Clean Water Act ("CWA") and the National Environmental Policy Act ("NEPA"). Although the Colorado River is does not generally flow south of Morelos Dam, the portion from Topcock Marsh to Morelos Dam, which may be subject to evaluation as part of the permitting of this project, is listed on the Arizona Department of Environmental Quality's ("ADEQ") Protected Surface Waters List for the Clean Water Act and under Arizona's Surface Water Protection Program ("SWPP").[23]

Potentially, Minute 242 consultation with Mexico: The Cocopah do not believe that the Cocopah Project would require a consultation with Mexico under Minute 242 Sections 5 or 6. However, the United States may elect to consult with Mexico under Section 6.

Potentially, consultation with ADWR re the AZ Anti-Export Statute: A.R.S. § 45-292(A) requires the approval of ADWR to "transport water from [the] state for a reasonable and beneficial use in another state."[24] Further consultation with ADWR may be required under this statute. If it applies to the Cocopah Project, the parties could address obtaining an ADWR permit as a part of the Feasibility Activities under a SCIA.

Potentially, consultation with ADWR re transportation from the Yuma Basin: A.R.S. § 45-547 requires ADWR approval to transport groundwater from the Yuma basin.[25] The Cocopah

[23] The page noting that the portion of the Colorado River from Topcock Marsh to Morelos Dam is included on ADEQ's list of covered waters is page 148 of this Arizona Administrative Register PDF: https://apps.azsos.gov/public_services/register/2021/44/contents.pdf
[24] A.R.S. § 45-292 is available at: https://www.azleg.gov/viewdocument/?docName=https://www.azleg.gov/ars/45/00292.htm
[25] A.R.S. § 45-547 is available at: https://www.azleg.gov/viewdocument/?docName=https://www.azleg.gov/ars/45/00547.htm

do not believe that this statute applies to the Cocopah Project because it targets in-state transfers. If any ADWR approval is required, it would likely be issued under A.R.S. § 45-292(A).

Potentially, under the Nonintercourse Act: Because the Cocopah Project would be implemented through a SCIA with Reclamation, the Cocopah do not believe that there are any potential issues arising under restrictions imposed by the Non-Intercourse Act.

3 – Required Engineering or Design Work

As noted on ***Exhibit F***, various engineering and design work would be required for the Cocopah Project. This includes hydrogeologic analysis to confirm the availability and quality of the Cocopah Groundwater, design work for the wellfield, and routing the pipeline/canal.

4 – Estimated Project Schedule

At this time, the Cocopah can only provide the timeline estimates noted ***Exhibit F***. The Cocopah propose entering a SCIA with Reclamation, based on which the Cocopah can solicit formal quotes for these activities. Then, the parties can more precisely coordinate the schedule.

5 – Timing for Implementation

Through a SCIA, the Cocopah propose having Reclamation agree to explore the viability of the Cocopah project by funding the Feasibility Activities. Based on those results, the parties could then agree on the specifications and schedule of the Capital Investments. Among other things, the parties could agree to phases for the construction of the wellfield and pipeline/canal.

6 – Whether the Cocopah Project can be Phased, Replicated, or Scaled

The viability of the Cocopah Project and whether it could be phased, replicated, or scaled, depends on the availability and quality of Cocopah Groundwater. Through the Feasibility Activities, the Cocopah hope to demonstrate that the Cocopah Project is viable for full funding by Reclamation. Depending on the results, the Cocopah Project could be phased, and the annual delivery amounts or project duration could be modified. And depending upon hydrogeologic conditions at the end of the initial project duration, the Cocopah Project could be renewed for a successive period through another SCIA.

Environmental and Cultural Resources Considerations

1 – Impact on the Surrounding Environment

The Cocopah Project would decrease the depth to water near the wellfield. M&A's 2021 analysis simulated this drawdown, concluding that it would be no more than 20 feet. Although the actual drawdown will depend on the results of the Feasibility Activities, the Cocopah believe that this is acceptable and would limit the potential impact to nearby wells. The more significant risk is that operating the wellfield may cause groundwater migration that could affect the salinity of the Deeper Zone. This will have to be studied in more detail during the Feasibility Activities.

Drilling the wells and constructing the pipeline/canal would impact the surrounding environment to an extent. Those disturbances, such as disturbing soil and generating dust, could be mitigated through responsible construction practices. Based on the current character and land uses near the project area, the Cocopah believe that these disturbances would be acceptable, particularly because the project wellfield would be entirely on the Cocopah Reservation.

The most significant environmental impact from the project could be that the Cocopah Groundwater could help reduce the salinity at Morelos Dam. Under the Minute 242 salinity standards, it has been increasingly difficult for Reclamation to counter agricultural runoff near the Yuma area. High quality Cocopah Groundwater could help control these salinity levels.

2 – Federal Threatened or Endangered Species; Designated Critical Habitat

The Cocopah Project would not impact any critical habitat for threatened or endangered species. The United States Fish and Wildlife Service ("USFWS") Threatened & Endangered Species Active Critical Habitat map does not show any covered areas at or near the project site.[26]

3 – Wetlands or Other Surface Waters

As noted above, the Cocopah Project would require environmental assessments and permitting under NEPA, the CWA, and potentially through the SWPP. The Cocopah would again like to emphasize that the Colorado River does not generally flow south of Morelos Dam and that withdrawing the Cocopah Groundwater does not require a Colorado River water entitlement.

4 – Existing Assets

The Cocopah have already invested heavily in the Cocopah Project. The Cocopah have funded the installation of the Cocopah Test Well, M&A's 2021 groundwater modeling, and the initial salinity analysis. The Cocopah have also consulted with Gammage & Burnham on the legal aspects of the Cocopah Project. Both entities have assisted the Cocopah with this proposal.

5 – Modification to an Irrigation System

The Cocopah Project could be constructed disconnected from any existing irrigation system. After the conclusion of the Cocopah Project, the associated infrastructure could be repurposed and potentially connected to other irrigation systems on the Cocopah Reservation.

6 – National Register of Historic Places

There are no listed buildings, structures, or features at or near the project area on the National Register of Historic Places.[27] None of the sites listed on the Arizona State Register of

[26] Last checked on June 30, 2023. The USFWS map is available at: http://fws.maps.arcgis.com/home/webmap/viewer.html?webmap=9d8de5e265ad4fe09893cf75b8dbfb77

[27] Last checked on June 30, 2023. The National Park Service's online map of these listings is available at: https://www.nps.gov/maps/full.html?mapId=7ad17cc9-b808-4ff8-a2f9-a99909164466

Historic Places, that are not included on the National Register, are at or near the project site.[28] The Cocopah are not aware of any other nearby potentially listable features or sites.

7 – Archaeological Sites

The Cocopah are not aware of any potential archaeological sites near the project area.

8 – Disproportionate or Adverse Effect on Environmental Justice ("EJ") Communities

The Cocopah believe that the potential harms from the Cocopah Project, including the drawdown of the depth to groundwater and disturbances from constructing the project infrastructure, would be offset by the funding it could receive from delivering the Cocopah Groundwater. That revenue would allow it to provide social services and invest in economic development. The project would benefit, rather than harm, communities with EJ concerns.

9 – Access to and Use of Indian Sacred Sites or Other Impacts on Tribal Lands

The project would primarily occur on and affect portions of the Cocopah Reservation. The Cocopah have evaluated these impacts and still wish to pursue the Cocopah Project.

10 – Noxious Weeds or Non-Native Invasive Species

The Cocopah do not believe that the project would contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species in the area.

Financial Capability

1 – Average Annual OM&R Costs

The Cocopah estimate that the project's annual OM&R costs would be $2,650,000, of which $1,800,000 are for operations and maintenance, and $850,000 are for replacement. Those costs are summarized on the first table of ***Exhibit G***. Of that, roughly half would go towards OM&R for the wellfield and half would be for the pipeline. The second table of ***Exhibit G*** illustrates how the $400 per-AF cost could cover these costs and loan repayments. Although these finalized values will have to be negotiated by the parties, assuming that Reclamation agreed to fund half of the Capital Investments as a loan and the remainder as grants, the Cocopah would still receive nearly *$12 million annually* as compensation for the use of Tribal resources.

As with its estimates for the Feasibility Activities and the Capital Investments, the Cocopah caution that these costs are estimated and are subject to change depending on formal quotes from contractors. The parties could account for these changes when they draft a SCIA.

2 – Estimated Replacement Costs by Year

At this time, the Cocopah are unable to provide more precise estimates of the annual replacement costs beyond the averages listed on ***Exhibit G***. For example, depending on the

[28] The list of these sites is available at: https://azstateparks.com/arizona-register-of-historic-places-arhp

specifications and number of wells, the timing and cost of replacements could vary. The annual costs contemplated on ***Exhibit G*** would likely fluctuate. Extensive replacements may be needed in some years, while other years would require very few. The estimate is just an average.

Project Budget Description

The Cocopah have estimated the costs and timeframes for the Feasibility Activities, Capital Investments, and OM&R costs in ***Exhibits G and F***. If Reclamation is interested in the project, the Cocopah could obtain formal quotes. The parties could then negotiate a SCIA where Reclamation's Capital Investment funding depends on the outcome of the Feasibility Activities.

Conclusion

The Cocopah Project would allow Reclamation to retain more water in Lake Mead and control the salinity at Morelos Dam. With Reclamation's support, the Cocopah would have the financial and technical capability to implement the project and its OM&R activities. Reclamation could easily monitor the withdrawals and delivery of Cocopah Groundwater to Morelos Dam.

For the Cocopah Project to be worthwhile for Reclamation, there must be sufficient quantities of groundwater of a high enough quality. The Cocopah and M&A's analysis on these matters are promising, but further feasibility studies are necessary. Thus, the Cocopah propose that Reclamation consider funding the Feasibility Activities first. If those results are promising, then the Cocopah and Reclamation could negotiate a larger SCIA for the Capital Investments.

The Cocopah Project costs no more on a per-AF basis than the other system conservation proposals that Reclamation has implemented under "Bucket 1." The project is an innovative and worthwhile investment because unlike other proposals, the Cocopah Project would be developing a new water source consistent with the goals of the 1968 Act. The Cocopah Groundwater could also be a valuable tool for meeting the increasingly challenging Minute 242 salinity standards. The project would also compensate the Cocopah for the use of Tribal resources, even after covering loan repayments and OM&R costs. The Cocopah Project could help alleviate ongoing drought conditions and provide flexibility to adjust deliveries depending on drought conditions in a given year, while allowing the Cocopah fund vital social services and economic development.

Thank you for your time and consideration of this proposal. The Cocopah are eager to partner with Reclamation. The Cocopah are happy to share additional supporting documentation with Reclamation or answer any of Reclamation's questions regarding this proposal.

Cocopah Tribe of Arizona

By: ______________________

Sherry Cordova; Chairwoman

Exhibit A – Map of Project Area in Yuma County

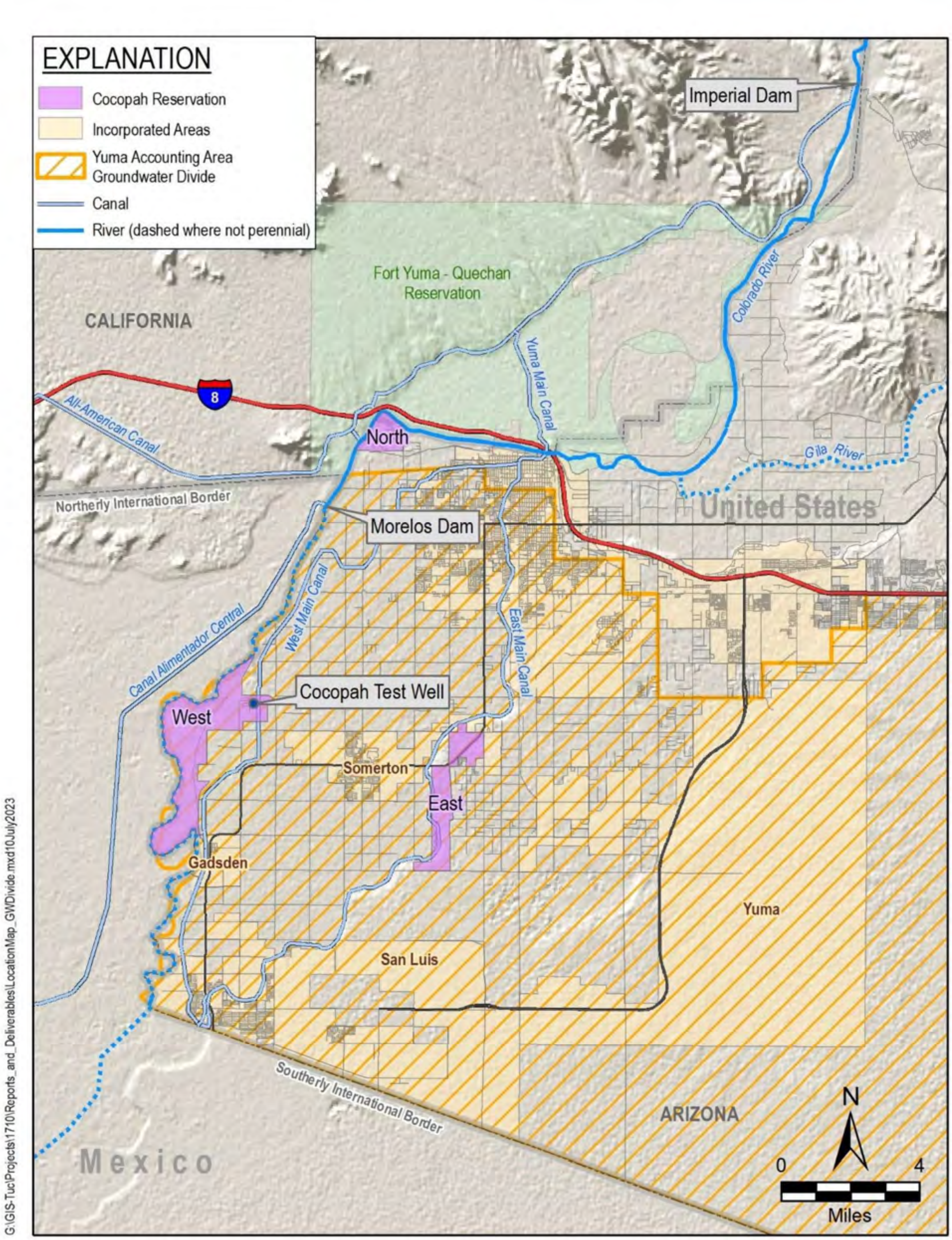


Exhibit B – Proposed Route of Pipeline to Morelos Dam

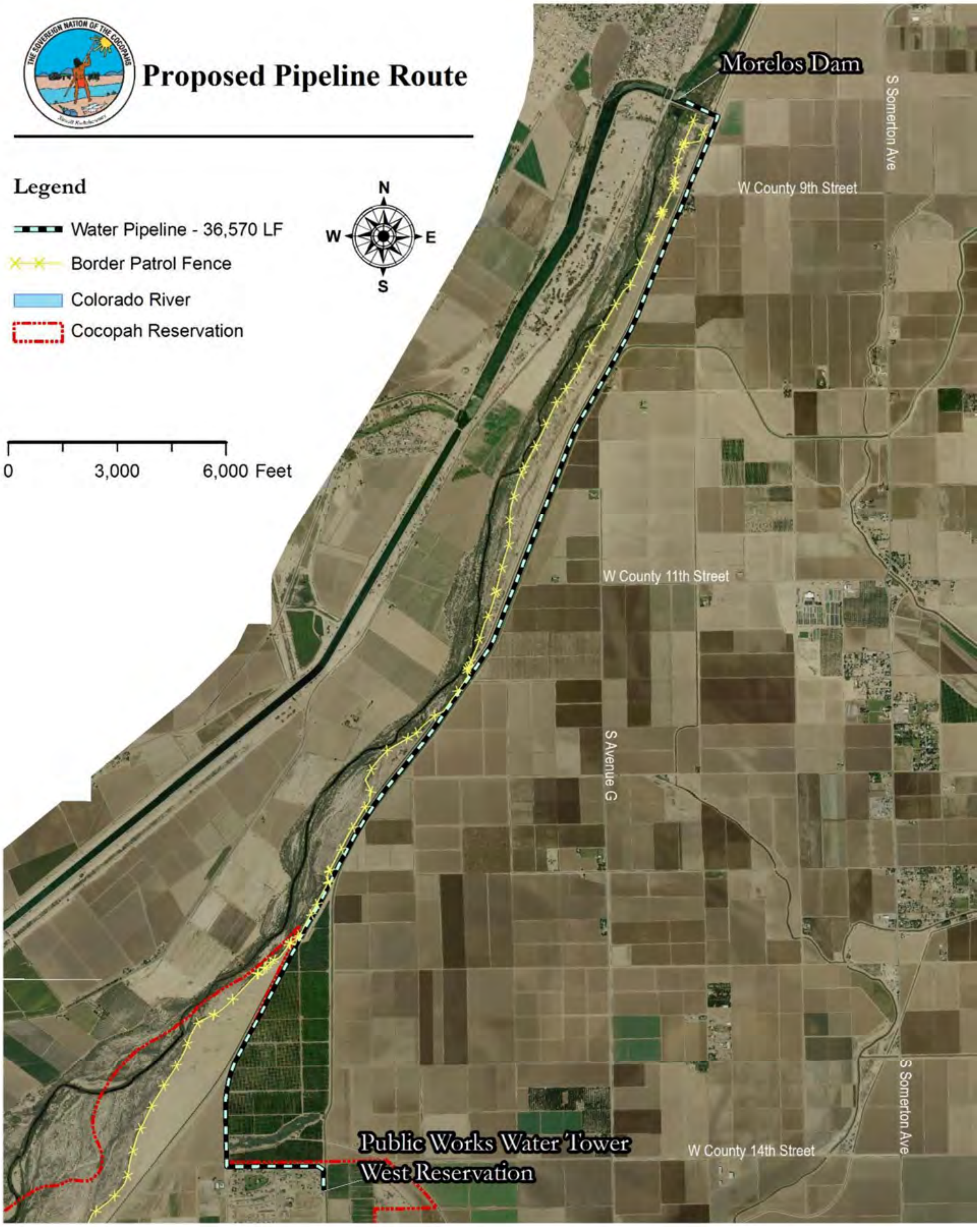
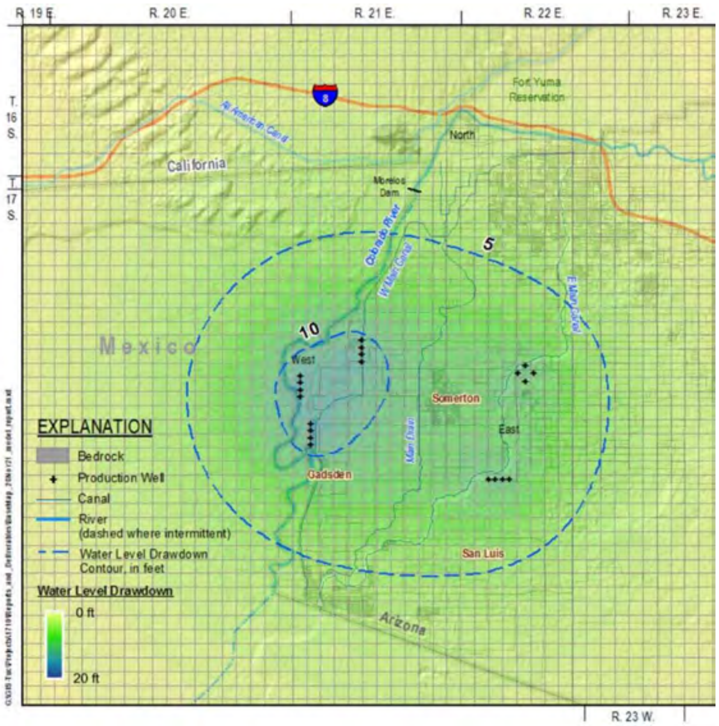
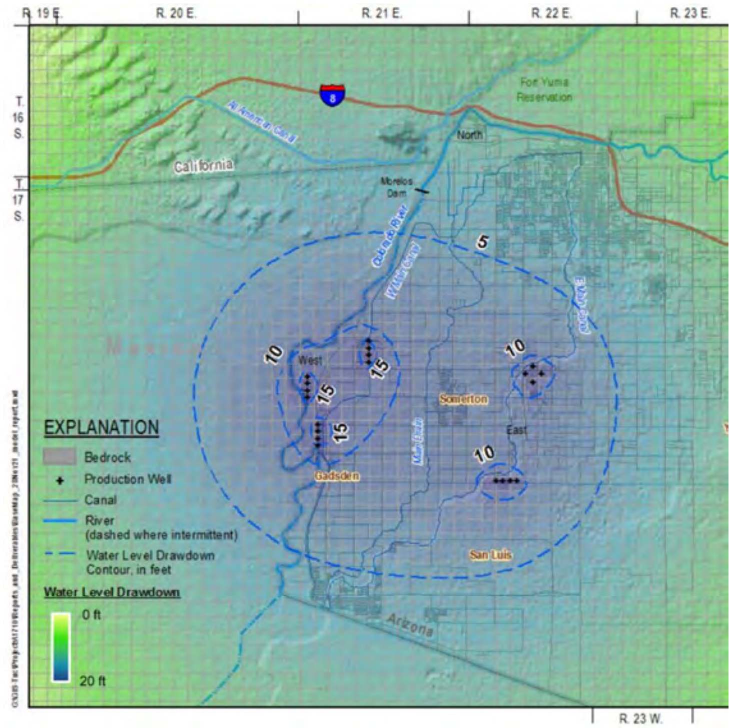


Exhibit C – M&A Groundwater Model Results

<u>Model Drawdown Results – Upper Unit</u>



<u>Model Drawdown Results – Deeper Zone</u>



<u>Model Drawdown Results – Coarse Gravel Unit</u>

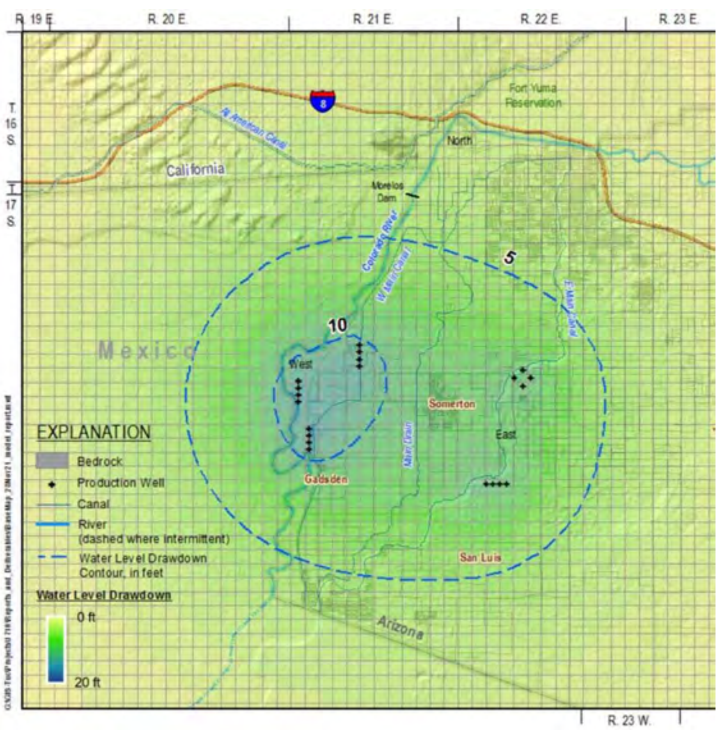


Exhibit D –TDS Concentrations Measured from the Cocopah Test Well

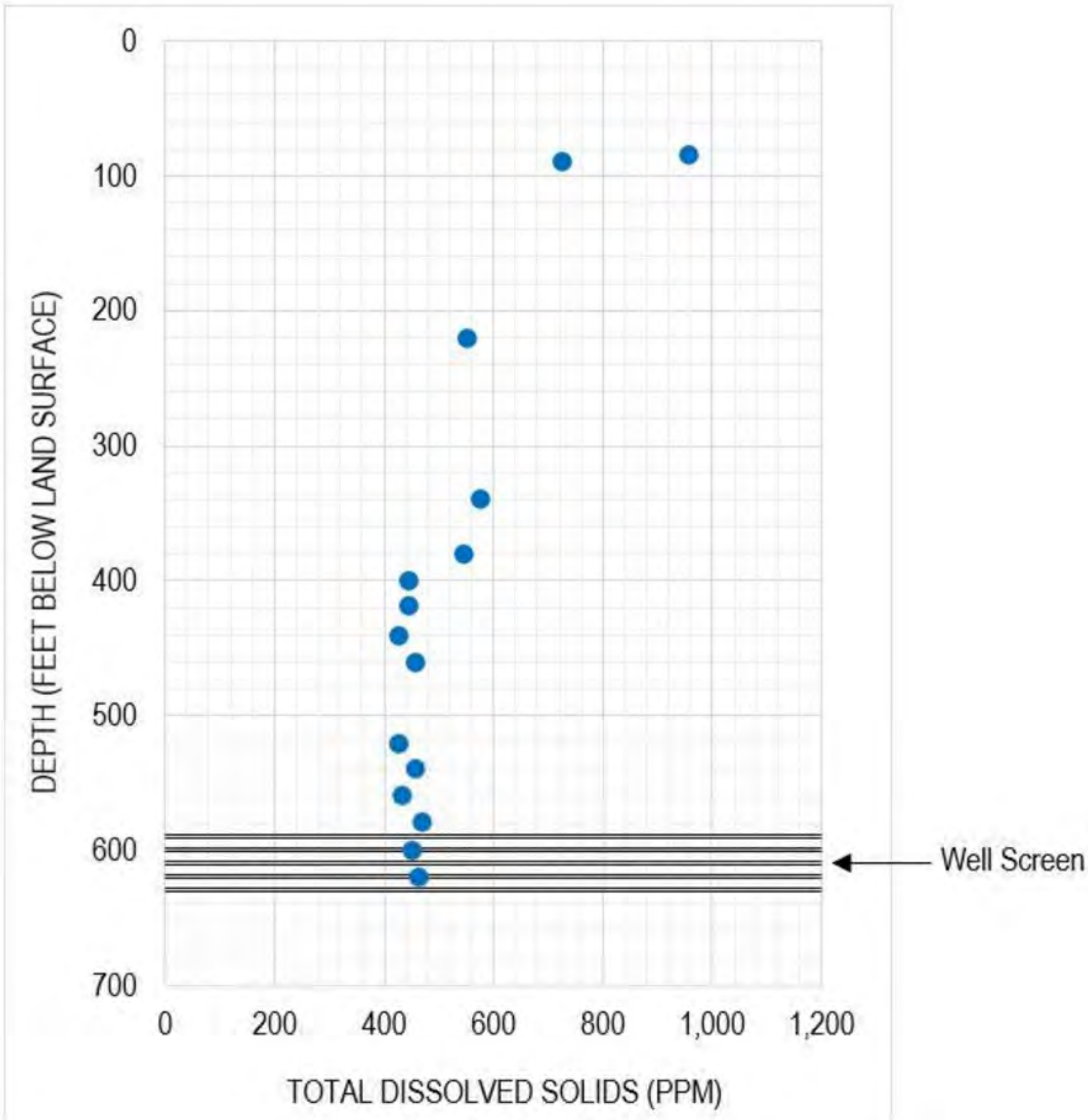


Exhibit E – Maps Showing Well Locations, TDS Values, and Aquifer Unit

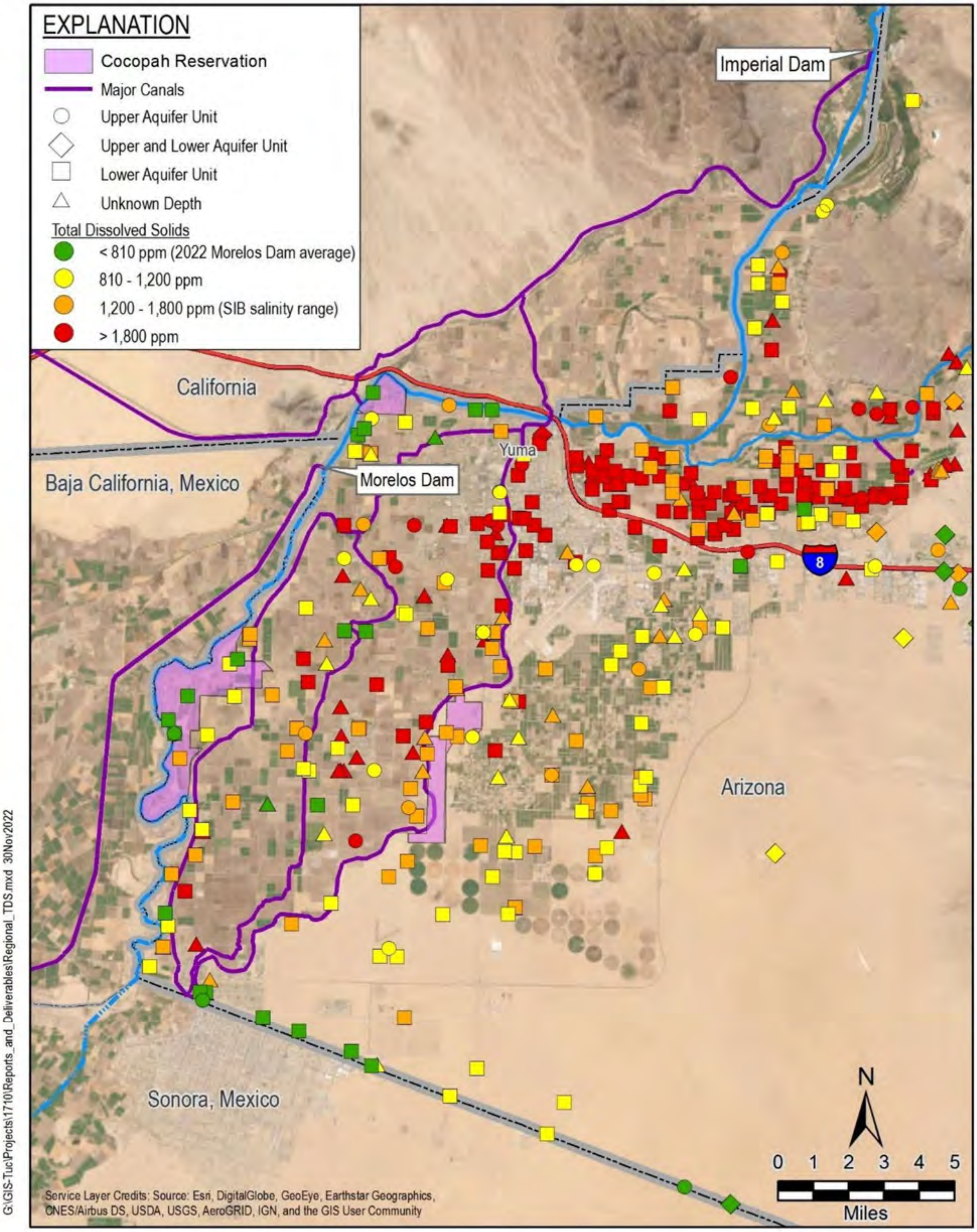


Exhibit E (Continued)

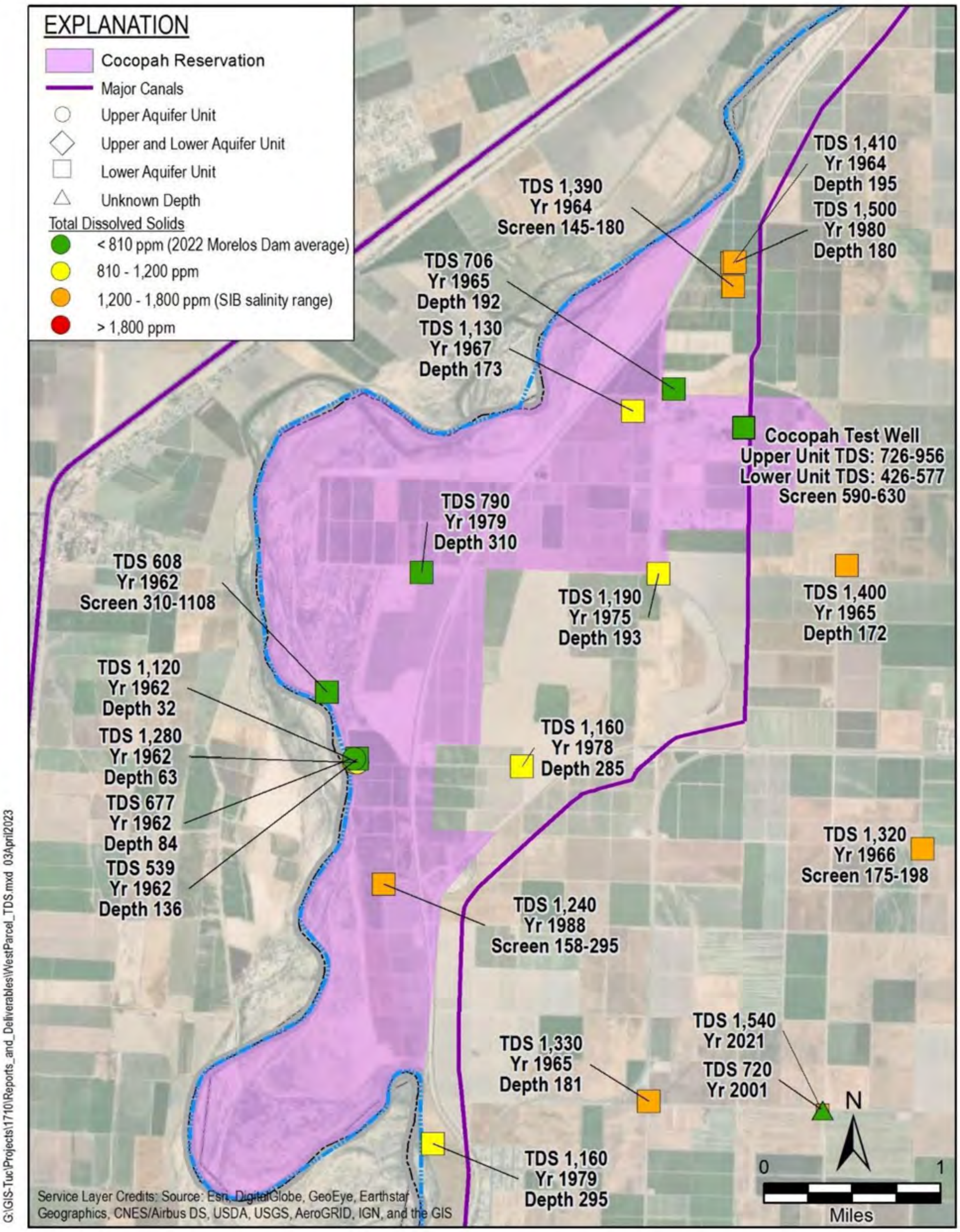


Exhibit E (Continued)

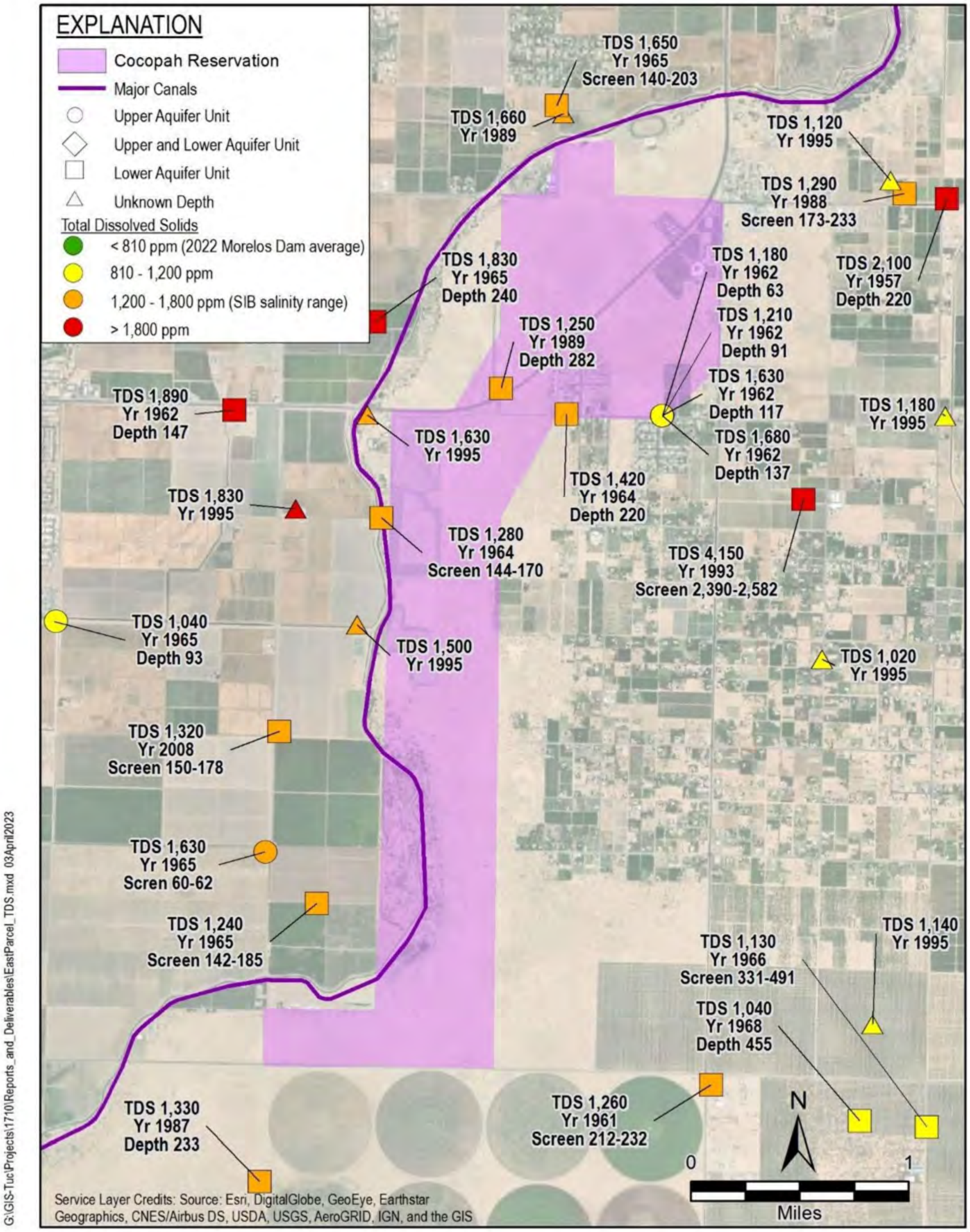


Exhibit F – Summaries of the Feasibility Activities and Capital Investments

Projected Feasibility Activities		
Phase of Work	**Approx. Cost**	**Approx. Timeframe**
A – Hydrogeologic Investigation (Pilot Production Well, Monitor Wells, Aquifer Testing, Modeling, Conceptual Wellfield Design) Preliminary Modeling	$2,250,000 (hydrogeologic & contractor services)	24 months
B – Conveyance Design Concept Report and Power Supply Study	$750,000 (engineering services)	6-12 months
10% Contingency	$300,000	n/a
Totals:	**$3,300,000**	**30 - 36 months**

Projected Capital Investments	
Category	**Approx. Cost**
Permitting (including NEPA)	$1,500,000
Wellfield Construction (~20 wells, hydrogeology, engineering, equipment)	$50,000,000
Pipeline Construction	$122,000,000*
Total:	**$173,500,000**
***Note:** This pipeline construction cost may be lower if the pipeline could be constructed using cheaper materials, or partially replaced by a canal. This estimate is based on a steel pipeline.	

Exhibit G – Summary of Annual OM&R Costs

Projected Annual OM&R Costs	
Category	**Average Cost**
Operations and Maintenance for Project Wellfield (includes electricity costs)	$1,100,000
Replacement Costs for Wellfield (annual average)	$250,000
Operations and Maintenance for Pipeline (includes electricity costs)	$700,000*
Replacement Costs for Pipeline (annual average)	$600,000*
Total:	**$2,650,000**
***Note:** These costs are based on pipeline for conveyance and would differ for a canal system.	

Hypothetical Annual Budget for Cocopah Project	
Income/Expenditure & Formula	**Amount**
Annual Payments for 60k AF of Groundwater at $400 per-AF (=60,000 AF x $400)	$24,000,000
Average Annual OM&R costs (=$1,100,000 + $250,000 + $700,000 + $600,000)	($2,650,000)
Average Principal Repayment of Capital Investment Loan ($86,750,000 of principal, repaid over a 10-year term)	($8,675,000)
Average Interest Repayment (2% interest rate, totaling $9,036,005.45 over a 10-year term)	($903,600.55)
Annual Budget Surplus:	**$11,771,399.45**

Water Infrastructure Finance Authority of Arizona
Long Term Water Augmentation Fund
November 6, 2023

Request for Information

Report Submitted by Deluge Technologies, Inc.

Contact:
Brian Hageman, CEO
Deluge Technologies, Inc.
bhageman@delugeinc.com
480-203-6815

*<u>**Deluge Technologies, Inc.**</u> is a privately held Delaware Corporation, Registered in Arizona

For more information about Brian Hageman's background and manufacturing team, please see the WIFA LTWAF application sent April 12, 2023.

Deluge Technologies, Inc.

Water Infrastructure Finance Authority of Arizona
Long Term Water Augmentation Fund
November 6, 2023
Reference: Request for Information

Greetings LTWAF Group – Thank you for the opportunity to submit Deluge Technologies Inc's. (DTI) proposals for **Arizona Water Augmentation**. The four (4) desalination projects, presented herein, are financially feasible by means of application of the unique Deluge Technologies Hydraulic Engine technology.

The largest expense of operating a desalination facility is typically the electricity cost for energizing the electric motors that power the high-pressure pumps, required in the reverse osmosis process. The DTI Hydraulic Engine systems require 90% less electricity, facilitating a reasonable wholesale price for desalinated water, including "zero liquid discharge" reject brine stream management. DTI's Hydraulic Engine system is 100% 'green', operating from solar thermal heat energy to produce purified water and 'green' electricity, with 24x7 availability.

Augmentation Projects:

1. Water Import from Gulf of California
2. Retrofit and Repurpose the Yuma Desalting
3. Arizona Desalting Stations Project
4. Buckeye Hassayampa River Pipeline

New water pipeline projects become financially feasible by utilizing the DTI Hydraulic Engine to pump water for conveyance. With no electricity required, remote water pumps may be powered with the DTI's new water pumping technology.

DTI's Hydraulic Engine projects are sustainable, built to last at least 50 years, and enable reductions in greenhouse gases by means of displacement of polluting fuels and electric motor systems.

Regards,

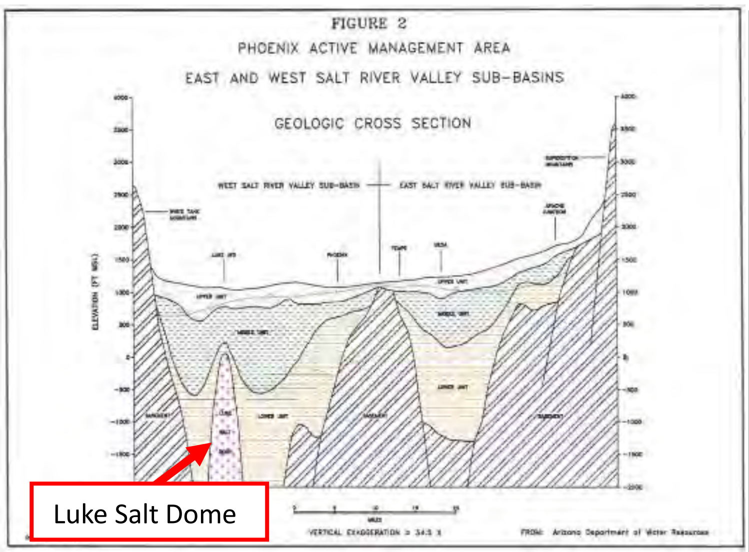
Brian Hageman, CEO
Deluge Technologies, Inc.

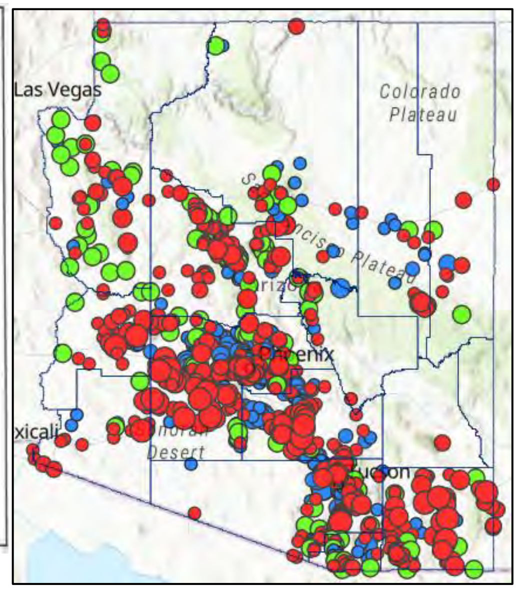
Report Submitted by Deluge Technologies, Inc.

Table of Contents:

Forward

Augmentation of Arizona’s water supply can advance through innovation. The new Hydraulic Engine technology developed by Deluge Technologies provides sustainable projects that will bring new water to Arizona, allowing current depleting aquifers to refill naturally to healthy levels. Groundwater management in Arizona can be shaped in the future to embrace all water sources in Arizona, both above ground and below. The below ground water is difficult to manage because it’s difficult to observe and measure but becomes very apparent as wells “dry up”, requiring deeper wells to be drilled. The map to the right was developed by the ASU Kyl Center for Water Policy indicating blue dots for increasing, and red dots for decreasing, levels of groundwater. *The major areas of population all indicate decreasing* levels of groundwater. The figure to the left is a cross section of the underground aquifers with the “large salt body” indicated in the west side of the Phoenix Active Management Area.





The groundwater under Phoenix is observed in the following example of decreasing groundwater levels. In 2010 Deluge rented ***Teardrop Lake*** to test floating solar hot water collectors. The lake was a perfect setting for water pumping experiments, being close to DTI's manufacturing shop, near the Phoenix airport and the Salt River. The lake is the actual groundwater aquifer exposed after the area was dug out by a river rock mining company. The boat launch made it easy for DTI's Hydraulic Engine equipment to be placed near the water, with associated solar thermal hot water panels and water pump floating on Styrofoam blocks. Today, that lake is gone, reduced to small pools of water that will disappear in the next few years!

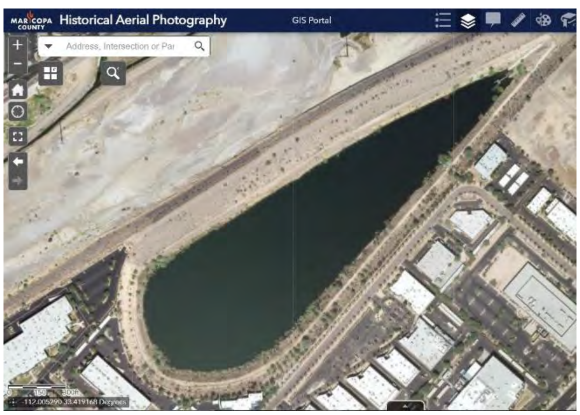


Figure 1 - Teardrop Lake - 2010

Figure 2 – Teardrop Lake - 2022

Teardrop Lake can come back to life with augmented water supplies that allow existing water resources to be conserved. This DTI RFI submission identifies four (4) projects designed for groundwater management, to ease the burden on existing municipal water systems. The first two (2) projects describe importing water from Yuma to Phoenix via water pipelines through Gila Bend and Buckeye. The first project builds a seawater pipeline from the Gulf of California to a new desalination facility

in Yuma. A trade agreement with Mexico would provide one (1) acre-foot of purified water to Mexico for every twenty (20) acre-feet of seawater delivered from the Gulf of California to Yuma.

The second project retrofits the existing Yuma Desalting Plant with DTI Hydraulic Engine pumping technology, fueling/energizing the engines with hot water produced with waste-heat from the adjacent Yuma Yucca Power Plant. The repurposing of the Yuma Desalting Plant for use by central Arizona will use existing Arizona groundwater. The same pipeline route through Buckeye to the CAP would deliver water to Tucson via the CAP.

The third and fourth projects utilize the Arizona Desalting Stations project as submitted to WIFA LTWAF earlier this year, with a pipeline project using six (6) Desalting Stations in Buckeye, pumped to north Buckeye and the CAP.

The pipelines from Yuma could be built by the Department of Interior, as the DOI built the Central Arizona Project canal, then sold it to the CAP political subdivision; created to manage the waterway. DTI expects that a private operator would operate the pipeline and desalting facilities. Deluge Technologies, Inc. is prepared to operate the desalting facilities, including managing the pipelines and would plan accordingly.

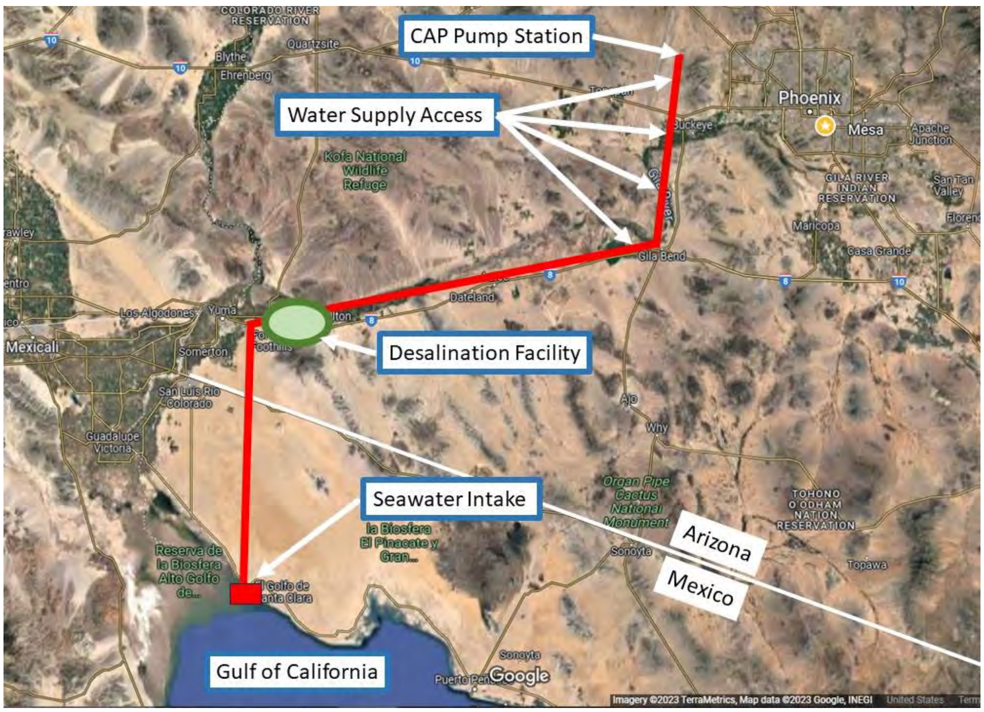
The groundwater management needed for the future in Arizona requires innovative solutions, and innovative technology. The DTI Hydraulic Engine technology converts 180-degree Fahrenheit hot water to high-torque shaft power, without emissions and operates silently. DTI is prepared to start building a Pilot-Plant desalting station and to begin the process of including DTI Hydraulic Engine technology in all future Arizona water projects. Both projects including seawater from Mexico and brackish groundwater from Yuma can reconstitute natural groundwater levels and provide a healthy water industry in Arizona, for the foreseeable future.

Brian Hageman testing solar collectors at Teardrop Lake

Water Import from Gulf of California

DTI proposes Augmentation of Arizona's water supply with ocean water desalination by means of a seawater pipeline from the Gulf of California in Mexico to a desalination facility near Yuma, Arizona. The Yuma desalination facility would pump purified water, through a pipeline, east to Gila Bend, then north through Buckeye, with surplus water being delivered to the Central Arizona Project Hassayampa pumping station. The Yuma desalination facility, and water pumping stations, will utilize the DTI Hydraulic Engine technology, operating from stored solar thermal energy, resulting in a 100% 'green' and sustainable water project.

The map below indicates the proposed 68-mile seawater pipeline, from Mexico to Yuma, and the 145-mile purified-water pipeline, with water access points in the pipeline in Gila Bend, lower Buckeye, and the north Buckeye development area.



Seawater would be purchased from Mexico by means of a trade agreement, whereby Mexico will receive one (1) acre-foot of purified water for every twenty (20) acre-feet of seawater supplied to the Yuma desalination facility. Negotiations of the seawater supply agreement may allow the purified water supplied to Mexico to earn credits for the Colorado River Treaty with Mexico, enabling CAP to pump additional water from the Colorado River, in exchange for the new, Yuma purified, water supply to Mexico. Mexico would be allowed to use the new purified water supply allocation or sell part of it to Arizona, should Mexico not require the full allocation.

The Hydraulic Engine desalination technology may be designed for brackish or seawater desalination. Seawater desalination requires higher pressure system components because of higher levels of salt content, compared to brackish water. The Hydraulic Engine for seawater desalination requires heavier duty pistons, piping and associated components, increasing the price of the system by 25% - 30%. This will raise the wholesale price of desalinated water from the brackish water price of $612 per acre-foot to about $800 per acre-foot. This price is less than half of the price of desalinated seawater supplied by traditional electric motor-powered desalination systems. There will be an additional pipeline delivery cost and, depending on the funding source for the pipelines, the final price to municipalities, including conveyance, would be below $1,200 per acre foot.

The capacity of the water supply system will be variable. The pipeline easement will be designed for multiple pipelines, providing the ability to double or triple the capacity of the system. The initial design will incorporate a 48-inch diameter pipeline, with additional 48-inch pipelines reserved for future needs. A 48-inch pipeline will deliver 50,000 acre-feet of purified water per year. The full project cost is based on a 2004 estimate for a similar project of $1.5 billion, and adjusted for inflation would be about $2.4 billion in 2023 dollars. The construction period will be about 5 years.

Retrofit and Repurpose the Yuma Desalting Plant

This project proposes converting an existing desalination plant from electric motor-powered water pumps to Deluge Technologies, Inc. (DTI) developed, Hydraulic Engine powered high-pressure water pumps. Typically, large desalination plants are located adjacent to an electric power plant, because of the very large amounts of electricity required for the electric motor-powered high-pressure pumps. The proposed project will use hot water to energize the DTI Hydraulic Engines utilizing the waste-heat stream of the APS Yucca Power Plant, located adjacent to the existing/'not-in-service' desalination facility, versus solar thermal energized hot water.

The Yuma Desalting Plant (YDP) was built to augment the water supply to Mexico, in agreement with the Colorado River Water Treaty. The YDP was built in 1992 and temporarily operated for "pilot testing" in 2007 and 2011. The YDP has a total capacity of 82,000 acre-feet/year however has only been operated at one-third capacity during testing.

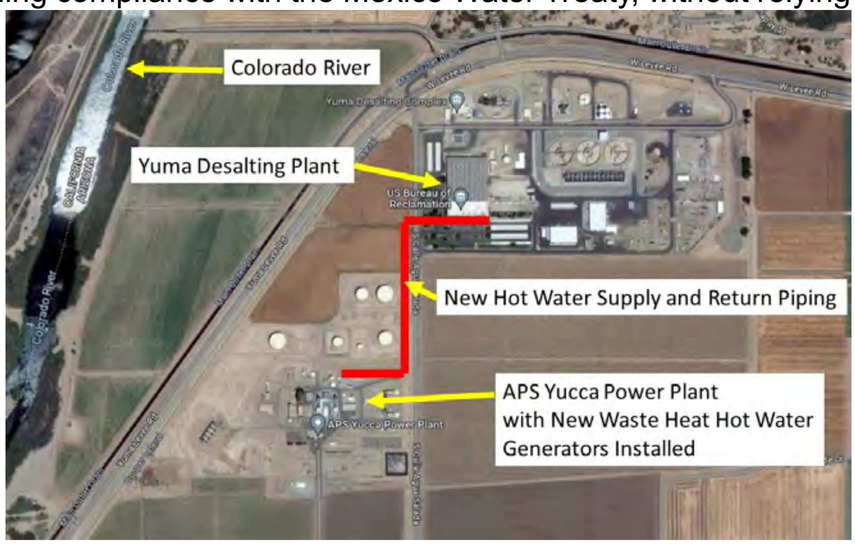
The photo to the left shows the size of the large electric motors required for pumping and pressurizing the raw brackish water that feeds into the reverse osmosis membranes. The new (DTI) Hydraulic Engine powered pumps will bypass or replace the electric motor/pumps.

The photo to the right shows the RO membrane structure that will be utilized, remaining in place as-is. *The RO membranes are brackish water membranes*, (ocean water membranes would require a higher-pressure piping system).

The YDP is designed to desalt brackish groundwater that has migrated through the state to southwest Arizona. The desalted water produced from the YDP is pumped directly into the Colorado River.

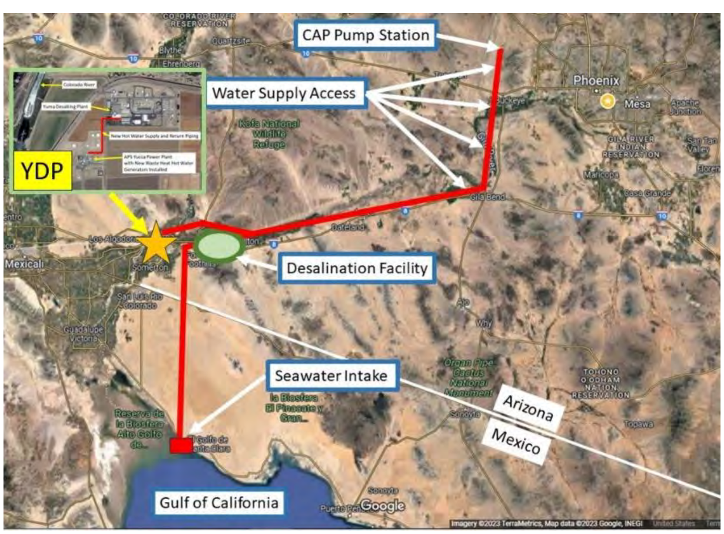
The ASU Arizona Water Blueprint shows the underground aquifers in the southwest United States. If the aquifer map were extended into Mexico, it is observed that the underground water migrates to the Gulf of California, hence becoming lost to the ocean. The YDP uses brackish water on its “last stop” prior to reaching the Gulf.

The Yuma Desalting Plant has been unproductive for over 30 years; its upgrading and repurposing would bring significant collateral benefits for the regional freshwater infrastructure. Maintaining the Colorado River Treaty water delivery to Mexico may be accomplished by means of alternative methods, not relying on Arizona’s groundwater. The YDP may be repurposed to augment the water supply in central Arizona, recycling the groundwater from Yuma instead of losing the water to the Gulf of California. By sending the reclaimed and purified brackish water back to the Phoenix Metro area, water users in the Phoenix AMA (Active Management Area) can decrease their use of current water sources and reduce the burden on the CAP, gaining more waterflow in the Colorado River and therefore maintaining compliance with the Mexico Water Treaty, without relying on the Yuma YDP Station.



The proposed Retrofit Project would include DTI Hydraulic Engines, installed at the YDP, and hot water pipelines built between the Yucca Power Plant. Heat exchangers would be installed at the power plant, enabling waste heat sources to produce hot water, as primary energy for the DTI Hydraulic engines. Deluge would purchase hot water from APS for supply of utilized waste-heat.

A pipeline from the YDP to Buckeye would follow the same route as the new desalination facility that will desalt the imported seawater from Mexico. A second pipeline in parallel, or the same pipeline, can be used, depending on capacity required for the population growth in the Phoenix Metro area and CAP water augmentation for cities including Tucson.



This new water source will enable the Phoenix AMA to reduce well pumping usage, allowing the aquifers to recharge to full levels. Retrofitting the existing YDP will benefit all of Arizona's water users, while facilitating sustainable management of water resources. The YDP retrofit and repurposing, along with the Mexico seawater resource will provide a sustainable 'green energy', fresh/purified water source for the foreseeable future. The estimated project cost for the retrofitted YDP and pipeline is $2.5 billion with a five-year construction schedule.

The YDP is owned by the United States Department of Interior, Bureau of Reclamation. DTI proposes to become the new owner/operator of the facility. In order to accomplish the forgoing stated goals, DTI would need supporting political persuasion, for the Department of Interior to agree with the proposed YDP repurposing. The retrofitting project may be started with a "Facilities Use Agreement" between the Department of Interior and Deluge Technologies, Inc. The project would take five years (approx.) to build, during which time the political transition of the facility may be completed. In consideration of the prevailing regional drought conditions, DTI recommends that optimal use of the YDP facilities be considered.

The original intent of the YDP appears to have become somewhat obsolete, and now offers opportunity to be reconfigured to address current critical regional freshwater needs, taking advantage of new/innovative technologies, including significant sustainability and environmental benefits. Pumping expensive reverse osmosis water into the Colorado River where, within 30 miles, the river sinks into the delta is clearly less than an optimal application of valuable purified water, and resources. While the existing YDP complies with the water treaty between the US and Mexico, DTI believes that new, mutually beneficial, terms may be negotiated with Mexico, ensuring long term purified water security.

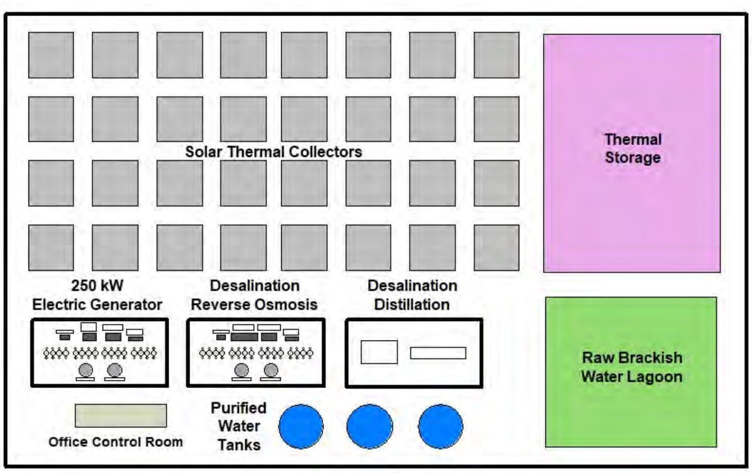
Arizona Desalting Stations Project

The Arizona Desalting Stations Project will produce local water augmentation using desalination of brackish water aquifers in the Phoenix AMA and across the state. The desalting stations, as with gas stations, for example, would be distributed throughout the state, with the primary locations being in the Buckeye Waterlogged Area brackish water aquifer. The purified water produced would be pumped into existing water supply systems in the west Metro Phoenix area.

The proposed project would become a portion of the full state-wide groundwater management vision, attaining a sustainable, 'green-powered' water future, *while maintaining healthy aquifers* throughout the state. The DTI Hydraulic Engine enables the possibility to desalinate brackish or ocean water and to pump the water across the state, using alternative thermal energy such as solar-thermal, geothermal, or waste heat. The desalting stations will provide a unique and new source of water that will conserve existing water sources.

According to water consultants Montgomery and Associates, more than 600 million acre-feet of recoverable brackish groundwater remain in storage aquifers in Arizona. 600 million acre-feet is 100 times the annual Arizona water use. This is the largest unallocated water source in the state and will become the next major water source for Arizona.

Each **Desalting Station** will produce one million gallons of purified water per day. Each location may have multiple Desalting Station systems. Desalting Stations will be located to distribute the effect of lowering the water table. The project schedules 100 desalting stations, built in locations throughout Arizona, over a five-year period.



Desalting Station

Each Desalting Station includes a 250 kW Electric Generator along with the 'hybrid' reverse osmosis ***and*** distillation desalination equipment. The solar-thermal collectors harvest heat from the sun, producing hot air which is circulated through the Adobe/Salt thermal-storage reservoir (battery), providing 24 hours of continuous thermal-energy for operating the Desalting Station 24 hours per day.

The Phoenix AMA has provided the industrial well drilling permit instructions that allows new wells to be drilled to extract the underground brackish water. The Phoenix AMA will allow the brackish water to be sold on a wholesale basis for non-agricultural purposes. Further details concerning this are available in the WIFA LTWAF "Arizona Desalting Stations" project submittal of April 12, 2023.

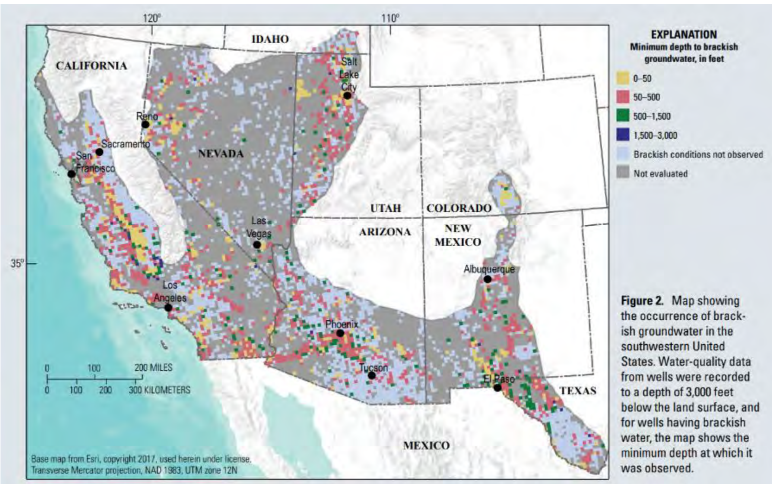
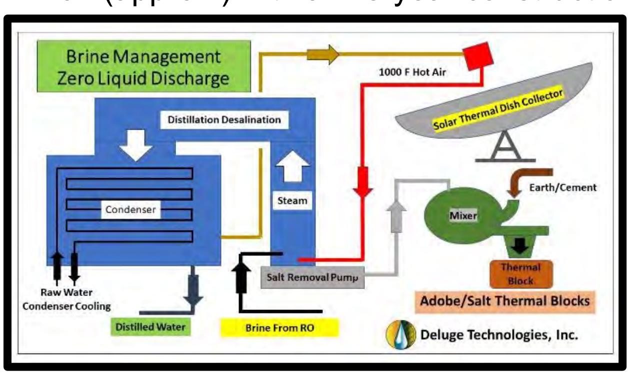


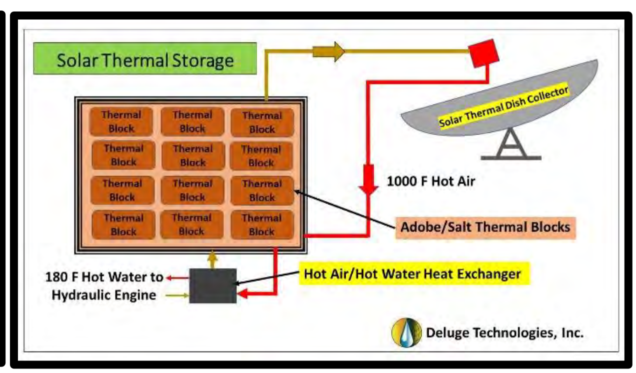
Figure 2. Map showing the occurrence of brackish groundwater in the southwestern United States. Water-quality data from wells were recorded to a depth of 3,000 feet below the land surface, and for wells having brackish water, the map shows the minimum depth at which it was observed.

The US Geological Survey has provided a map of brackish water resources that includes the depth of the aquifers. There are many aquifers around Phoenix where the water table is less than 50 feet. The Buckeye Waterlogged Area has a water table as shallow as 5 feet.

An important feature of the Desalting Stations is the *"Zero Liquid Discharge" brine management system,* resulting in additional purified water extracted from the brackish water, compared to traditional RO systems. The salt reject from the *secondary distillation desalination process* is mixed with selected soils/dirt and cement to manufacture Adobe/Salt Thermal-Blocks, required for the thermal storage "battery". Also, DTI utilizes the incoming/raw brackish water flow for the Hydraulic Engine cooling system; thus, warming the brackish water, resulting in a more efficient reverse osmosis process.

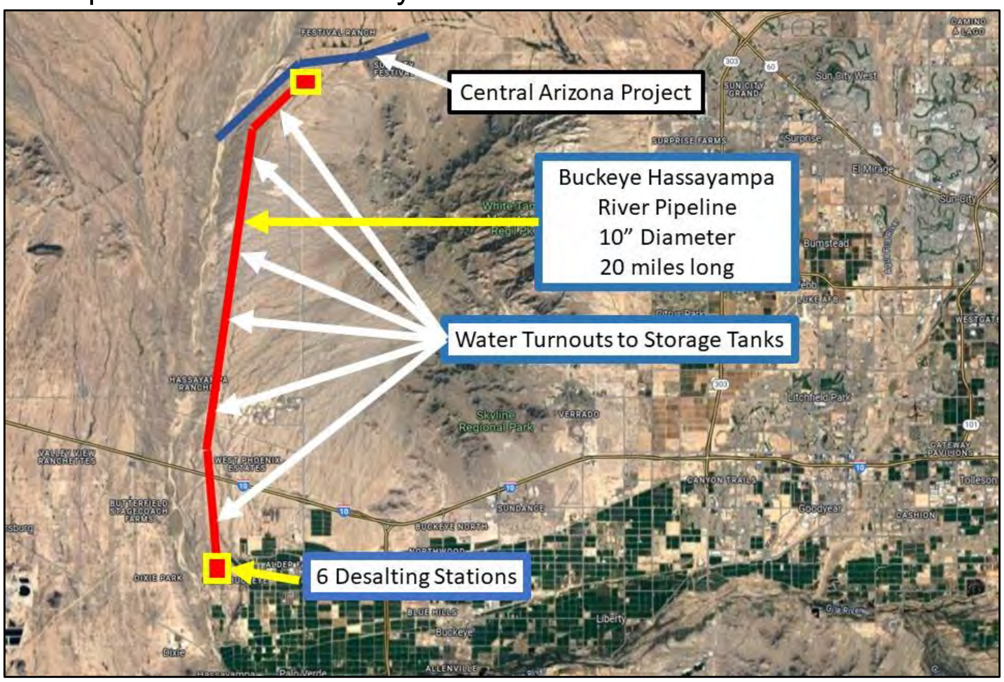
The Arizona Desalting Stations project will produce 100,000 acre-feet/year of new water and 25 Megawatts of 'green' baseload electricity, (24x7). The project cost is $250 million (approx.) with a five-year construction schedule.



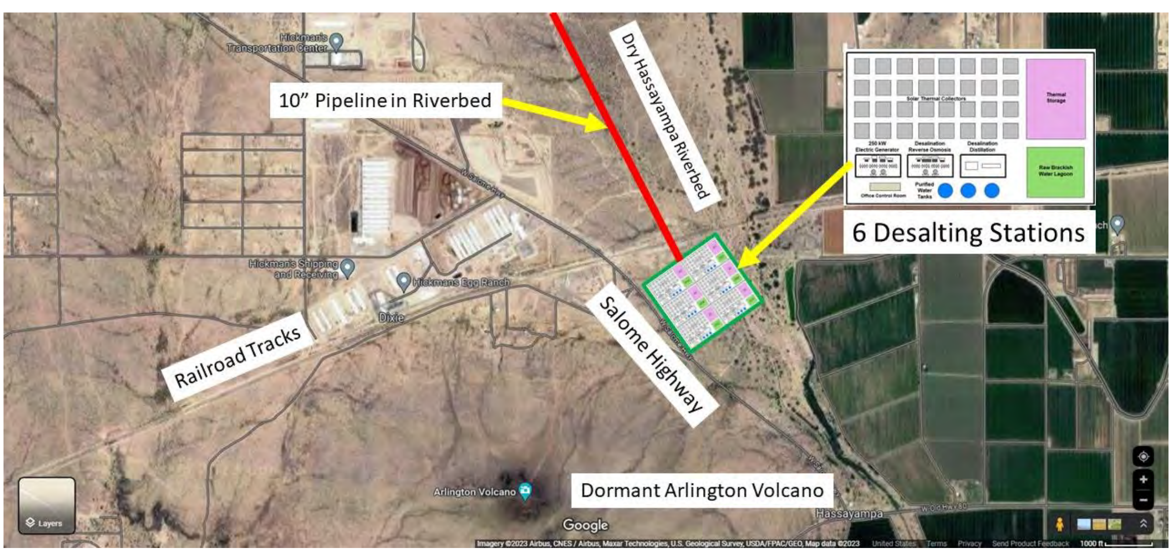


Buckeye Hassayampa River Pipeline

The Desalting Station and Pipeline project will desalt brackish water from the Buckeye Waterlogged Area and fill drinking water storage tanks in North Buckeye, allowing conservation of groundwater pumping in the North Buckeye residential area. The pipeline will be automated to maintain full storage tanks with excess water being provided to CAP to augment the Colorado River water supply. Six (6) Desalting Stations will provide five (5) million gallons of purified water per day. Each Desalting Station will be built as the population expands North of Buckeye.



The proposed Desalting Stations are in the lower part of the Hassayampa Riverbed. One of the Desalting Stations is configured to pump purified water through the pipeline. Also, 1.5 megawatts of 'green' baseload electricity will be supplied to the grid.



The location of the proposed Desalting Stations would be adjacent to the Buckeye canal drainage to the Gila River

The Buckeye pipeline project originated from the Recommendation Report provided to Governor Doug Ducey of Arizona in November 2020. The Recommendation Report, written by Brian Hageman, outlines the groundwater table management by the Buckeye Water Conservation and Drainage District (BWCDD) and the dewatering efforts to pump water out of the aquifer to lower the brackish water level for the benefit of farmers. The Buckeye brackish ground water table is so shallow that the roots of the alfalfa crops would be harmed by the salty brackish water. The BWCDD operates the nine (9) groundwater pumps in the Buckeye valley and successfully lowers the water table approximately ten feet, reducing the risk of crop root damage. The Department of Water resources has designated the Buckeye Waterlogged Area as an area of an abundance of brackish water. The Recommendation Report quantifies the amount of water available for brackish water desalination. During the research, it was noted that when the pumps were turned off for maintenance, the water table rose again within a week, proving the renewability of the aquifer.

Currently, the amount of brackish water dewatering pumped out of the waterlogged area, if desalted, would provide water for approximately 50,000 homes. It is expected that further lowering of the groundwater table is possible, ie. instead of ten (10) feet, up to thirty (30) feet, and would be replenished from the natural underground water flow. This abundant brackish water source would supply the Desalting Stations project and the North Buckeye area residential development for *centuries* into the future.

The expected cost of the Desalting Stations and the pipeline is approximately $25 million, with a five-year construction schedule.

E2Eden

ENGINEERING ABUNDANCE

Unlocking 3 MAF on the Colorado River, with desalination evaporative technologies

Big things start small

PREFIX

As new entrants with an unconventional, innovative approach we recognize two audiences:

- the **public agencies** tasked with the sober responsibility of providing our cities and civilization with water in a desert,
- and **the general public**, who we believe to be key partners whose enthusiasm, support and energy are the true key to doing anything of scale. Accordingly we have designed this document to serve both.

To WIFA and the State of Arizona we intend to provide the details necessary to credibly convey our idea to domain experts & engineers for rigorous evaluation. However, we have also designed this to be an easily **consumable**, **unconventional**, but most importantly, **inspiration vision** of the future for the public – and took some liberties stylistically to accomplish that end.

"Creativity is just connecting things."
- *Steve Jobs*

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- **ETH Zurich, Switzerland** – PhD Civil Eng.

Charlie Paton
Desalination & Desert Farming visionary & entrepreneur,
Founder of Seawater Greenhouse Ltd.

- **Central School of Art & Design, London**

Ryan Gravel
Infrastructure Visionary,
Founder of the Atlanta Beltline

- **Georgia Tech** – M.S Architecture, M.S. City Planning

Zvi Lerner
Ex-VP SNL Lavalain, Biz Mentor

- **University of Toronto, Canada** – MBA
- **Technion, Israel** – B.S Mechanical Eng.

THE IDEA & TECHNOLOGIES

THE SETUP

While not the conventional view, our thesis is that water is incredibly ABUNDANT in the southwest. The key to our insight is understanding the reality that any commodity, when mispriced, is squandered. And in the case of the Colorado River basin, with no liquid and freely traded water market, water has been egregiously mispriced, depriving rational users of the economic rewards of saving. Agriculture consumes 85% of the water in west give or take, and pay an order of magnitude less than urban users, producing farm products worth less than the market value of the inputs were water priced at urban rates. A noble use of water, and one we seek to SUSTAIN and IMPROVE whilst simultaneously reducing the water needed dramatically.

The problem is likely one widely known. Unfortunately this has been used to justify unimaginative buyouts to fallow land for the water, collapsing the agrarian economies and engendering much ill will to outside attempts to purchase land. After and in parallel with the attempts to buy the water rights, have been attempts to seize those same rights through one means or another. The result of these and other approaches has been to entrench both sides, urban and agricultural water users, in opposition to each other, rendering the situation ever more intractable.

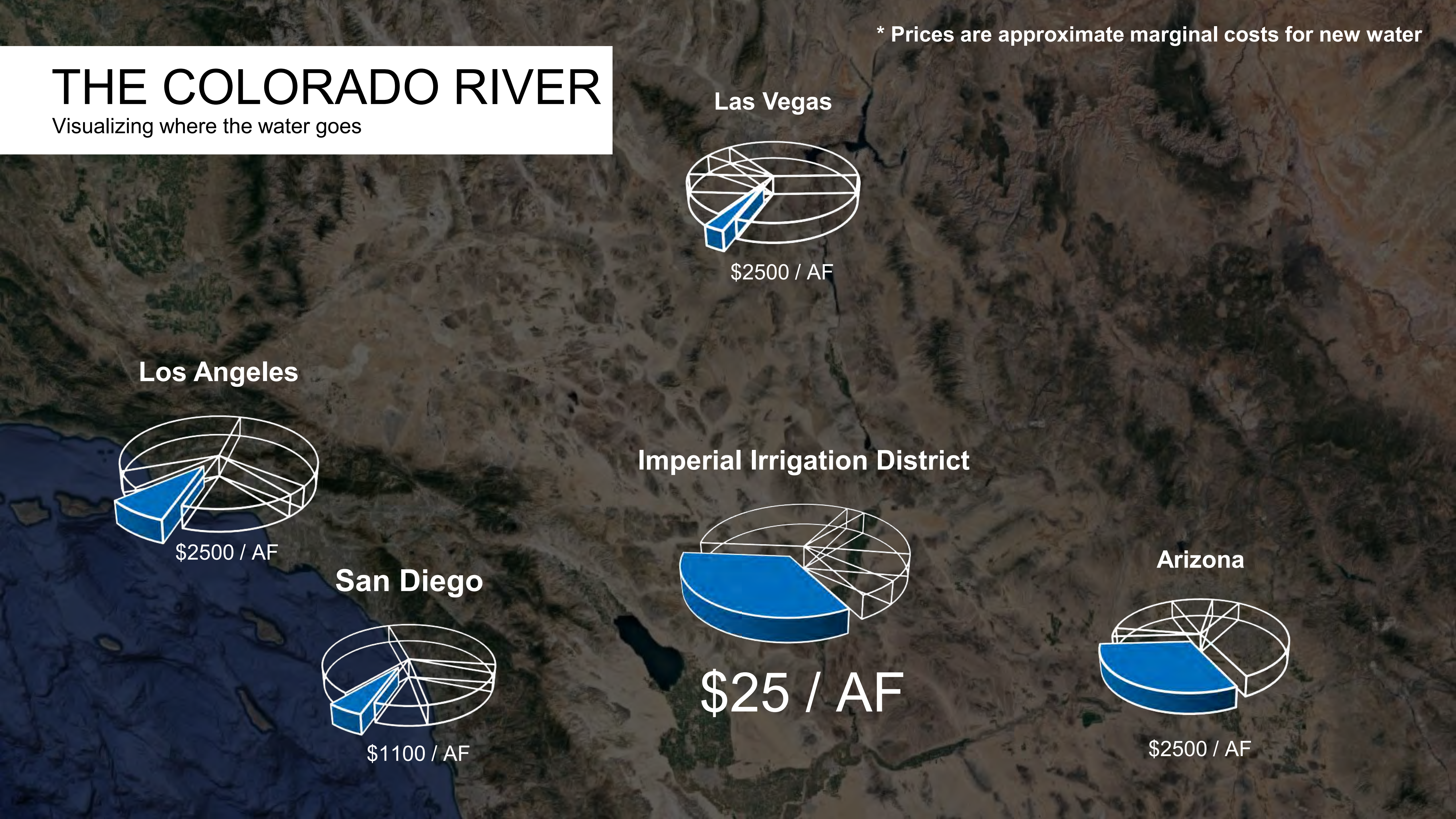
So how do we unlock this massive pool of water spilled into the arid desert heat in the noble service of feeding the growing sunbelt? Can innovation, human cleverness, or new perspectives yield a win-win that could unlock the water we already have in vast quantities for new uses?
Can we have our cake and eat it too?
Yes! We believe we offer just such a solution, as technologists and outsiders, we believe there exist non-speculative technologies when configured correctly, that have the potential to transform the southwest to a magnitude with no precedent since the Hoover Dam.

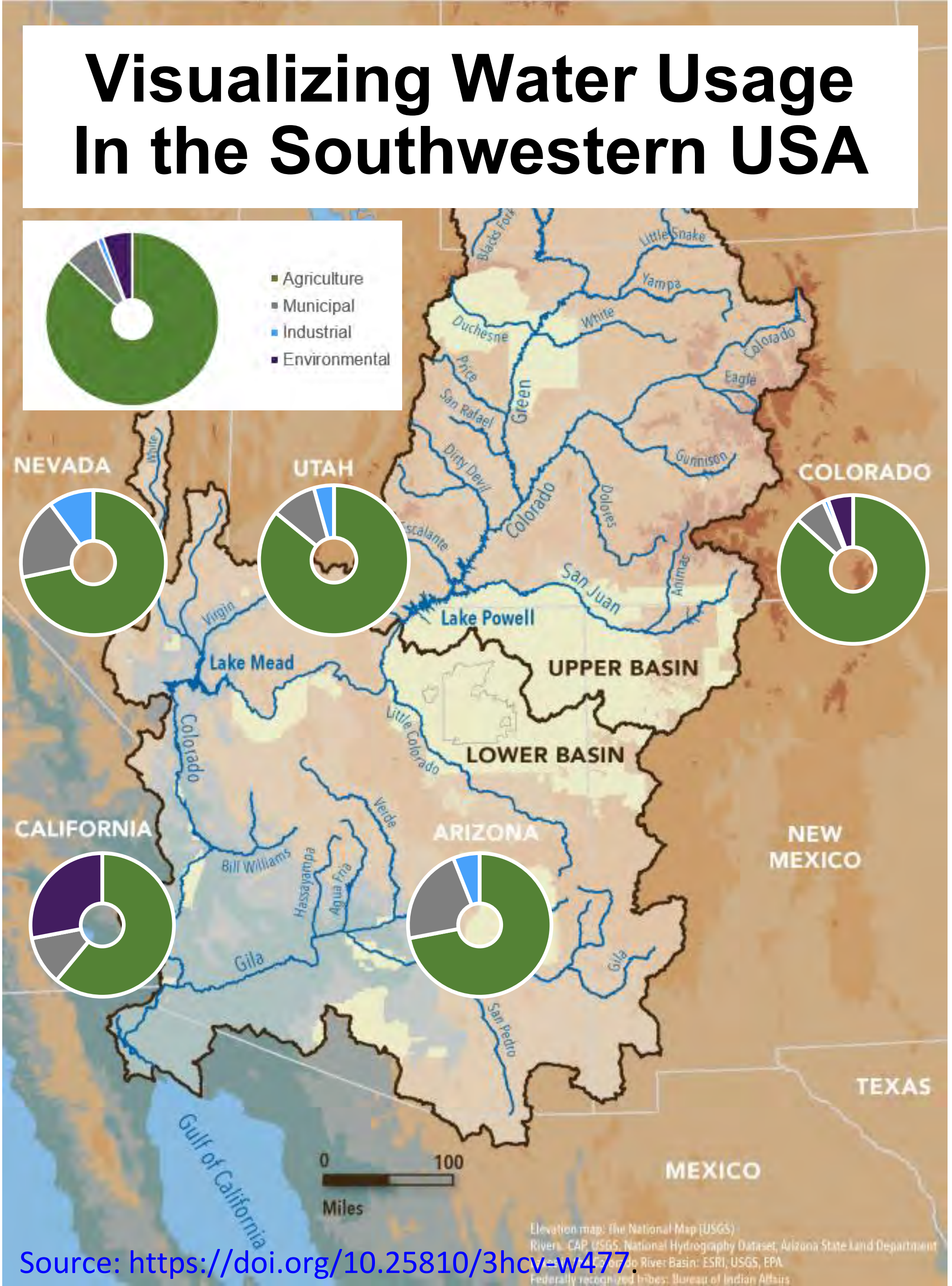
How?

Grab a cup of coffee and a seat and let us walk you through it.

THE COLORADO RIVER

Visualizing where the water goes





Agriculture is the #1 consumer of water across every state

Arizona – Arizona Drinking Water Report, 2020
California - https://www.ppic.org/publication/water-use-in-california/
Utah - https://extension.usu.edu/waterquality/learnaboutsurfacewater/usesofwater/
Colorado - https://waterknowledge.colostate.edu/water-management-administration/water-uses/
Nevada – water.nv.gov

WHERE THE WATER GOES

Talk to the average person about the water problems of the west and invariably they bring up the absurdity of Las Vegas, a city in a desert. As ostentatious as the city is by design, contrary to public imagination, they draw far less from the Colorado than most presume.

While most see millions of people in Vegas, San Diego and Los Angeles and assume that's where the water goes, the truth is they are but a fractional users of the river.

And that fact is the key insight to our proposal.
There is an **OCEAN OF WATER**, hidden in plain sight, locked up in the noble mission of feeding us all.
Agriculture accounts for ~85% of the total water used. That cup of water the restaurants withhold during a drought?
Performative sacrifice. Irrelevant. A rounding error.
You see fields of alfalfa, we see a resource waiting to be unlocked.

Farms are where the water goes, where it must be saved, and where the future of the west will be decided.

Source: https://www.arizonawaterfacts.com/water-your-facts

AND HOW WE SAVE IT

The Evaporative Desalination Farm

Concept primer
https://www.youtube.com/watch?v=LqPZoQMv6vQ&t=5s&ab_channel=CharliePaton

Seawater Greenhouse, Ltd. project

EVAPORATIVE DESALINATION

Introducing a technique pioneered by Charlie Paton at Seawater Greenhouse Ltd. https://seawatergreenhouse.com/, and deployed worldwide in Oman, Australia, Somaliland, and beyond…

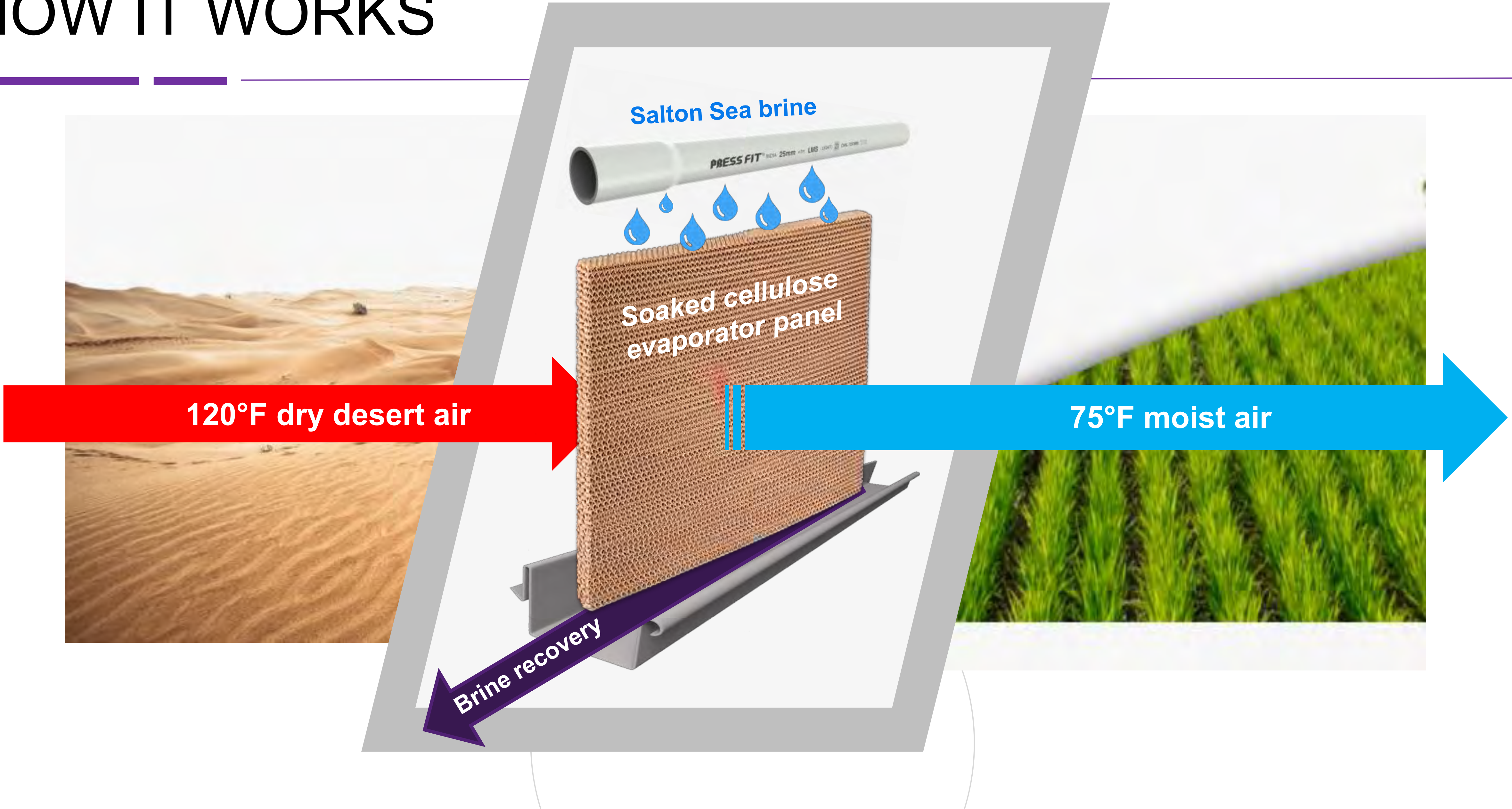
Whereas traditional RO desalination uses massive amounts of energy to create pressure to separate the water from the salts, we use the thermal energy in the blistering heat of the atmosphere to let nature do the job for free!

Plants, like humans, “sweat” prolifically in the dry heat of the desert to cool. Most of the water, even with drip irrigation, is transpired into the air just to cool the plants.

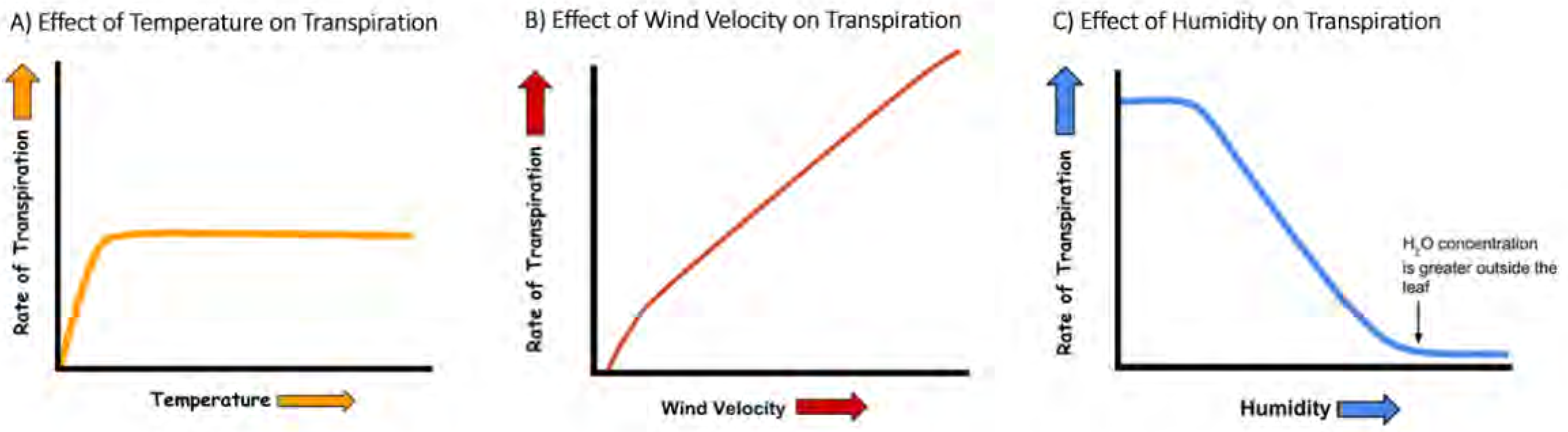
We can reduce their water use by 90% using “Swamp Coolers” drenched in brackish or ocean water as a wind break on farms. The water evaporates stealing the heat from the hot dry desert air as the hot winds try to squeeze through the mesh, cooling, humidifying and slowing the wind.

The cooling effect result – a dramatic reduction in plant transpiration

HOW IT WORKS


Salton Sea brine
PRESS FIT
Soaked cellulose evaporator panel
120°F dry desert air
75°F moist air
Brine recovery

WHY IT WORKS



Plants sweat like you do.

Dropping **wind speed** and **temperature** while increasing **humidity** can reduce agriculture's water needs by **90%+** !

This represents a transformation opportunity to solve the demand side of the equation in a transformative and meaningful way for mankind.

And all by using either brackish water or an inexhaustible resource – ocean water!

THE PROPOSAL

THE REQUEST

Cost Categories	Cost ($k)
Subcontracts	$214
Material	$946
Equipment	$108
Personnel	$1,586
Agricultural	$57
Total	$2,911

This funding request is limited to Phase 1 Proof of Concept.

A critical consideration by WIFA is the question of debt versus equity and/or grants.
As raised in the WIFA RFI kickoff on October 4th, debt funding structures favor incumbents with the scale, history and cash flow to justify a debt issuance – and yet innovation and creativity rarely come from established companies.
Equity investments and grants are the typical funding mechanisms for novel ideas that by definition have not been broadly tried, or tried but not at scale, and thus have low visibility to revenue streams or assets to collateralize loans.

We are exactly and proudly that. An insurgent upstart from California ready to deploy a novel solution in answer WIFA's call for innovation and new paradigms as one cure to the scarcity that ails the west.
We request not only the **amount** listed above, but in the **form** of a grant to prove the concept worthy of further investment for scale.

THE ROADMAP

Phase 2 – Facilitate water transfers

Phase 2 – Scale to multiple Evaporative Desalination Farms

Phase 2 – Target select areas to maximize results

Phase 2 – Develop partnerships
Agricultural partnerships to introduce this process at scale

Phase 2 – Decision Point
Continue to advance this economically viable solution to potable water demand?

Phase 1 – Analysis and Iteration
Adapt farm design to US context, increase acreage and deployments. Identify best practices for a scalable solution.

Phase 1 – Design & Construction
Design & Construct Evaporative Desalination Farm

Phase 1 – Professional Study
Validation of concepts

PHASE 1

PROOF OF CONCEPT

THE EVAPORATIVE DESALINATION GREENHOUSE

"We have run the best climate data for Salton Sea that we could find – from Jacqueline Cochran Regional Airport.

It all looks very promising from a horticultural perspective – about as good as you could hope to achieve anywhere!"

- Charlie Paton, Seawater Greenhouse Ltd.

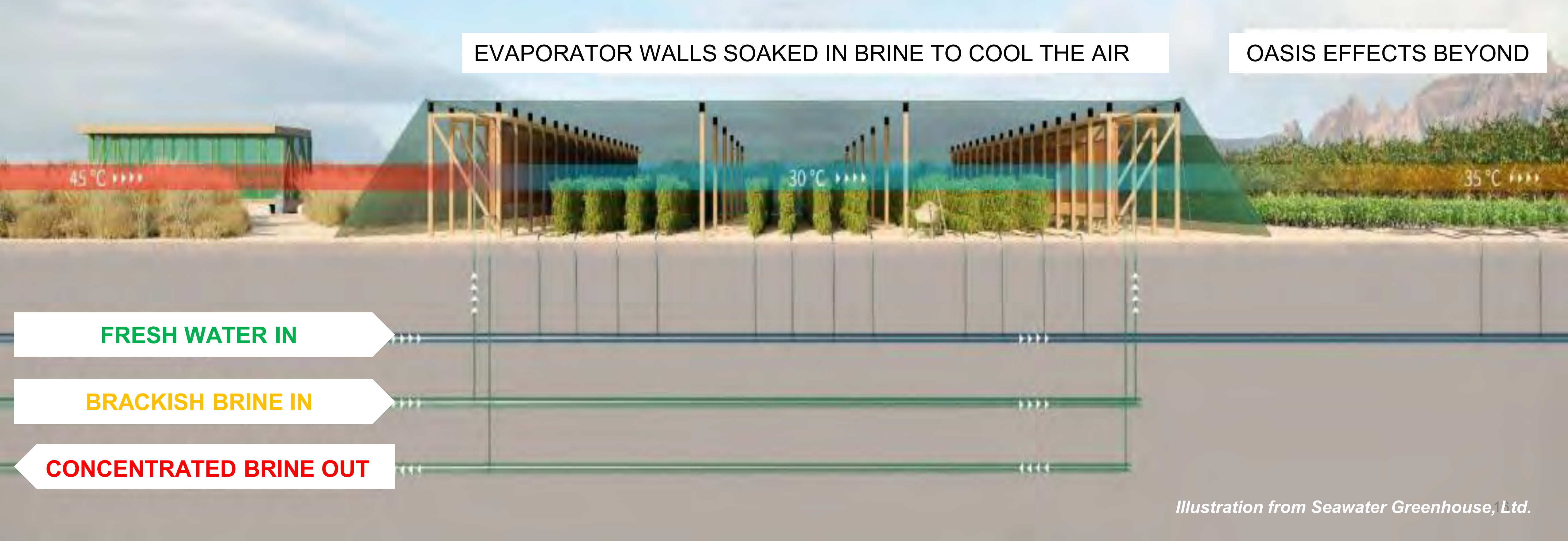
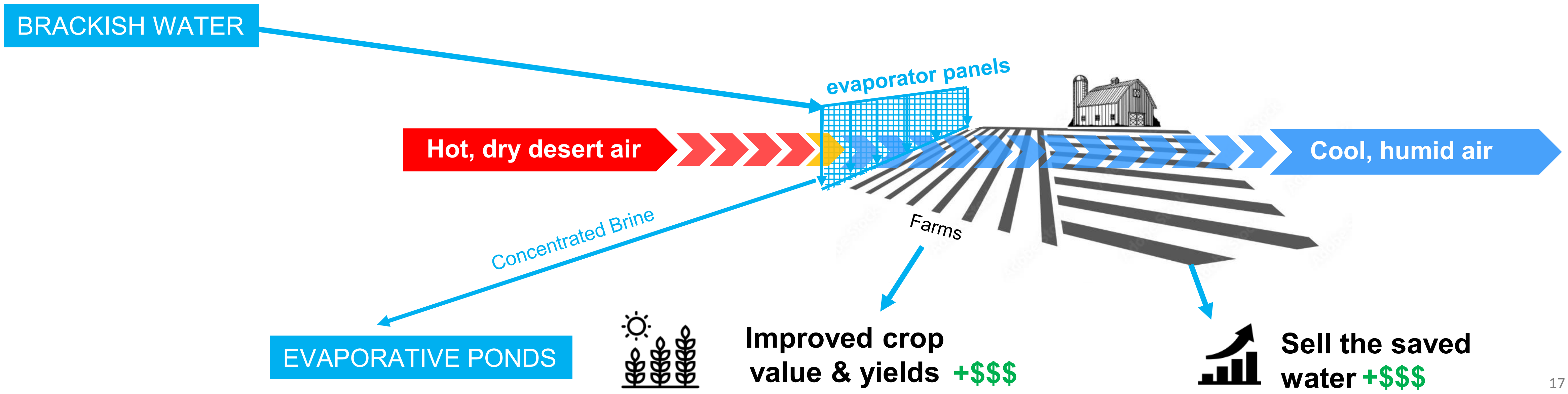


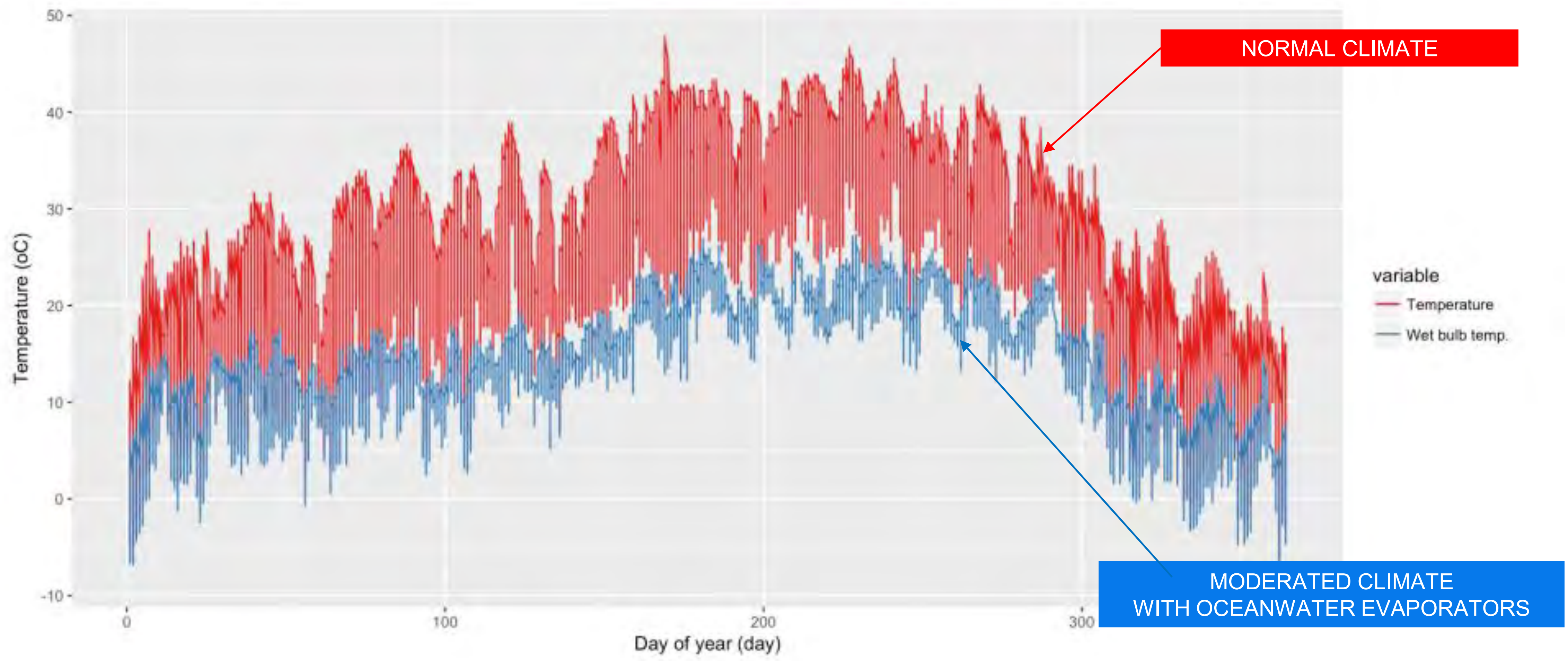
Illustration from Seawater Greenhouse, Ltd.

THE FRAMEWORK

Saltwater Evaporative Desalination walls to evaporate water, humidify and cool the farmland and generate economic value by
(a) reducing agricultural fresh water consumption by ~90%
(b) moderating the climate & dust
(c) unlocking economic value in improved crop value & yields



THE EFFECT MODELLED IN PALO VERDE, AZ



FAQs

- **How long do the cellulose panels last?** Despite essentially being cardboard, counterintuitively they last 10 years or more as calcium is the least soluble mineral in ocean water and brackish brines. As the calcium precipitates out onto the panel, it hardens to create a rigid bonelike structure that enables the panels to last for years
- **Do the panels clog up with algae?** No. Salt water essentially sterilizes the panels, preventing moss, mold or algae growth
- **Are these panels easily available?** Yes, you can order them at Grainger.com for example. https://www.grainger.com/search/hvac-and-refrigeration/air-conditioners-accessories/evaporative-misting-coolers/evaporative-cooling-media?filters=webParentSkuKey&searchQuery=evaporative+cooling+media&webParentSkuKey=WP10877604&sst=4
- **Has this approach been done at scale?** Yes. A $100M facility was built in Australia by "Sundrop Farms" that supplies 15% of Australia's tomatoes. https://www.youtube.com/watch?v=jUWdtwYh96c&ab_channel=AalborgCSP
- **Does cooler air enable more fragile, higher value crops?** Yes. Beyond the economic value of water saved that could be sold for profit, these systems create an ideal climate for a variety of higher value crops.
- **Can you harvest minerals from the brine?** Yes. An interesting possibility is to pump lithium brines, evaporate away the water, extract and sell the lithium as just one example of economically attractive commodities that could be extracted and sold for incremental profit.
- **Do you need fans or is wind enough to push air through the panels?** In many places you might need fans to push air through. However in many places in Arizona and California, mountains funnel the winds to ensure a consistent presence and direction of wind.
- **Can you farm without the tarp above the farms?** Yes. The tarp was useful in international projects where farms were not mechanized. In the USA with mechanized industrial farming, you could omit the tarp, enable normal operations and yet still receiving the benefits of the evaporation walls.

E2Eden

PHASE 2

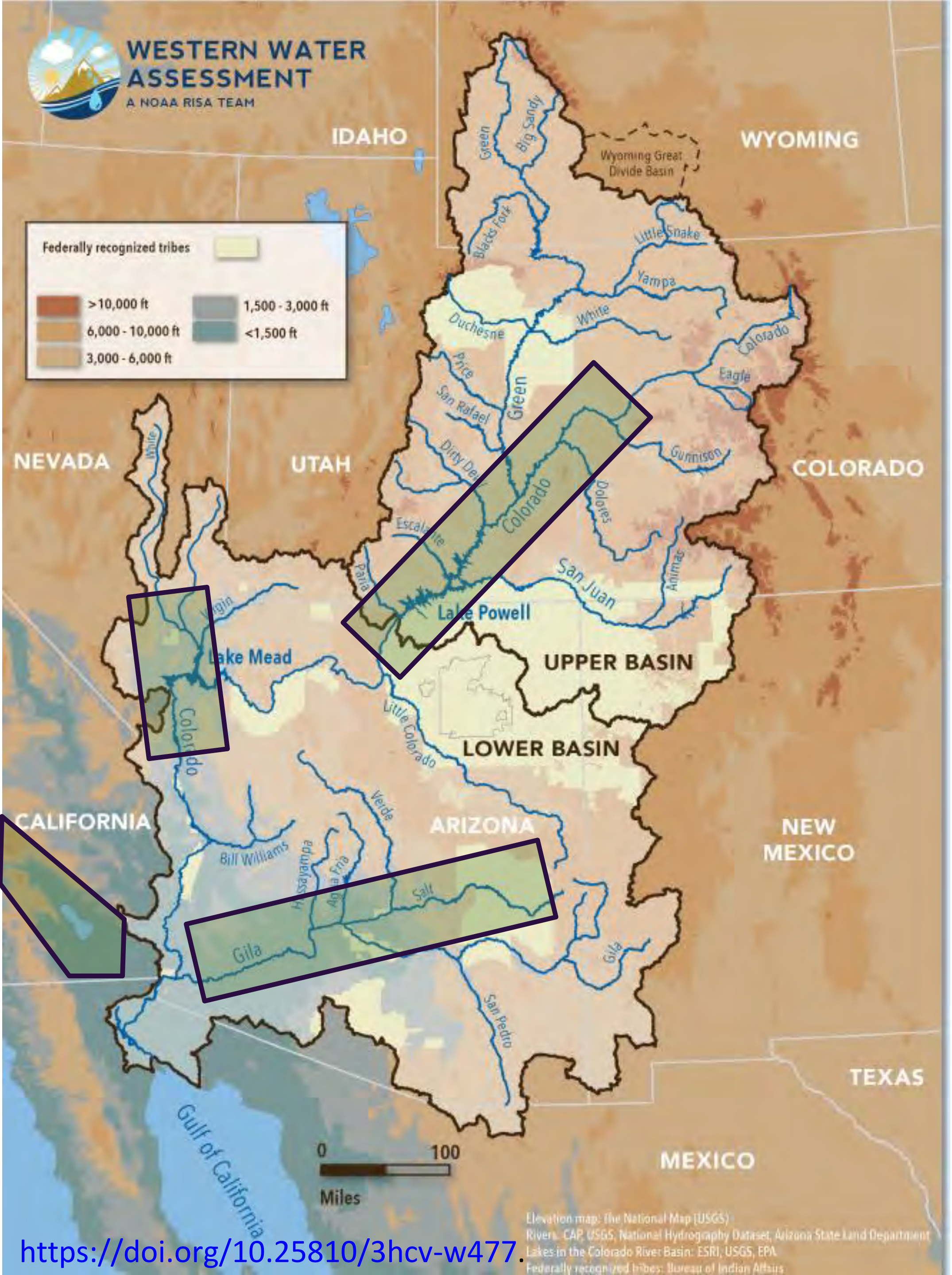
SCALE: GOING BIG

REPLICATING SUCCESS

Assuming successful deployment and testing with a proof of concept farm, the goal would then be to replicate the success at scale, leveraging existing and available water sources including underground brines, brackish water, etc. If successfully able to reach impactful scale, then the system would need a substantial source of ocean water, given the high water consumption by the evaporative desalination panels.

One way this could be sourced is through tunnel/pipeline from the Pacific Ocean to farms in the Imperial Irrigation District. At this scale, the displaced and conserved potable water could then be traded and sold by the farmers and the IID to buyers upstream on the Colorado River through water transfers leveraging existing infrastructure at Hoover Dam and elsewhere.

At scale, the issue of brine disposal would become significant, but we believe that other recent advances in accelerating evaporation make evaporation ponds a viable solution.



Phase 2 – Scale: Realize increased benefits across the Colorado River's Upper and Lower Basin states to facilitate availability of water transfers.

https://doi.org/10.25810/3hcv-w477.

Response to Request for Information

Long Term Water Augmentation

Water Infrastructure Finance Authority of Arizona

November 15, 2023

ENERGIA Y AGUA DE MEXICO

Cover Letter

November 15, 2023

Water Infrastructure Finance Authority of Arizona
100 N. 7th Avenue
Phoenix, Arizona

RE: REQUEST FOR INFORMATION – Long Term Water Augmentation

To the Evaluation Committee:

The severe drought conditions in the Colorado River Basin are imposing a challenge on the water supply available to meet the needs of Arizona, the southwestern U.S. and northwestern Mexico. By 2030, the population of this region of the U.S.-Mexico border is expected to exceed 50 million, with demand for fresh water far exceeding currently available sources. Securing the provision of clean water and power has become critical in these high-population areas.

To address these challenges, Energia y Agua de Mexico (EAM) has developed a dynamic pumped storage energy and water supply solution. Our seawater pumped storage hydroelectricity (SPSH) approach leverages and smartly integrates the components of both a seawater desalination plant and power generation facilities to provide a clean, renewable source of power for the region and a source of water produced entirely with green energy.

Implementing a project of this magnitude requires a team with unique set of capabilities. We have assembled that team.

- First, you need a partner that **knows how to design and build large water treatment and conveyance infrastructure.** Our team includes AECOM Technical Services, Inc. and Kiewit, two of the world's largest and most respected water and power infrastructure engineering and construction firms.
- You need a partner with the **financial backing to repay the WIFA loan and finance the rest of the project.** Our team includes a number of well-known and respected financial partners, including Regius and NADBANK.
- A binational project requires **support in both the U.S. and Mexico.** We have established relationships with U.S. and Mexican government officials and the water authorities in both countries and have garnered their support for this project.
- Finally, you need a partner **capable of addressing the unique social and environmental challenges** associated with such a project. Our team includes a number of key Mexican partners (Grupo ICB, Tutor Negotia, and Ryal) to help us navigate the unique social and environmental challenges associated with a binational water and power project.

We appreciate the opportunity to respond to this request for information and look forward to scheduling a one-on-one meeting with you to further discuss our submittal.

Sincerely,

Energia y Agua de Mexico

Jose Garcia
President

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A

General Information and Experience

A. General Information and Experience

Team Organization

The proposed project is a seawater pumped storage hydroelectricity project (SPSH). The approach integrates a water supply storage, a hydroelectricity reserve, desalination and green energy production to provide drinking water to a water-scarce region, as well as energy for a region that is accelerating the adoption of intermittent renewable energy sources such as wind and solar, which require dynamic energy storage. Completing this project requires a binational team of industry leading capabilities in dams, major conveyance, desalination and power generation. ***As such, we have selected our partners (please see our Organizational Chart below) carefully and with the intention of assembling a team of worldwide leaders in water and power design and construction.***

Energía y Agua de Mexico (EAM), and its Mexican associate, Energía y Agua de México S.L.R. de C.V., a Mexican Co., was established in 2015 in Mexico, and headquarted in California since 2019.

President – Jose Garcia

Vice President – Tom DuBose

Acting CFO – Tim Kelley

Legal Counsel – Ralph Córdova

Energy Advisor – Alfredo Ascolani

EAM are the project sponsors. EAM is a company based both in the U.S. and Mexico and is a privately held company (please see management structure at right).

Since 2016, the EAM team has been working on developing the proposed mixed use of well-known and probed technologies, while also looking for areas that are best suited for an SPSH project based on due market and site conditions. After market considerations were analyzed, we followed a path on different scenarios.

The path include:

- Procurement and securing a site with all the needed considerations
- Performance of a preliminary engineering trade-off analysis
- Analysis and establishment of a clear roadmap for regulatory, compliance and preparing submittals for permit applications
- Studies of the market conditions and evaluation of the financial viability of the project and establishing a path for offtake agreements

Since we identified a scenario of a possible binational opportunity, we have begun working and developing a crafted approach through proper authority on both sides of the border.

While we were working on developing specific models and trade off analysis of the components, we have established a good understanding on conditions in order to develop these projects in the complex political and social landscape.

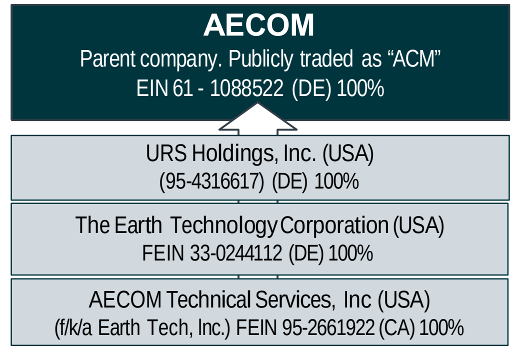
Our technical partner, AECOM, has performed studies of the trade-off analysis at an early stage and continues to further evaluate the project opportunities and explore additional regional benefits – not only on the financial side of the project results – but to the environmental challenges in building a facility in an area of the world (sea of Cortez and/or Pacific Ocean near Southern California) where there are some special constraints and challenging conditions.

Part of the strategic plan is developing a relation with capable, honest and experienced companies creating a consortium of U.S. and Mexican firms sharing similar values.

We are certain that a large infrastructure project – that serves both countries – needs to be assembled to comply with regulations, laws and public interest, as well as being prepared for public scrutiny.

AECOM

AECOM is our lead engineering partner and is headquartered in the U.S. AECOM conducts business in more than 150 countries around the world, including Mexico. AECOM has more than 46,000 employees, 400 U.S. offices and 1,500 offices worldwide. For this project, AECOM will lead the preliminary and detailed design efforts from its office in Phoenix, with support from its more than 5,000 water professionals in North America, including Mexico City.



AECOM is the world's trusted infrastructure consulting firm, delivering professional services throughout the project lifecycle – from advisory, planning, design and engineering to program and construction management. On projects spanning water, transportation, buildings, new energy and the environment, AECOM's public and private-sector clients have demonstrated trust in its ability to solve their most complex challenges. AECOM is driven by a common purpose to deliver a better world through our unrivaled technical and digital expertise, a culture of equity, diversity and inclusion, and a commitment to environmental, social and governance priorities. AECOM is a Fortune 500 firm and its professional services business had revenue of $13.1B in fiscal year 2022.

Kiewit

Kiewit is our lead construction partner. **Kiewit is privately-held and 100% employee owned.** Kiewit is one of North America's largest and most respected construction and engineering organizations. Kiewit's commitment to safety, quality and environmental stewardship are ingrained in everything it does. With its roots dating back to 1884, the employee-owned organization operates through a network of subsidiaries in the U.S., Canada and Mexico. Kiewit offers construction and engineering services in a variety of markets including water, power, transportation, oil, gas and chemical, building, industrial, and mining. Kiewit had 2022 revenues of $13.7B and employs 25,700 staff and craft employees. Kiewit is ranked #1 in the ENR of top 400 contractors for water treatment and desalination plants, dams and reservoirs, water supply, and hydropower markets and is ranked #4 for water transmission lines.

Water and Power Law Group PC

Water and Power Law Group, PC will provide legal consultation associated with water rights, international water law, and coordination with governmental agencies. Water and Power Law represents governmental entities across the U.S., including Native American tribes, state agencies, counties and cities, and local conservation and water districts. Formed in 2011, the Water and Power Law continues a practice that the firm's shareholders started in 1991 at the Natural Heritage Institute.

> Successful implementation of this project will require coordination between the U.S. and Mexico. As such, our team includes a number of key Mexico-based firm team members.

Grupo ICB (Mexico) Holding Company is divided into eight main areas: strategic communications and investor relations lobbying, political campaigning and government affairs energy real state healthcare science and technology.

Tutor Negotia (Mexico) specializes in business and investment risk management, private equity and project financing. Based in Hermosillo, Sonora, Tutor Negotia has helped the EAM team develop relationships with local stakeholders, evaluated potential project locations, completed due diligence assessments and assembled a complete legal and permit roadmap for each of the potential project locations in Sonora.

Ryal Legal Management and Consulting (Mexico) is based in Baja California Mexico and has been key to conducting due diligence assessments on the legal status of sites evaluated in Baja Norte, negotiating memoranda of understanding (MOU) with land owners, and developing a legal framework and regulatory roadmap on land, water and energy related specific permit process.

Team Members' Experience with Water Augmentation Projects

The proposed project is a seawater pumped storage hydroelectricity project (SPSH) in which seawater is pumped to an elevated reservoir and integrated with a desalination and power plant to produce water and green energy. The SPSH concept significantly reduces the cost and environmental impacts of desalination and provides the foundation for economic development in the region.

Water Treatment Design and Construction

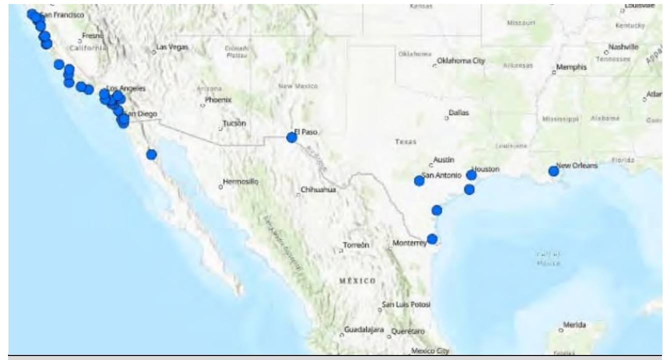
AECOM and Kiewit bring design and construction experience together in all areas of water supply development, major water conveyance, and water treatment, including desalination. AECOM has planned, designed, permitted and built water supply and treatment infrastructure for more than 100 years and in over 150 countries. Ranked #2 globally by ENR, AECOM brings the necessary technical and project delivery capability to successfully deliver the seawater desalination component of the proposed SPSH project.

AECOM is a pioneer in providing cradle-to-grave services for brackish water desalination projects worldwide. Over the past 40 years, AECOM has performed pilot studies, peer reviews, planning, economic analysis, regulatory compliance, design and construction of brackish water desalination, seawater desalination and advanced treatment of wastewater involving desalination technologies such as reverse osmosis (RO) and electrodialysis reversal (EDR). As a recognized industry leader, AECOM has delivered more than 100 desalination projects worldwide.

From planning, pilot and demonstration testing, conceptual and final design to construction, start-up and commissioning, AECOM has the tools and engineering capabilities to solve the most complex water treatment challenges. AECOM is responsible for planning, design and construction of nearly a half-a-billion gallons per day of seawater RO treatment capacity around the world, including projects in North America, Singapore, Australia, India and the Middle East.

Over the past 70 years, Kiewit has delivered nearly 2,000 projects — of all sizes, complexities and delivery models — that deal with the treatment, storage and conveyance of water, wastewater and stormwater. Kiewit has vast experience as a contractor in North America when it comes to the construction of large-scale desalination plants, including the 50 MGD Claude “Bud” Lewis Desalination Plant in Carlsbad, California and the 27.5 MGD Kay Bailey Hutchison Desalination Plant in El Paso, Texas.

AECOM and Kiewit are currently working together to deliver a new $500M USD, 50 MGD brackish water desalination project in Fort Lauderdale, Florida.



AECOM brings over 40 years of extensive project experience in performing studies, design, and construction for desalination facilities in North America.

Dams and Hydropower

AECOM and Kiewit also bring their design and construction experience together in the dams and hydropower space. AECOM has furnished engineering services in the study, design, and construction of pumped storage hydroelectric projects in the U.S. and throughout the world. AECOM has provided services for all stages of pumped storage development, including preliminary reconnaissance, project and system planning, technical and economic feasibility evaluations, Federal Energy Regulatory Commission (FERC) licensing, environmental assessment and mitigation, preparation of conceptual and detailed designs, preparation of equipment and materials specification, purchasing and inspection, construction management and construction, operation analysis, and startup and testing. Pumped storage projects have been a key focus of AECOM for numerous clients since the 1950s, and the total generating capability of our project experience is approximately 21,000 MW.

Kiewit is the #1 contractor of dams and reservoirs in North America and has permitted, designed, and built water projects throughout North America since 1924. These projects were delivered through the following construction methods: 1) Bid-Build (BB), 2) Progressive-Design-Build (PDB), 3) Engineering, Procurement, and Construction (EPC), 4) Construction Manager/General Contractor (CMGC). Their dam experience dates back to the construction of Garrison Dam, North Dakota, in 1953; Flaming Gorge Dam, Wyoming, in 1962; and they are presently constructing Gross Reservoir Dam Enlargement, Colorado. With nearly $4B USD in water related construction experience, Kiewit specializes in building some of the most modern and technically challenging projects, associated structures and mechanical systems. Kiewit combines extraordinary financial strength and extensive resources to provide complete solutions — from concept to completion — for complex and multidisciplinary water projects. Kiewit is a preferred EPC and design-build contractor, taking on the full scope of development in some of the largest projects in North America.

AECOM/Kiewit Team North American dams and hydropower project experience

On the next page, we have provided a small sample of recent relevant projects.

Claude "Bud" Lewis Desalination Plant, Carlsbad, CA

Kiewit was the EPC Contractor for the Claude "Bud" Lewis Desalination Plant in Carlsbad, CA. The project includes a 108 MGD seawater intake and pump station, 54 MGD desalination plant and 10-mile 54-inch welded steel pipeline.

Marina East Desalination Plant, Singapore

AECOM designed the 36 MGD facility, which features a number of innovative process and sustainability features and won the *2021 Global Water Awards Desalination Plant of the Year.*

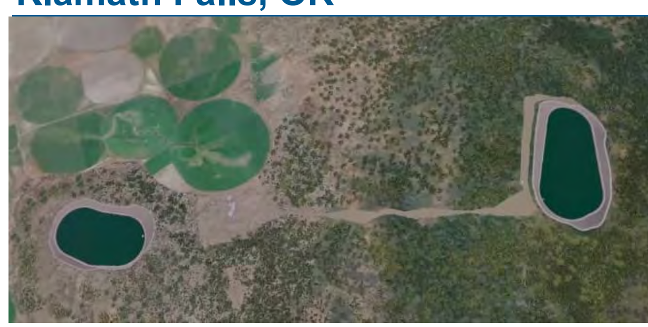
Integrated Pipeline Project North Texas

AECOM designed the IPL, which includes 150 miles of 84 to-120-inch pipe, three 150-280 MGD raw water pump stations, three 200-350 MGD booster stations, two 150-450 MG balancing reservoirs and other facilities.

Oven Mountain, New South Wales

AECOM is the owner's engineer for the pumped hydroelectricity facility which will provide 900 MW of renewable, clean energy generation and storage capability for the region.

Swan Lake Pump Storage Klamath Falls, OR



Kiewit's Progressive Design Build project includes construction of a new 400 MW powerhouse, 2 new reservoirs and large diameter steel penstock connecting reservoirs through powerhouse.

B

Potential Augmentation Opportunities

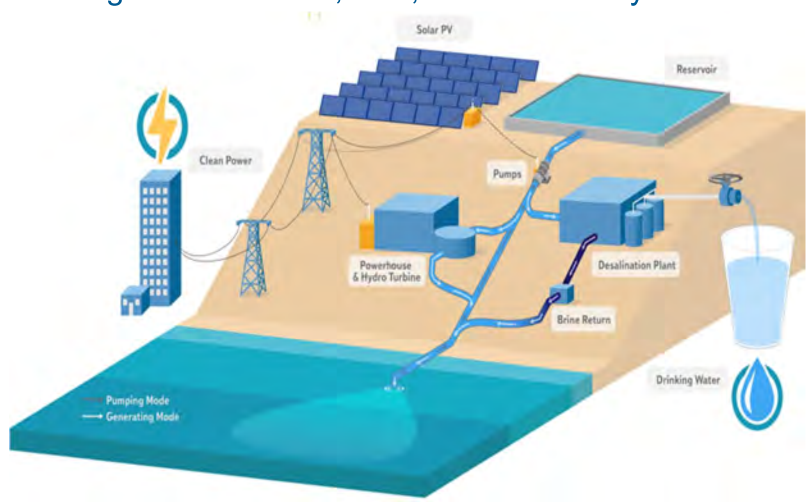
B. Potential Augmentation Opportunities

1. Description of Augmentation Opportunities

The proposed project(s) consists of a seawater intake and outfall structure, pipelines, upper reservoir, desalination plant and power plant. As shown in the figure below, seawater is pumped to the upper reservoir and released to the desalination and power plants. The elevation of the upper reservoir relative to the plant provides much of the required energy for the desalination process – the rest is provided by the power station. ***The result is sustainable water production using entirely green energy.***

Our project concept is inherently more sustainable and resilient than a traditional desalination project. By providing our own green source of energy we are significantly reducing greenhouse gas emissions and avoiding the need for construction of new carbon-based energy sources thereby reducing the carbon footprint of the project.

EAM's proposed approach combines pump storage with desalination to **provide green energy and water**, providing environmental, cost, and community benefits.



In addition to providing supplemental power to the desalination plant, the power plant provides source of green energy to the grid.

During the recharge cycle, seawater is pumped back into the reservoir using the same reverse turbines, which generates a low-cost load (i.e., energy during non-peak hours). The system can also help stabilize the power and ancillary services included as programming and dispatch, reactive power, voltage control, loss compensation, load monitoring, protection of the system, and energy imbalance.

Any potential marine impacts are minimized by diluting the concentrate from the desalination plant with the discharge from the power plant, which then flows through an underground discharge channel and emerges on the seabed. Blending the concentrate (brine) from the desalination process with the discharge from the hydroelectric power plant dilutes the brine to near background levels and minimizes the potential for any marine impacts. The concentrate offers other potential benefits. Brine can be used to generate hydrogen – another source of green energy – as well as produce building materials (gypsum) and other industrial chemicals (chlorine). These options will also be considered in the final design pending further market analysis.

Finally, this project contributes greatly to the economic development of the region. The project will create manufacturing, construction, installation, operation, and maintenance jobs. Water can be used for aquaculture and vertical farming, expanding economic development, and contributing to water and food security for the region. Finally, expansion of regional power and water supplies will also provide the foundation for further industrial and economic development.

The following section discusses the specifics of the three proposed project locations:

- Option #1: Pitiquito Site (Sonora, Mexico)

- Option #2: Baja Norte (at Pacific Ocean)
- Option #3: Laguna Salada

Each has its own benefits for Arizona, Mexico and the southwestern U.S. The locations are not exclusive – meaning a final water and power solution for the region could include one or more of the project locations.

Option #1: Pitiquito Site (Sonora, Mexico)

Annual Water Supply Availability:

204,000 acre-feet / year
153,000 acre-feet / year (U.S.)
51,000acre-feet / year (Mexico)

Power Generating Capacity: 300 MW

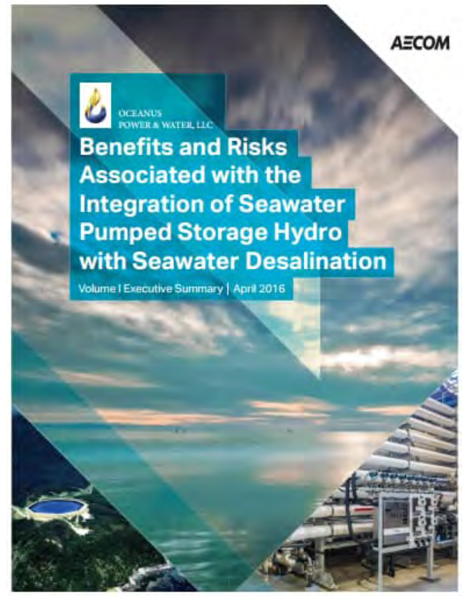
Estimated Capital Cost: $3.4B USD

The preliminary design concept for the Sonora Project consists of an 8 m^3/second (183 MGD) desalination plant capable of producing 252 million m^3/year or 204,000-acre feet/year of sustainable water supply and a 300 MW facility with the capacity to store energy for 12 hours, generating 985,000 Wh/year of electricity for the region. Up to 2 m^3/second of drinking water would be made available to Hermosillo and the remaining 6 m^3/second would be delivered to the Morelos Dam. This would ease the downstream stresses on the Colorado River and provide up to 137 MGD (153,000 acre-feet/year) available to U.S. users of the Colorado, including Arizona, under the terms of the current Binational Agreement.

Since 2017 we have been making a continuous effort in the state of Sonora to carry out the pertinent studies to establish the opportunity to carry out a project of this magnitude, investing resources in both the hiring of local and foreign companies, which has generated a considerable degree of progress in the required studies already having 80% progress.

We have been developing our solution at Pitiquito since 2017 and have secured the necessary land agreements to make the project a reality.

We have had extensive discussions and communication about our project with public officials at all levels of the government in Mexico. At the federal level, we maintain contact with the Director of CILA, Patricia Resendez, and the Technical Secretary, Jose De Jesus Luevano. At CONAGUA, we have had extensive communication with Dr. Humberto Marengo, Technical Director and former Director of CILA. He has expressed support for our project because the energy component and the reduced environmental impact of the SPSH concept. We have also had regular and extensive conversations with local officials for CONAGUA in Sonora, Jesus Antonio Cruz and in Baja California, Francisco Bernal. We have presented the project to Congressman Ruben Muńoz, President of the Congress Commission of



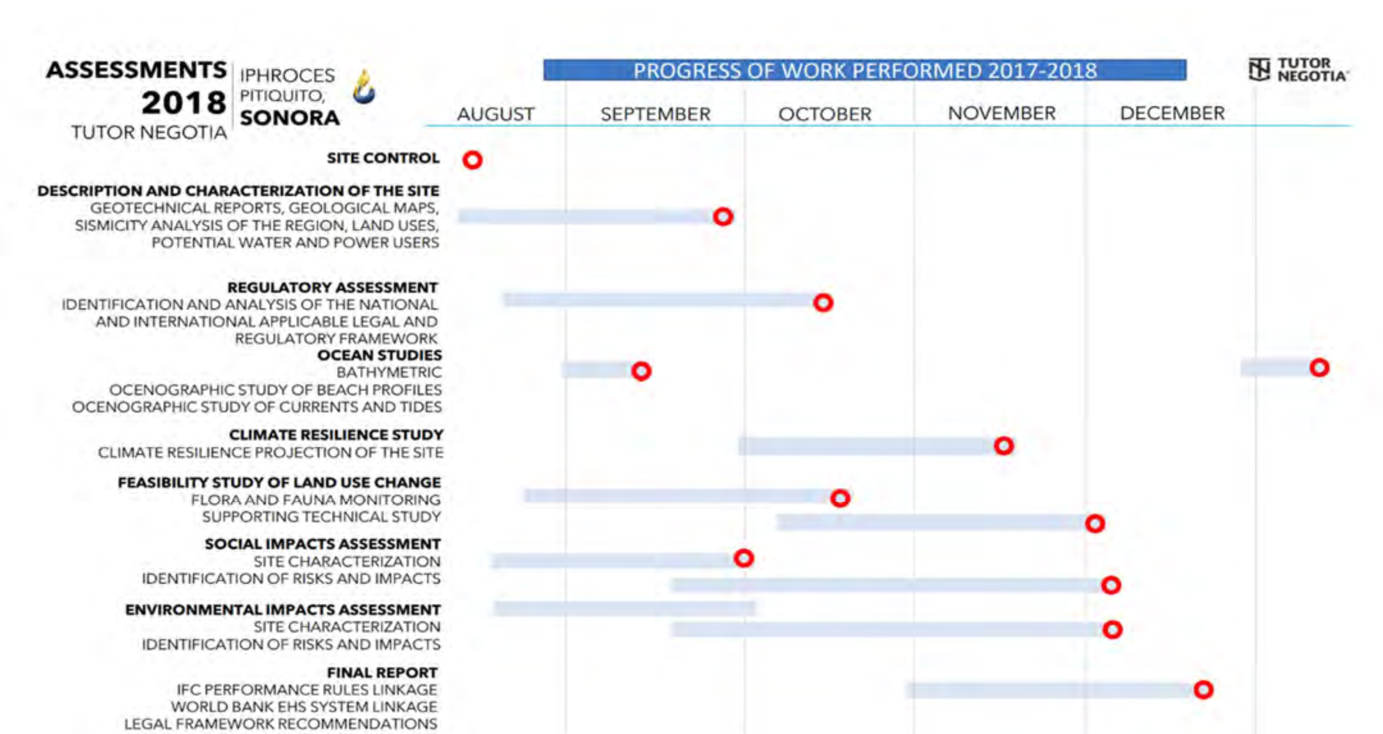
Hydraulic Resources, Potable Water & Sanitation. We have also had a number of communications with additional State and municipal officials.

Our partner, Tutor Negotia, has already conducted an evaluation of potential project locations in Sonora and identified a site that meets all the project requirements. We have negotiated a memorandum of understanding (MOU) with the local landowner for 4,200 acres on which the reservoir, desalination and power plants, and associated facilities will be located.

AECOM has already prepared a verification study (see graphic at right) and evaluated the risks and benefits of the of the SPSH. AECOM found that there are multiple environmental, economic, and engineering benefits to co-locating and integrating the two proven and cost-effective solutions.

Environmental and regulatory considerations. Tutor Negotia has developed a regulatory compliance roadmap that identifies the required permits for each of the project components, including environmental and social impact. It is important to note that preliminarily from the environmental and social point of view, no fatal elements of risk were established for obtaining such permits.

The team has already completed the topographic, geotechnical, and bathymetric studies and investigations required for the permits as shown in the progress of work performed below. As a results, we are ready to prepare the permit applications and are able to receive the necessary permits more quickly than those projects who have not yet done their initial investigations.



We have completed the necessary preliminary studies for our Pitiquito site and are ready to submit permit applications.

Jurisdictional / political considerations. The project would provide a supply of safe drinking water for Sonora and allow urban, industrial and agricultural expansion. For the U.S. and specifically, Arizona, it would provide the water supply needed to address reductions in Colorado River allocations and address the increasing water supply needs.

The current climatic conditions in the southwestern U.S. and northwestern Mexico recently resulted in Tier 1 water restrictions for the seven U.S. states and Mexico which utilize the Colorado River as a water supply. Tier 2 restrictions are a possibility and could be discussed as early as 2024 – resulting in more significant water restrictions for users of the Colorado River.

This has resulted a sense of urgency for the U.S. Bureau of Reclamation (USBR) and U.S. water agencies, including those in Arizona.

The International Boundary and Water Commission (CILA), both the Mexican and U.S. sections, agreed and established in Minute 323 a binational desalination commission. The commission established a working group that commissioned a study to identify desalination opportunities and technologies in the Sea of Cortez.


BINATIONAL STUDY OF WATER DESALINATION OPPORTUNITIES IN THE SEA OF CORTEZ

TM3: Identification of Potential Desalination Opportunities

PREPARED FOR:
Minute 323 Desalination Work Group

B&V PROJECT NO. 400584
APRIL 2020

ESTUDIO BINACIONAL SOBRE OPORTUNIDADES DE DESALINIZACIÓN DE AGUA EN EL MAR DE CORTÉS

TM3: Identificación de Oportunidades Potenciales de Desalinización

PREPARADO PARA:
El Grupo de Trabajo de Desalinización de Acta 323

B&V PROYECTO NO. 400584
ABRIL 2020

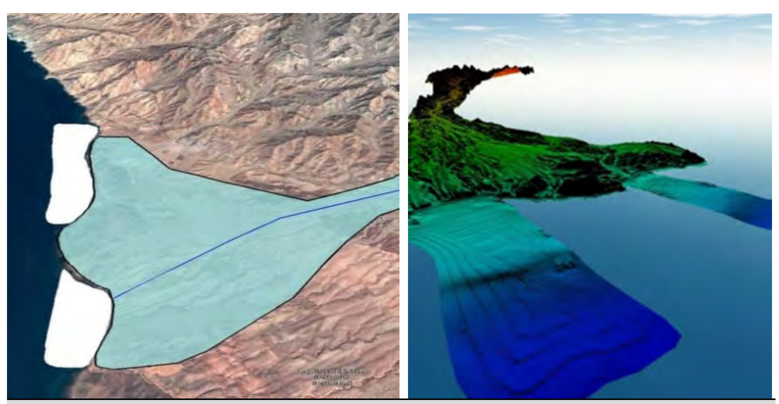
BLACK & VEATCH LIBRA

The binational desalination study validates our proposed Sonora project was identified as one of the three recommended opportunities, with clear benefits for both the U.S. and Mexico.

Capital investment and financial considerations. The preliminary estimate of the total project cost is $3.4B USD. Project costs will be financed through a combination of equity and debt. We expect 20 to 30 percent of project costs to be covered by capital. Sources include private capital, private infrastructure funds and international financial institutions. The remaining 70 and 80 percent of the project costs will be financed with long-term debt (25 years).

The sources of income will be based on long-term power purchase agreements and water purchase agreements with Mexico's utilities, in the Binational component water from the project can serve to increase the supply of water to neighboring U.S. states with their corresponding supply contracts.

Sustainability, security and resilience considerations. In addition to the general benefits mentioned in the project description, Sonora is known to be one of the best solar resources in the world, but development is hampered by a lack of effective energy storage costs. This project will allow storage of energy to provide stability in the grid and auxiliary services to, as well as accelerate the growth of intermittent energy sources such as wind and solar, for the region.


Topographic surveys, geotechnical investigations and bathymetric studies are complete for the Sonora site and permit applications are ready to be prepared and submitted.

Option #2: Baja Norte (at Pacific Ocean)

Annual Water Supply Availability:
112,200 acre-feet / year

Power Generating Capacity: 100 – 300 MW

Estimated Capital Cost: $1B USD

The proposed project location(s) is in the general area of La Fonda and Cuenca Lechera, Baja, Mexico. Two reservoir sites have been identified, one in the vicinity of La Fonda, and one in the vicinity of Cuenca Lechera, approximately 9 km to the north. Each of these sites is located about 300m – 400m above MSL to take full advantage of the use of green energy associated with the SPSH concept.

A pumped hydroelectricity capacity between 100 MW and 300 MW is planned. The reservoir storage for these two scenarios will be based on the energy generation requirements for flow and duration.

The proposed desalination plant would be designed with a net production capacity of 112,200 acre-feet per year (4.4 m^3/second or 100 MGD). The facility would be powered by gravity using a split stream from the SPSH facilities. Two distinct sites for the desalination plant are under consideration, as aforementioned, depending on the location of the reservoir(s). Both plant sites are in the lowland area in relative proximity to the shoreline.

Water from the desalination plant would be delivered north to a connection with San Diego County Water Authority in the Otay Water District. This would reduce the Authority's need for water from the Colorado River (via Metropolitan Water District of Southern California) and make that water available to the State of Arizona via a water swap under the terms of the current Binational Agreement.

Environmental and regulatory considerations. Our legal partner, Ryal, helped us identify potential project sites in Baja Norte. Based on a legal and regulatory assessment, we identified the two locations in La Fonda and Cuenca Lechera. We have prepared a regulatory roadmap for those sites that identifies the necessary studies and permits required for each of the project components. Based on our preliminary assessment, no fatal flaws were identified.

We conducted a preliminary geotechnical investigation of the sites (2017) and determined a concrete face rockfill dam (CFRD) would likely be required, as the soil cover is thin and there is no known source of clay in the project vicinity. To reduce truck traffic during construction and further enhance the sustainability focus of the project, rockfill material would be available from quarried basalt from the reservoir area.

Jurisdictional / political considerations. As with the Sonora option, current and future water restrictions for users of the Colorado River are a real concern. Binational cooperation is required to address these challenges. This project would provide a supply of safe drinking water for Tijuana and other areas within Baja Norte to allow urban, industrial and agricultural expansion. For the

U.S. and Arizona, it would provide the water supply needed to address reductions in Colorado River allocations and address the increasing water supply needs of the State.

It is necessary to maintain a low profile while a project like this is being developed. Others have failed by going public without the required stakeholder approval. We are keenly aware of these challenges. EAM and our partners, Tutor Negotia and Grupo ICB, have been meeting with authorities in both the U.S. and Mexico at the federal, state and local levels to discuss this project since 2016. In these discussions we have heard their concerns and developed our project to address their needs. Our partner, Grupo ICB, has prepared a stakeholder communication plan – which we are currently executing – and have developed a media and public outreach and education strategic plan to address communications with all project stakeholders.

Capital investment and financial considerations. The preliminary estimate of the total project cost is $1B USD. Project costs will be financed through a combination of equity and debt. We expect 20 to 30 percent of project costs to be covered by capital. Sources include private capital, private infrastructure funds and international financial institutions. The remaining 70 and 80 percent of the project costs will be financed with long-term debt (25 years).

The sources of income will be based on long-term power purchase agreements and water purchase agreements with Mexican utilities, in the Binational component water from the project can serve to increase the supply of water to neighboring U.S. states with their corresponding supply contracts.

Sustainability, security and resilience considerations. As mentioned previously, our project concept is inherently more sustainable and resilient than a traditional desalination project. The use of 100 percent renewable energy for desalination significantly reduces our carbon footprint, and our method of brine disposal minimizes any potential marine impacts.

We will also consider the potential for green hydrogen production and brine mining at the Baja Norte site pending further market analysis.

Finally, expansion of the water and power supplies for the region creates jobs, increases food and water security, and provides the foundation for workforce and economic development within the region.

Option #3: Laguna Salada

Annual Water Supply Availability: TBD

Power Generating Capacity: 300 MW

Estimated Capital Cost: TBD

A third site under consideration is in Laguna Salada, Baja California, Mexico. This option delivery would be to the All-American Canal (~23 miles away), shown at left.

Laguna Salada is a dry lake approximately 10 meters below sea level. The area can be flooded with seawater from the Sea of Cortez via gravity through the existing Canal del Coyote. The intake for the SPSH facility would be located in the flooded area of the newly formed seawater lake.

A pumped hydroelectricity capacity of up to 300 MW is considered. The reservoir storage for these two scenarios will be based on the energy generation requirements for flow and duration.

The capacity of the proposed desalination plant is to be determined. The facility would be powered by gravity using a split stream from the SPSH facilities. Desalinated water could then be supplied to the All-American Canal.

A portion of the desalinated water would remain in the Mexicali region. The water would be used for drinking water and to support economic development (industry and agriculture) within the region.

Environmental and regulatory considerations. A comprehensive environmental and permitting assessment is still required for this site and will be developed in coming months.

Jurisdictional / political considerations. This project also requires binational cooperation. However, it also provides a unique opportunity.

Laguna Salada lies within the tribal lands of the Cocopah Tribe. Preliminary discussions with the Tribe indicated interest in a long-term partnership. The Tribe would provide land for the SPSH facilities. Land could be obtained via a long-term lease agreement, purchase of land rights, or through a dividend arrangement. Benefits to the Tribe would also include a reliable source of safe drinking water, water for industry and agriculture, jobs, and long-term water security.

Capital investment and financial considerations. The preliminary estimate of the total project cost is yet to be determined. We expect project costs will be financed through a combination of equity and debt. We also expect 20 to 30 percent of project costs to be covered by capital. Sources include private capital, private infrastructure funds and international financial institutions. The remaining 70 and 80 percent of the project costs will be financed with long-term debt (25 years).

The sources of income will be based on long-term power purchase agreements and water purchase agreements with Mexican and U.S. water utilities.

Sustainability, security and resilience considerations. As mentioned previously, our project concept is inherently more sustainable and resilient than a traditional desalination project. The potential for green hydrogen production and brine mining also provide enhanced sustainability opportunities.

Discussions with the Cocopah Tribe have also included aquaculture and vertical farms. These types of sustainable food production not only provide substantial economic development and jobs for the region, but also use less water and improve food security.

Finally, expansion of the water and power supplies for the region creates jobs, increases provides the foundation for workforce and economic development within the region.

2. Factors that will positively or negatively influence your consideration of various potential delivery models

WIFA's consideration of P3 and other alternative delivery models is a wise decision, and the EAM encourages WIFA to fully commit to these types of delivery models. Benefits include better project outcomes – faster project delivery, high rate of Owner buy-in, minimal change orders, and lowest claim risk. P3s have an added benefit of increasing the efficiency of the State's funding. Leveraging money available from the LTWAF and private financing, P3 delivery would allow WIFA to develop alternative water supplies outside Arizona to meet the long-term needs of the State.

Delivery of projects via alternate delivery makes projects more attractive to the market. This is driven not only by the outcomes identified above, but these projects also allow for better assignment of risk (to those best able to manage it), better understanding of the scope and the cost and time to delivery it, and a lower cost of sales for the respondent team(s). Additional factors that would positively influence our participation include:

- Have the Owner and Owner's Agent engaged with the market? Do we understand the issues and do we have solutions to those issues?
- Is the model collaborative? Is the Project Agreement fair and equitable and/or is there a process for evaluating and assigning risk to the party best able to manage it?
- Are the project budget, scope, and schedule reasonable and achievable?
- Number of shortlisted bidders equal or less than three
- Use of a qualifications-based selection approach

With the addition of P3, the attractiveness of business opportunities related to water augmentation vary positively and negatively based on the following factors:

1. **Development Capital:** Funding of or sharing of development capital or back stop from the agency in the event the project does not reach financial close would increase attractiveness and provide market incentive to bring projects to WIFA.
2. **Long-term Revenue Stream:** P3 agreements often involve long-term contracts, providing a steady revenue stream for the private entity. This can make the business opportunity more attractive.
3. **Revenue Structure:** P3 agreements can benefit from a solidified revenue stream in this type of delivery, an availability type payment or take-or-pay structure would increase attractiveness. Without a commitment to buy the water, a P3 may suffer to get to completion.
4. **Public Support and Perception:** Water augmentation initiatives often have strong public support due to their environmental and sustainability benefits. This can make the business opportunity more attractive.
5. **Access to Capital:** P3 agreements can provide private entities with access to public funding, which can make the project more financially feasible and thus more attractive.
6. **Expertise and Efficiency:** Private entities often bring specialized expertise and efficiency to a project, which can lead to cost savings and improved project outcomes. This can make the business opportunity more attractive.

Our team has specific recommendations that WIFA can consider achieving an efficiently procured alternative delivery project or P3 while maximizing the likelihood of optimal outcomes.

Project Definition and Risk Allocation: The attractiveness of an alternative delivery or P3 approach to the project will be strongly influenced by the project's ultimate definition, and the expected allocation of risk. It is in WIFA's best interest for proponents to have a well-defined project, and a clear and transparent understanding of how risks will be allocated early in a request for proposal phase. If the expected risk allocation is not clearly communicated, proponents may expend significant resources pursuing projects that do not have a risk allocation that a proponent considers commercially reasonable. At best this results in suboptimal pricing and, in some cases, results in proponents dropping out of the procurement process.

The premise of risk allocation on P3 projects is to optimize value for money so the risk is allocated to the party who is best able to manage it. It is important to understand that when risks are allocated to the proponent, the proponent must fix their price at bid time.

Progressive Delivery Model Option: Due to the complex nature of the envisioned project, and the need to evaluate all the technical options from a true construction/engineering framework balancing real world cost constraints, we recommend implementing a qualification-based selection followed by a preconstruction phase in the case of alternative delivery or a pre-development phase in the case of a P3. This approach allows for greater collaboration between WIFA, the agencies participating in the transfer of water resources, and the preferred proponent, and a better procurement, utility system performance and long-term financial capacity for WIFA. Using a collaborative approach, WIFA and the preferred proponent can work together to define the scope and work through risk allocation during a transparent open book review of the construction build-up. The state of the current financing market can shape the scope to prioritize projects and discover the most efficient use of capital.

Upfront collaborative consideration of scope, basis of design and project schedules translate into execution certainty for the project. A progressive procurement also helps mitigate risks associated with complex projects such as this. The pre-development phase allows the project team to conduct comprehensive studies, assess potential risks and develop strategies to address them effectively. By identifying risks and developing risk mitigation plans early on, the project avoids costly delays, disputes, and rework during the construction phase.

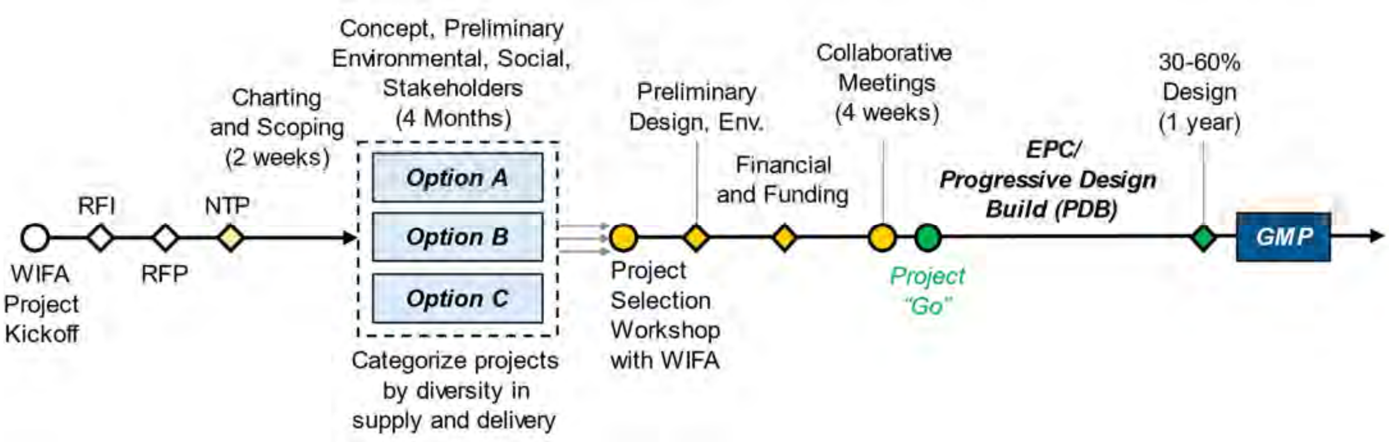
Use of a three-phased progressive delivery model as described takes the best parts of the traditional P3 model and adds in early collaboration between WIFA and the preferred proponent to optimize the Projects' approach to find best value solutions. Within the described pre-development phase, WIFA and the preferred proponent could collaboratively assign risk to optimize value for WIFA.

3. Recommendations on how to best prioritize, finance and pay for proposed WIFA augmentation opportunities

Our team suggests WIFA initially categorize projects based on diversity in supply and delivery. Then, a matrix evaluation of each project can be used to prioritize them. This recommendation is more detailed as follows:

- Sort projects into categories to establish reliability in the water supply through diversity. Diversity can be in types of project (sources spread across available resources like seawater or brackish desalination or potable reuse) and in delivery method (various methods including progressive design-build, construction manager at risk, and public-private partnerships).
- Once sorted on that basis, WIFA should determine goals and evaluation criteria that allow ranking of projects. Some evaluation criteria might include how reliable a particular source is, how climate resilient is the source, can the team delivering the project deliver it on time (based on past experience), how efficient will the project deploy the funding provided, and how much will the project cost on a per unit basis.
    - As a rudimentary example, “P3 Project X” may be the fastest online with the highest capacity and potential for on time delivery but comes with a higher cost of water on a per unit basis. It would be easy to weed this project out simply because it costs more. However, when comparing all factors, this may be a better option. More water online sooner and later delivery of other project types can reduce the overall per unit cost of water.
    - An added benefit of P3 in the mix of projects is efficiency in funds available, as use of private funding, while more expensive, may increase public funding for other projects.
- Project delivery methods can be driven by the amount of risk in delivering a certain project. As an example, consider permitting risk. A particular project may look great on paper for speed and cost, but it may also take 10 years to achieve a permit. That project viability may drop compared to projects with lower metrics that achieve permitting in a shorter period of time. As a primary evaluation and ranking point, WIFA should consider how likely a project is to be delivered on a technical basis as well. Potential criteria for the type of project include process history, permitting history, and operating history – history including whether there are other similar projects that have been delivered successfully.

Project Selection and Pathway



After consideration of the various water supply alternatives for which WIFA will receive responses as a result of this RFI, WIFA will ultimately work one or more teams to further develop and implement viable long-term water augmentation projects. Above is a preliminary project roadmap, that shows suggested phases and milestones to move the project from concept to completion. Note that the early phase includes development of several parallel concept layouts and preliminary environmental analyses. This would allow the WIFA and EAM team to work collaboratively, in delineating early project opportunities and challenges, preliminary schedules, stakeholders, and costs. Also included in this scheme is a chartering session and several collaborative workshops that will strengthen the WIFA – EAM partnership.

4. Practical market capacity constraints to deploy water augmentation plans

The potential for a water augmentation program between Arizona and Mexico presents an intriguing opportunity for addressing water scarcity issues in these regions. However, the practicality of such a program is subject to market capacity constraints that will need to be considered by the selected team. Our team has addressed many of these constraints which will support a quicker implementation schedule. The following discussion explores potential constraints and how our team has addressed these constraints during the planning period of the project.

1. **Physical Construction Limits:** The construction of new water infrastructure such as pipelines, desalination treatment plants, reservoirs, and pump storage hydropower facilities is a significant undertaking that requires substantial time, resources, and planning. The availability of suitable land, the need for environmental and other regulatory approvals, and the complexity of the construction process itself can all serve as constraints. Through our geopolitical efforts EAM has identified sites and already begun our due diligence and negotiation with property owners for the sites. This will help to mitigate the constraints related to the timing of access to and physical construction limits at the sties. For the Sonora site, we already have a contract with the owners and have prepared preliminary environmental permit applications.
2. **Manufacturing and Delivery Capacity:** The production and delivery of the necessary materials and equipment, such as pipes, pumps, and filtration systems, can also be a limiting factor. This can be influenced by factors such as the capacity of the manufacturing industry, the availability of raw materials, and the efficiency of the logistics and transportation networks. For example, manufacturers have reduced supply in response to demand reduction; creates a price floor in many commodity markets with modest price increases expected in 2024. Lead times for mechanical and electrical equipment has increased from an average 20 – 40 weeks to 50-80 weeks. Cement production remain stable for the near future but weaken trucking and rail transport might impact delivery based on demand.
3. **Supply Chain Constraints:** The global supply chain can be affected by a wide range of factors, including political instability (i.e., wars in Ukraine and Israel), trade restrictions, natural disasters, and pandemics. Any disruption in the supply chain can delay the delivery of essential materials and equipment, impacting the timeline and cost of water augmentation projects. Our team uses a very effective supply chain strategy, starting during the planning and design phases, which includes 1) Risk Assessment of supply chain, 2) Diversify suppliers to reduce dependency on one source, 3) Local sourcing to reduce delays and costs, 4) Long-term contracts with reliable suppliers, 5) Technology integration to track and manage in real-time, 6) Contingency planning based on supply change risk assessment, and 7) Continuous improvement related to the strategy.
4. **Labor Constraints:** The availability of skilled labor, in the US and Mexico, is another critical factor. The construction and operation of water infrastructure require a range of skilled workers, including engineers, construction workers, and operators. Labor shortages or strikes can delay projects and increase costs. Construction wages will remain strong by historic comparisons across most regions; however, high interest rates are acting as a headwind to new projects, limiting demand for workers. That said, sticky inflation combined with labor market shortages, especially in developed economies, will keep wage risk to the

upside in some regions. High interest rates weigh on construction activity in Latin America, limiting labor demand. Construction wage growth will moderate in Mexico. High interest rates are creating major headwinds to hiring activity; however Mexico is the outlier. Strong growth combined with new investment in Mexico will keep risk to the upside. Our team will use a proven planning approach, during the project's planning and design phases, which includes 1) Workforce planning during design to ensure appropriate skills and labor are used, 2) Training and development of our craft staff, 3) Use of technology to automate equipment to reduce manual labor, 4) Subcontracting with local contractors, and 5) Contingency planning through risk assessment to deal with unexpected labor shortages.

5. **Regulatory Constraints:** Water projects are subject to a range of regulatory requirements, including environmental impact assessments, water rights, and construction permits. The process of obtaining these approvals can be time-consuming and uncertain, serving as another potential constraint. EAM is in the process of developing environmental clearances for the sites and appears they are no or limited concerns. EAM is using a local environmental company to support obtaining permits.
6. **Public Acceptance:** The need for water is already well known by the public within the binational region. We and our partner, Grupo ICB, have already prepared a strategic plan to create and maintain public support not only with the various levels of government, as previously discussed, but also with academic institutions, the private sector, environmental organizations, and the general public. We intend to fully implement this plan as the project moves forward.

The studies already performed by our team have included a social impact assessment which clearly identifies all the areas of influence of the project and the risks and benefits associated with each. For example, there is a tribe allocated nearby one of the sites which is in need of a small amount of water. This project can help meet those needs and based on discussions with local authorities we can not only help meet the tribe's water supply needs, but its power needs, and provide some foundation for workforce and economic development.

5. Challenges not project/program specific

There are several challenges that need to be overcome with an out of state water augmentation project that supplements Arizona's water supply, whether that source of water is from another state or if the water is to originate in Mexico. However, based on our existing roadmap to project delivery we see opportunities that could arise from these challenges that could help streamline project implementation to augment Arizona's long term water supply.

We believe that there are at least three key challenges that must be addressed by any out of state project:

Multi-Jurisdictional Agreements

In order for a water augmentation project originating outside of Arizona to be successful there must be established agreements between the supplier and the off taker along with the agencies that have jurisdiction. Establishing an agreement can be a challenge when considering that the benefits should be equitable to those involved. EAM has recognized this challenge and taken the opportunity to carefully coordinate with agencies on both sides of the border since 2016. Our team maintains a regular communication today in Mexico and USA with authorities of different branches aligning the projects with the ongoing discussion but also aligning with Mexico Federal, State, and local communities. We follow the binational discussions while we maintain a low initial profile. Our associate in Mexico ICB group prepared a comprehensive strategic plan to communicate and react to media and public sector and has been involved in discussions with authorities at all levels.

Environmental Impacts and Permitting

Environmental permitting and mitigation can have significant impacts to a desalination project if the permitting process is not managed appropriately and considers all of the stakeholders affected by the project. Desalination is a costly process that requires a significant source of energy and also produces waste from the treatment process. Careful consideration and planning will be required to navigate environmental regulations from multiple jurisdictions and potential end users.

The environmental benefits of the project are derived from the availability of new sources of water produced by desalination with a lower energy input. The energy storage that will be provided will give stability to the grid and allow the acceleration of intermittent sources of renewable energy, such as solar and wind. These benefits would help reduce its greenhouse gas emissions footprint supporting climate resiliency of the project site. Additionally, the proposed integration of the components allows an environmental mitigation in the disposal of the brine back into the sea resulting from the reverse osmosis process in desalination rather than implementing an additional facility to manage the brine.

Social Considerations

The project has the potential to create local and regional manufacturing, construction, installation, operation, and maintenance jobs. More jobs are expected to be created indirectly to the entire renewable energy supply chain. Additionally, water and affordable energy allows investments in local businesses by providing a reliable source of water and energy. Although economic development would be a benefit to the project area, there could be a perceived social challenge from developing and operating a project that provides water to users outside of the area where clean water is also needed.

Continued social coordination with the local community along with state, tribal and federal agencies must continue so that a consistent message of collaboration and inclusion can be maintained. Our team has chartered social awareness for the Pitiquito project site that can be emulated for the other sites.

About

Energía y Agua de Mexico (EAM), and its Mexican associate, Energía y Agua de México S.L.R. de C.V., a Mexican Co., was established in 2015 in Mexico, and has been headquartered in California since 2019. EAM is a privately held company and is the project sponsor.

Gila Monster Water Augmentation Plan

1 EXECUTIVE SUMMARY

The Goal of Project Gila Monster (PGM) is to assist WIFA in securing reliable, out-of-State water supplies with minimal impact to the environment using seawater reverse osmosis on the Sea of Cortez. Secondary goals are to assist the irrigation districts in Arizona and California in procurement of reliable GHG-free power to pursue improved water use efficiency and generate economic activity.

1. New water generated via large scale sea water reverse osmosis of water taken from the Sea of Cortez all outside of Mexico's El Pinacate and Gran Desierto de Altar Biosphere Reserves.
2. Mexico will be incentivized to swap an equal amount of water from their senior annual apportionment of the Lower Colorado River with more reliable, higher quality water, additional peak power generation, additional transmission, two high voltage connections to the USA and a significant facilitation fee. <u>The incentives will be significant</u>.
3. Mexico will get credit for "diversions at Parker Dam avoided" in the pricing to Arizona. Using the math from SNWA, this would require an additional 80,000 acf/year to be diverted at the Parker Dam so that 750,000 acf would reach Morelos Dam.
4. Power is the most significant cost and hurdle, needing reliable, GHG-free power delivered on a constant basis, every hour of the year. The power will be generated by a combination of solar photovoltaic panels, geothermal, thermal power from green hydrogen and pumped storage in both California and Arizona.
5. Transmission of the power will require the construction of 400 miles of high voltage lines built. PGM proposes redundant sources of transmission to make sure the SWRO plant always has power.
6. Interconnection of the power will require the construction of two 500kv switchyards and 10 substations to transform voltage (500kV, 230kV, 130kV, 93kV, 69kV and 34.5kV)
7. Reverse Osmosis is a very energy intensive process, requiring reliable 24/7/365 power for maximum efficiency. PGM seeks to have a very low GHG footprint using renewable energy.
8. All electric assets will be independent from CAISO. IID is its own balancing authority with connections to WAPA. WMIDD currently depends upon WAPA for generation.
9. This RFI does not conduct a detailed analysis of financing alternatives. There are substantial financing programs in addition to WIFA's Long Term Augmentation Program: The Bipartisan Infrastructure Law, The Inflation Reduction Act, EPA's WIFIA program and the North American Infrastructure Bank.
10. Approval process for a bi-national project will need to go through the International Border and Water Commission (IBWC) which is an arm of the US State Department.
11. The total cost of the Plan is estimated to be $17 billion and will take 5 years to construct.
12. WIFA gets 750,000 acre feet (acf) of annual water supplies at a reasonable cost
13. Payback period is estimated at 7.5 years including ancillary revenues.
14. <u>All efforts</u> will be made to minimize the impact to the local environment. We did not analyze the impact of the reduction in flows below the Parker Dam to the MSCP and Imperial National Wildlife Refuge.

2 SEA WATER REVERSE OSMOSIS

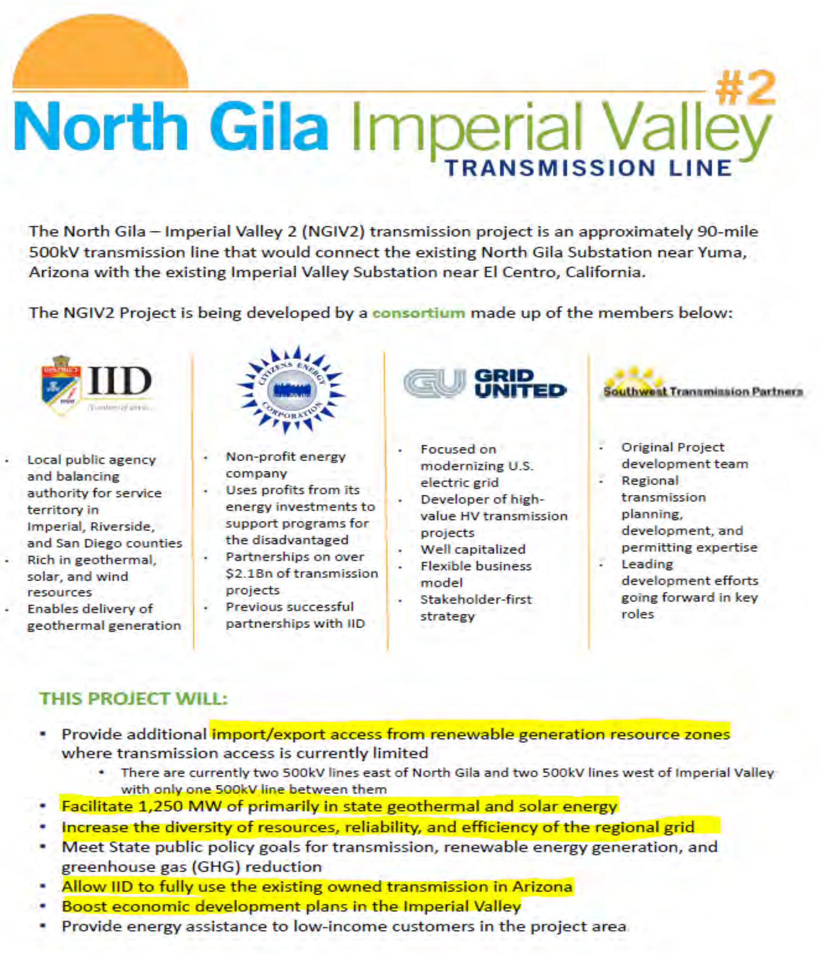
Using the optimal location on the Sea of Cortez, we will use Reverse Osmosis to split 1.5 million acf of seawater per year into 750,000 acf of 500 TDS permeate and 750,000 acf of concentrate (brine) holding all of remaining dissolved solids. Special caution must be taken to minimize ecological impacts to the Sea and wildlife. Fortunately, the Sea of Cortez has some of the largest tidal action on the planet, and some very deep troughs, which will help in the dispersal of saline concentrate. Additionally, the concentrate will be warmer than the Sea temperature at point of dispersal, helping counter-act the tendency of heavier saltwater sinking.

1. Intake will be done via horizontal directional-drilled wells, to minimize impact to the Sea of Cortez and reduce the need for pre-treatment.
2. Disposal will be done with a 47-mile-long outfall pipe fitted with diffusers located 25 miles offshore in the Wagner Basin, where Sea depth and currents will keep impact to surrounding salinity to less than 4%. This is outside the RAMSAR site boundaries.
3. Project energy requirements were scaled for the needs of a 750,000 acf/year SWRO system.
4. Target finished water quality will be 500 TDS, better than Lower Colorado River water, delivered to the San Luis and Mexicali Valley irrigation system.
5. All permanent Project operations will be sited outside of the RAMSAR sites, some underground boring will occur to minimize surface impacts.

3 POWER GENERATION AND TRANSMISSION

Seawater Reverse Osmosis is a very capital and energy intensive process. To maximize efficiency, SWRO requires reliable, redundant 24/7/365 power. We are fortunate to have one of the best geothermal and solar resources in the world to produce GHG-free power.

1. There is abundant former farmland located adjacent to the one of the proposed transmission line corridors to site 3 gigawatts of solar photovoltaic power using the most efficient technology.
2. Given the intermittent nature of renewable energy generation and the need to have a high-capacity factor at the SWRO plant, we propose using pumped storage. It is the most efficient way to "time shift" solar power. We have identified a location in Arizona with enough capacity.
3. Transmission lines, high voltage switchyards and multiple high voltage substations will need to be built to accommodate power to flow into Mexico. The plan is to have two connections, one with WMIDD and one with IID. Detailed plans are available on request.
4. The North Gila Imperial Valley #2 project is already in the approval phase. Being connected to the IID grid allows for access to the abundant geothermal resources in Imperial County.
5. Other renewable energy sources include green hydrogen and wind.



North Gila Imperial Valley #2 TRANSMISSION LINE

The North Gila – Imperial Valley 2 (NGIV2) transmission project is an approximately 90-mile 500kV transmission line that would connect the existing North Gila Substation near Yuma, Arizona with the existing Imperial Valley Substation near El Centro, California.

The NGIV2 Project is being developed by a consortium made up of the members below:

IID	Citizens Energy Corporation	Grid United	Southwest Transmission Partners
• Local public agency and balancing authority for service territory in Imperial, Riverside, and San Diego counties • Rich in geothermal, solar, and wind resources • Enables delivery of geothermal generation	• Non-profit energy company • Uses profits from its energy investments to support programs for the disadvantaged • Partnerships on over $2.1Bn of transmission projects • Previous successful partnerships with IID	• Focused on modernizing U.S. electric grid • Developer of high-value HV transmission projects • Well capitalized • Flexible business model • Stakeholder-first strategy	• Original Project development team • Regional transmission planning, development, and permitting expertise • Leading development efforts going forward in key roles

THIS PROJECT WILL:

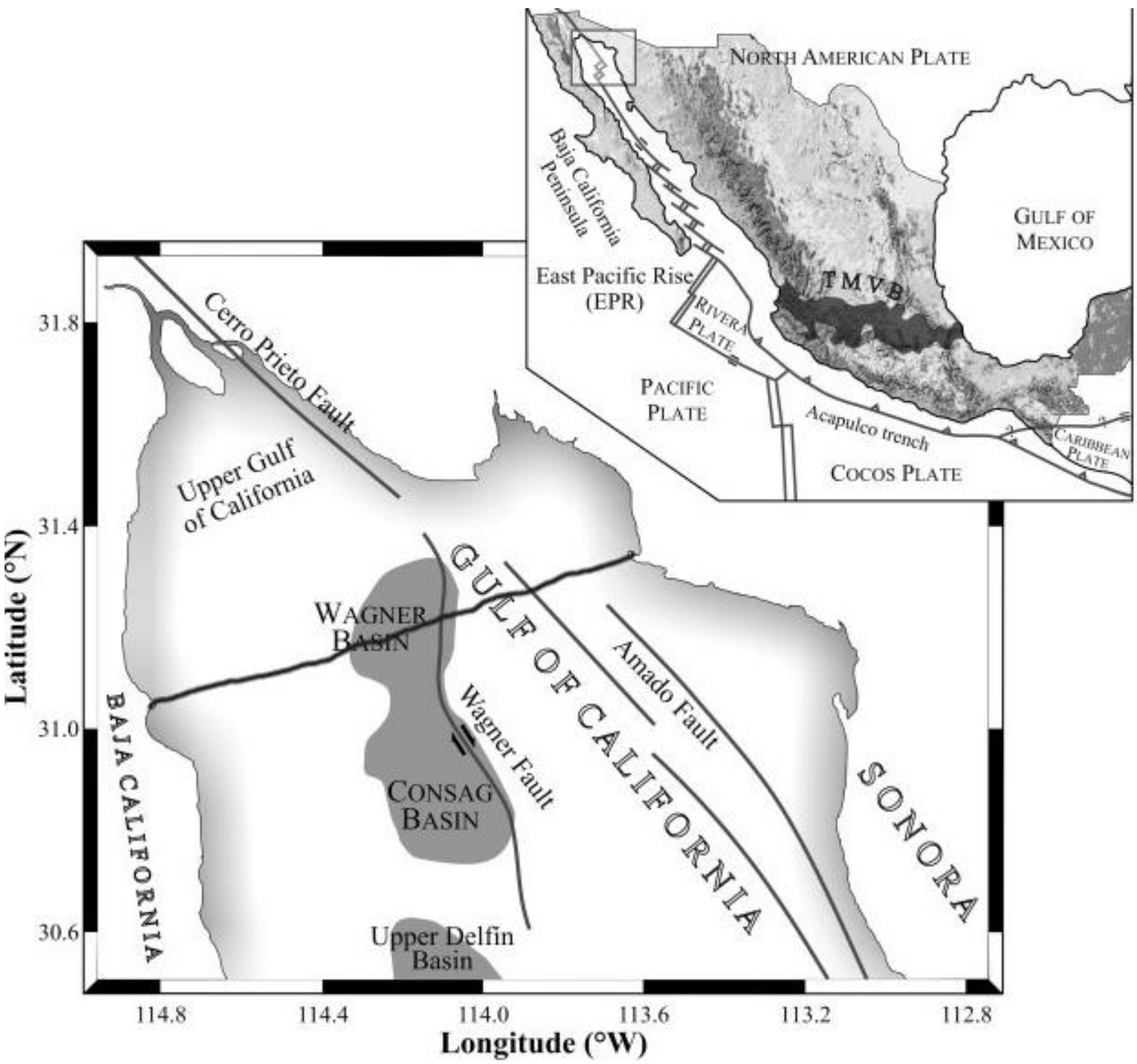
- Provide additional import/export access from renewable generation resource zones where transmission access is currently limited
  - There are currently two 500kV lines east of North Gila and two 500kV lines west of Imperial Valley with only one 500kV line between them
- Facilitate 1,250 MW of primarily in state geothermal and solar energy
- Increase the diversity of resources, reliability, and efficiency of the regional grid
- Meet State public policy goals for transmission, renewable energy generation, and greenhouse gas (GHG) reduction
- Allow IID to fully use the existing owned transmission in Arizona
- Boost economic development plans in the Imperial Valley
- Provide energy assistance to low-income customers in the project area

5 ECONOMICS

Each of the proposed links in the PGM chain will be financed in the most efficient way. The assets will be owned by the entity most suited to build, finance and operate. PGM entities will be tied together with long-term contracts. Common ownership of all the assets is not considered. Economics for each entity are for future analysis.

6 ENVIRONMENTAL

The geology of the Sea of Cortez was shaped by plate tectonics in the last 4 million years. Much of the upper sea is quite shallow but there are a series of basins over 1000' deep. Very strong tidal flows and deep water will eliminate negative effects of the concentrate on the local environment.



From:	Alan Boyce
To:	Long Term Water Augmentation Fund
Subject:	Re: Energy Transformation Investors RFI: Project Gila Monster
Date:	Friday, November 17, 2023 1:24:57 PM

Have a good weekend.

Sent from my T-Mobile 5G Device
Get Outlook for Android

From: Long Term Water Augmentation Fund <LTWAF@azwifa.gov>
Sent: Friday, November 17, 2023 11:57:21 AM
To: Alan Boyce <alan@materra.com>
Subject: RE: Energy Transformation Investors RFI: Project Gila Monster

No problem; I've added the corrected information. Thanks for sending it over!
-Chelsea

From: Alan Boyce <alan@materra.com>
Sent: Thursday, November 16, 2023 4:19 PM
To: Long Term Water Augmentation Fund <LTWAF@azwifa.gov>
Subject: FW: Energy Transformation Investors RFI: Project Gila Monster

Attention WIFA Staff,

I sent this yesterday but screwed up a few of the bios of our team. Here is the corrected version

Energy Transformation Investors (ETI) is an LLC incorporated in Nevada. We are an investor group dedicated to finding interesting technologies and solutions to the energy transition. The ownership of ETI is Alan and Mark Boyce and four other members. ETI is the controlling shareholder in MelRok LLC, an energy "internet of things" company which holds and develops valuable IP. MelRok's patented technology can measure and securely manage every circuit in all buildings, with a focus on energy efficiency and automated demand response. We have had successful partnerships with the California Electric Commission and Lawrence Berkely National Labs. ETI envisions setting up a de-novo project development company to bring Project Gila Monster to fruition.

Alan Boyce is the Manager of ETI and has substantial experience in water, power and environmental issues. I have years of experience on Wall Street, where I ran very large balance sheets and risk positions. Past employers include Salomon Brothers, Bankers Trust and Soros Fund Management. In addition, I have substantial experience in energy and water related companies.

- Boyce Land Co., Inc. is owned by Alan and Mark Boyce. We own over 5,000ac of farmland in Arizona, California, Indiana and North Carolina. We run two rural water companies and will purchase a third in 2024. Our farms in Arizona have 6 wells which produce 15,000 gpm.
- AdecoAgro (NYSE:AGRO) was founded by Alan, who remains a major shareholder and Director

of the public company. AdecoAgro farms 1.5mm acres of land in Argentina, Brazil and Uruguay. We are the most efficient sugar cane to ethanol/electricity producer in the world. We produce 500MW of power every hour of the year and export 75% to the grid in Brazil. We have developed an interesting technology to make biogas from vinasse, which will power our fleet of vehicles. Our rice business is the largest and most efficient in the western hemisphere. We manage 1.5mm acf of water from the Parana and Corrientes Rivers and reservoirs which we have built.

- Materra Farming Company owns 12,000 acres of irrigated farmland in Kern County, Imperial County and Pinal County. We have the most efficient groundwater extraction operation in Kern County, powered by 5 MW of our own solar power and/or natural gas. Our 25 wells can produce 15,000 acf of water per year.
- North Gila Imperial Valley Landowner Tenant Association is a group set up so that all the private landowners under the proposed NGIV #2 500kV power line would negotiate together. We organized in 2017 in response to ITC's proposed transmission line. We returned to life when Grid United proposed building the transmission line. Boyce Land Co. owns a significant amount of the ROW under the proposed 500kV transmission line.
- Westlands Solar Farms was founded and majority owned and managed by Alan and Mark Boyce. WSF permitted and built a large scale solarPV facility in western Kern County adjacent to the Gates substation, with COD in 2012. The facility has significantly outperformed the Independent Engineers projections
- Asher Inland Port is a 600ac rail served industrial park, organized and 40% owned by Alan and Mark Boyce. It is located at switch between the Union Pacific Railroad's Main Line and soon to be re-opened Phoenix Branch east of Wellton, AZ. Asher has substantial water and is served with a 69kV line by WMIDD, although power availability is limited by WAPA transmission bottlenecks and a future of less hydroelectric generation on the Colorado River.

The Team for Project Gila Monster includes:

- Larry Killman was the Assistant General Manager of WMIDD. After that he was a consultant siting natural gas, solar and wind electric generation plants including the Abengoa Solana Solar Project and the Basin Electric Wind Project in Arizona. He permitted 600 miles of 500kV lines in Arizona and New Mexico.
- John Morris was the COO of Westland Solar Farms. Prior to that he ran the energy trading for PG&E, where he had substantial experience with energy generation and transmission. After WSF he was in charge of solar development for EoN, a large European renewable energy company.
- Jose Quesada is the CFO of Southern Light and Gas. Prior to that he worked at Florida Power and Light. He has substantial experience building power stations in the USA, Middle East, India and Latin America. He is currently building a 400mw merchant solar facility in Texas.
- Luke Plante is the owner and manager of Valor Specialties , is a general contractor in Arizona.
- Wes Coers is the project manager at Valor, they are currently building several high-voltage substations for APS and TEP.

  They are currently building a series of new or expanded high voltage substations for APS and TEP in Arizona.
- KC Conway is the chief economist of the Commercial Mortgage Bankers Association with substantial experience in large scale industrial parks.

Mark Boyce is the co-founder and managing partner of True Homes, the largest homebuilder in the Carolinas.

More information regarding our past experience and details of Project Gila Monster are available upon request.

We look forward to hearing from you.

Alan L. Boyce
Manager
32165 E. County 6 ½ Street
Wellton, AZ 85356
Energy Transformation Investors
M (917) 975-4990

From:	Ryan Gravel
To:	Long Term Water Augmentation Fund; Chelsea McGuire
Cc:	Robert Gonzalez; Guy Nadler; Hermann Fritz; Charlie Paton
Subject:	RFI for LTWAF: The Innovation Engine - by Generator H20
Date:	Wednesday, November 15, 2023 8:11:32 AM
Attachments:	The Innovation Engine_final lr.pdf

Dear WIFA – Our team at Generator H20 is pleased and excited to submit **"The Innovation Engine – a Silicon Valley model for water"** in response to your RFI for LTWAF. We appreciate your interest in non-traditional, out-of-the-box, systems thinking, believing that's the only way Arizona will be able to generate the innovative, reliable, and sustainable solutions it needs to augment the state's water supply.

Please let me know the next steps of your process – and thanks for your interest!

Ryan

Ryan Gravel

404-786-9761

ryan@sixpitch.com

From:	Dan Bliss
To:	Long Term Water Augmentation Fund
Subject:	"RFI for LTWAF"
Date:	Tuesday, October 10, 2023 11:59:58 AM

Dear WIFA of Arizona,

We believe your RFI is an excellent step in the right direction. The fact that you have come out and actually used the word ‘augment’ in relation to water is very significant to us and tells us you understand the gravity of the situation you face. We are located in Southern California and have been saying to anyone that will listen that using less water will only get us so far. We have to stop looking at only demand side interventions and start looking at the supply side of water – namely making ‘new’ water or, as you put it, ‘augmenting the water supply’.

Before you read the bit below, I would like to introduce to you how we, in California, can produce water for Arizona. The answer is water wheeling – Arizona can install water making facilities at the Salton Sea. The water produced will go to LA, LA, in turn will free up a like amount water from the Colorado River to be delivered to AZ. We describe how this can be done below. That’s not to say we can’t work in Arizona – you will see below that we are in talks about a possible project outside of Phoenix.

As an aside, we looked at the IDE response/proposal to the RFI that is on your site and it’s laughable to think the Mexican government will allow for RO desalination on the shores of the northeastern part of the Sea of Cortez – it is a biosphere reserve and home to an endangered species of dolphin called the Vaquita. This sort of project is ‘dead in the water’ before it even starts and may indicate to you that you need to look for local partners that understand how things work as opposed to RO giants interested in selling you decades old technology that’s unsustainable and damages the environment.

We are in discussions with a city in southern Arizona interested in accessing the flow of salt water under their city – a sustainable source of unusable brackish water – and desalinating that water to augment water for the developments in that city.

As a startup, we have one final milestone before we go commercial – completing our full scale pilot system and proving our technology. We appreciate the opportunity to respond to this RFI and hope that as you develop your plans and ideas, that you keep us in mind. We are working to complete and commission our pilot by Q2 2024. Thank you for your time.

Manufacturing ‘New’ Water

Introduction

Global Water Farms (GWF) is a deep tech environmental start up located in La Quinta, California. We have patented technology that we use to desalinate brackish/saline/ocean/produced water. We use solar energy to sustainably manufacture 'new' water without membranes, without boiling water and with Zero Liquid Discharge (ZLD). Our brine management system is unique in the desalination world in that the ZLD process results in a dry salt which we monetize. The salt is hydraulically compacted to make encased salt-based construction blocks designed to replace cement cinderblocks and the carbon emissions they produce.

Global Water Farm's technology has world-wide implications for those areas of the globe that suffer from aridification and/or chronic drought. We have ongoing conversations with potential clients in Saudi Arabia, the United Arab Emirates, Texas, Tanzania and Australia about their need for freshwater and how our technology could help them meet that need. It's worth mentioning that in Saudi Arabia our technology could be directly applied to the effluent stream of their current Reverse Osmosis (RO) facilities to double their water output and eliminate environmental damage. That said, we have chosen the Colorado River and its connection to the Salton Sea as our starting point because it offers the best location and conditions to introduce our technology. Although our aspirations are global, in the interest of brevity and focus, the rest of this paper will be devoted to our efforts in the Colorado River Basin.

The Problem

The US Southwest is in a 1200 year dry spell with the last 22 years being the driest so far – this mega-drought is taking a toll on the people and the economies of the 7 states in the Colorado Basin and Mexico. The Colorado River is in a Tier 1 water shortage situation which means that cutbacks in available water may increase if water levels drop further. The Colorado River has been over-allocated and the threat of 'dead pool' in its key impoundments (Lakes Mead and Powell) is still looming. Dead pool refers to the level at which the water in a dam is so low, it no longer flows water. Even before dead pool occurs in Lakes Mead and Powell, the renewable hydroelectricity that supplies nearly 7 million people will have to come from other means. The key point is that without enough water, the US Southwest will fall into economic decline that could spur an eastward migration of people looking for basic services.

California alone lost $3.5B in crops because of the drought in 2022. There are knock on effects that ripple throughout the economy beyond the loss of $3.5B in agricultural revenue and the associated 14,000 farm jobs – this is only the tip of the iceberg. In Arizona, when the Tier 2a shortage was in effect, Colorado River water was cut by 21%. Tribal economies in Nevada have had to cull their cattle herds and decrease hay production due to the reduced availability and increased costs of irrigation water. Given the dependency of tribal communities on agricultural operations to feed themselves and generate income, the drought disproportionally impacts them. I could go on with many more examples. The Colorado River supports a $1.4 trillion economy that needs more water than is currently available to maintain the status quo.

More locally, here next to the Salton Sea, the mega-drought/lack of water has exposed the playa or lake bed that contains pesticides and fertilizers which then get blown into the air as dust – causing high rates of asthma in the communities near the lake. Over more than 20 years nearly $200m has been spent on feasibility studies and other research to fix the issues at the Salton Sea. It is only now that small wetland projects and dust suppression projects are being implemented – these are symptomatic fixes or 'band-aid' solutions that do nothing to address the underlying water problem. It is wrong to consider the water related health and environmental crisis at the Salton Sea and water supply in the US Southwest as two separate issues. The problem is one and the same – not enough water.

The US Southwest cannot continue to develop and prosper without 'new' water – even with the winter storms, we'd need 20 good years of rain and snowpack to begin to refill Lakes Mead and Powell. From the time the dam gates on Glen Canyon Dam closed, it took 16 years to fill Lake Powell in good water years when all the other impoundments were already full. Our whole premise is that 'new' water must be manufactured to mitigate the current drought and to supply water for future expansion. The last census showed a trickle of people leaving California for the first time. If the Colorado River does not recover and federally mandated cuts are implemented, a flood of people will leave to seek opportunity elsewhere.

The Solution

Beyond the arguments between the 7 states on water cuts, the overwhelming response to the mega-drought has been to use available water more efficiently. Water conservation, reuse, drip irrigation, rainwater capture, storm water capture, storage, recycling are all essential tools in the management of our water resources. However, using less water and being more efficient is a defensive position in a losing battle. It is clear that no amount of conservation will generate enough water to refill the impoundments in the Colorado River system nor will conservation allow for continued economic growth and expansion in the US Southwest. There is only one real solution to the lack of water – 'new' water must be sustainably manufactured to make up the shortfall and assure that economic development in the US Southwest can continue apace.

So how does one get 'new' water? In short, it's about taking unusable water like ocean water or brackish ground water and desalinating it. On March 1, 2023, nearly two years after applying, we have been issued a Conditional Use Permit to build our first full scale pilot project on a small portion of the 642 acres we own on the east side of the Salton Sea. The East Salton Sea Basin, a brackish unusable aquifer under our property, will supply the source water for the pilot project. Once our technology is proven, we can begin supplying taps in LA with ocean water desalinated at the Salton Sea.

The Salton Sea is 223 feet below sea level – using a siphon pipeline, ocean water can be flowed downhill to the Salton Sea (Reservoir) from the Gulf of California/Sea of Cortez while generating hydro-electric power. We would not access the Gulf of California directly, but drill wells inland far away from sensitive ecosystems and take advantage of saltwater intrusion for our source water. Once the Salton Reservoir is full, GWF renewable-powered ZLD desalination can take the sea water coming into the lake, desalinate the water and put it into the Coachella Canal which abuts our property. Coachella Valley Water District (CVWD) and Metropolitan Water District (MWD) will convey it to LA and other coastal cities via a short connector pipeline between the Coachella Canal and the Colorado River Aqueduct. This project of One Way Water will take ocean water imported to the Salton Sea, desalinate it and deliver it to taps in LA while taking pressure off of the Colorado

River.

This is, of course the grand vision of a start up company and we certainly have to prove ourselves before anyone would buy into a project of this magnitude. That's why we feel a proof of concept or 'bridge' project would be needed. As a shovel ready 'bridge' to ocean water importation from the Sea of Cortez, there are 14m AF of brackish water in an unrestricted aquifer under the Imperial Valley from 100 years of irrigation that could be pumped into the Salton Sea, desalinated and sent to market. By pumping unusable brackish groundwater from the aquifer into the Salton Sea, the health and environmental threat of exposed playa is immediately mitigated. This 'bridge' project would also serve as a proof of concept and demonstrate the commercial and environmental viability of our approach and technology. However, this can only happen if the Salton Sea Reservoir is full – two problems fixed by one solution.

Our brine management system is unique in the world of desalination. You may be asking what do we do with all of the salt that comes out of our system. RO systems typically pump their hypersaline waste brine back into the ocean and other systems use evaporation ponds. The Persian Gulf has more than 850 RO facilities around it and their effluent are adversely affecting the water chemistry and marine life.

Every ocean water desal unit we deploy will generate 43 tons of salt every day. We have found a green way to monetize our salt waste stream – encased salt based construction blocks. Our salt based construction blocks are designed to replace cement cinderblocks and the carbon emissions they produce. Each ton of cement cinderblocks creates one ton of carbon emissions. Creating 2m AF of freshwater a year will replace 3.44 billion cement cinderblocks a year with a green alternative. This would be equivalent to removing 86m tons of carbon emissions per year.

Ocean water importation is the only sustainable solution to two of California's critical issues – the Salton Sea and freshwater supply. The only way that ocean water importation can work is if there is a sustainable and environmentally friendly way to desalinate 2 or more million acre feet of water/year. Perhaps our technology will not make the cut, but inland desal is the only sustainable way to help the Colorado River to recover and allow for continued economic development in the US Southwest.

In short, we are a company on the cusp of bringing new disruptor technologies to market. The disruption Global Water Farms will cause will have worldwide implications and will hopefully sunset RO technology as inadequate to meet today's demand for freshwater. By sustainably manufacturing 'new' water without the power requirements and environmental damage of Reverse Osmosis and by using our salt waste stream to create a green alternative to cement cinderblocks, GWF will grow to lead the water conversion industry while creating a new green construction materials industry.

Dan Bliss
Chief Sustainability Officer
www.globalwaterfarms.com

Global Water Farms
77935 Calle Tampico, Suite 101
La Quinta, CA 92253
Office - +1-866-WATER16
Cell - +1-941-960-0933

From:	mary greenough
To:	Long Term Water Augmentation Fund
Subject:	re:RFI
Date:	Tuesday, October 3, 2023 11:25:20 AM

To Whom It May Concern,

There are technologies available for conservation/preservation/recovery of existing water sources in addition and supplemental to “importing” water (which adds long-term costs without providing long-term solutions).

I read about one such technology at some point during the previous ten year drought and studies showed it was extremely successful.
The technology consisted of dark spheres that floated atop a reservoir which reduced the evaporation. I believe it was near Lexington reservoir somewhere in santa clara county or santa cruz county.
Additionally, adding more catch-basins and reservoirs to the existing ones would be an effective long-term solution to a growing need for water resources not just in metropolitan areas but statewide for tain and snowmelt runoff. The Anasazi hand-dug canals, so I imagine we could create “pipelines” or canals to interconnect reservoirs and catch-basins across the state.

I would like to submit a suggestion that in considering solutions for water supplies also include some application of funds towards research and utilization of
newer conservation technologies.

Mary Ellen Greenough
2700 S White Mountain Rd 425
Show Low, Az 85901

ZARETAW, LLC

01 November, 2023

Cover Letter

To counter aridification, the 20-year mega-drought in Arizona and throughout the entire Southwest, ZARETAW, LLC and IDE Technologies (Project Team) created a multi-billion-dollar solution to supply fresh, sustainable quantities of drought-proof water directly to the fastest-growing cities in Arizona. The Project Team will allow continued expansion and economic growth to the Southwest region for at least 100 years.

The Project Team intends to draw water from the Sea of Cortez, desalinate it, convey it, and provide 300,000 acre feet/year, and up to 1 million acre feet of water (circa 1 billion cubic/meters) a year, for 100 years and more to the State of Arizona. The entire water system of Arizona, including the Central Arizona Project (CAP), will benefit from the capacity of the Project Team water and this will solve one of the biggest growth, economic and environmental issues of our generation for the Southwest U.S. IDE Technologies, winner of the Global Water Award for Desalination Company of the Year 2022, and a world leader in desalination, develops, designs constructs and operates the largest desalination plants in the world and leads the desalination portion of the project and is a committed partner to the Project.

The entire Project Team has been working with strategic partners, consultants, counsel etc, on the development and contractual framework to increase the certainty of commercialization and capitalization of the project. To ensure engineering and permitting can commence upon WIFA approval, the Project Team has already submitted to the Bureau of Land Management their SF-299 application.

Puerto Peñasco – Arizona project

- **Project Scope**
  - Intake system near Puerto Peñasco, Mexico
  - Desalination facility – initial stage of 300,000 AF/year, expandable according to State of Arizona's future needs (and up to approximately 1,000,000 AF/year)
  - Pipeline – about 200 miles
  - Reservoirs
  - Water distribution facility
- **Product Water** – Potable water, according to relevant regulation
- **Site for the Desalination Facility** – Puerto Peñasco, Mexico
- **Seawater Source** – Sea of Cortez
- **Pipeline Route** – based on most economic and environmentally friendly route, including right of way, according to relevant regulation
- **Delivery Point** – Water distribution facility in Arizona (CAP), for complementary treatment and quality validation

Erez Hoter-Ishay
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CEO
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ZARETAW, LLC

01 November, 2023

Water Infrastructure Finance Authority of Arizona
Long-Term Water Augmentation - Request for Information
LTWAF@azwifa.gov

It is a tremendous honor to reply to this RFI with an innovative and transformative project that will supply the State of Arizona with a new assured water supply. The project team, as outlined in the attached documents, will, with its affiliates and partners, design, construct, own, operate and maintain an integrated water supply system consisting of a desalination plant for water procured from the Sea of Cortez along with the infrastructure for a conveyance system and distribution hub in the State of Arizona. The project will allow Arizona's Water Infrastructure Financing Authority (WIFA), to purchase, or cause to be purchased, up to one million (1,000,000) acre feet of water per year for use by the State of Arizona or other end users.

The Project Team has spent over 4 years in due diligence, planning and preliminary engineering as well as meeting with all relevant State and Federal agencies in both Arizona and Mexico to determine the feasibility of constructing a water solution for the State of Arizona. Through this extensive work, the project team has determined the proposed project is feasible and has submitted an application for the formal process required by the National Environmental Policy Act (NEPA) for a project of this magnitude. A key technical and operational part of the Project Team is IDE Technologies. IDE, established in 1965, is a world leader in building, owning, and operating 450 of the largest desalination plants around the world. Additionally, the development team has been working with strategic partners, consultants, counsel on the development and contractual framework to increase the certainty of commercialization and capitalization of the project.

This RFI will include the following information, as requested by WIFA:

- One Page Cover Letter
- Background on the Project Development Team to include experience
- Project description to include general explanation, estimated water supply available, duration of supply and financial and environmental considerations
- Financial and ownership terms and considerations

The Project Team provides the following information in response to WIFA's RFI:

1. **Benefits to current and future residents of Arizona:**
   In an economic study prepared by the W.P. Carey School of Business at Arizona State University, the benefit of the Central Arizona Project (CAP) is approximately **$100 billion per year**, compared to its estimated annual operating cost of only **$300 million**. Similar economic benefits are expected from this project as it will be large and flexible enough to sustain the State of Arizona as well as support its continued growth. With a potential of up to 1,000,000 acre feet of water per year, this project has the potential to supply water to about 3,000,000 households[1]. With 2.6 million households in Arizona, such an amount of water could supply the entire State and would secure Arizona's future growth and prosperity by addressing any current concerns about its water supply. Removing uncertainty about Arizona's future water supply will allow current and future residents to enjoy and validate Arizona's reputation as the best state to live, work and recreate.

2. **Ability to provide multiple water supply developmental benefits:**
   By creating a new water supply for the State of Arizona this project will address a number of current concerns regarding Arizona's water supply, especially the uncertainty of future Colorado River water. This project will create a new source of water and thereby protect the water current users receive from the Colorado River. This will consequently benefit the sensitive ecosystem of the lower reach of the Colorado River by providing an alternative to Colorado River water transfers. This project will also increase supply and thereby help to keep water user costs in check as this valuable resource sees increased demand in the western United States. Uniquely, the project provides many solutions to the water issues that Arizona is currently facing.

3. **Projected costs of the project:**
   The first phase of the project will focus on the supply of 300,000 AF/Year (including desalination facilities, pipeline, PV facilities, and pumping stations, and other associated infrastructure) and is estimated at $5 billion to $5.5 billion in one-time capital expenditures. There will, of course, be on-going, annual operating costs. The capital expenditures will be financed by equity and debt and will be recovered through the sales of the water to the State and other end-users during the O&M phase.

4. **Ability to address or mitigate water supply reductions to existing users:**
   As previously stated, this project will mitigate water supply reductions to water users by providing a new water supply to Arizona[2]. A portion of the water from this project will not be subject to long-term water delivery contracts and will be reserved for sale to additional users in Arizona, as needs may arise.

5. **Cost-effectiveness of the project:**
   This project is the most cost-effective large-scale augmentation project available to Arizona. Other water augmentation projects being considered in Arizona are

[1] See *How Many Homes in Arizona, On Average, Share an Acre-Foot of Water Each Year?* Published on April 19, 2021 by Arizona Department of Water Resources. https://new.azwater.gov/news/articles/2021-19-04

[2] It is noted that this project will also provide water to Sonora, Mexico without impacting the amount of water committed to Arizona. This will help to further protect Arizona's water supply by ensuring that Mexico does not demand more from its northern neighbors and is an example of the flexibility and scale of this project.

significantly smaller in size and will not mitigate the existing and projected reductions of water supply from the Colorado River. The costs to Arizona can be mitigated by the sale of water to other end-users such as cities and towns within the Central Arizona Project (CAP).

6. **Reliability and long-term security of the water supply project:**
IDE has successfully built, owned, operated and maintained similar projects throughout the world and its proven track record will lead to a well-built and operated project.[3] With the exceptions of shutdowns for maintenance and other temporary purposes, this project can supply water to Arizona 24 hours per day and 365 days per year. Given the project's cross-border location, it will utilize best-in-class security practices working in conjunction with the US and Mexican governments. The water delivery system itself will include state-of-the-art control system architecture to ensure the efficient operation and provides the applicant the ability to respond to and mitigate any reliability or security issues that may arise.

7. **Existing and planned conservation, best management practices and water management programs of RFI applicant:**
The project will leverage the expertise of IDE and take advantage of its best-in-class management practices, including those it uses at its other desalination projects in the United States, such as the Carlsbad Desalination Plant, that maximize conservation and water management practices to ensure the efficiency of its operations.[4]

8. **Degree to which project will maximize or leverage funding sources:**
This project intends to utilize all available funding sources, but the principal funding will be a combination of equity and debt.

9. **Applicant's ability to meet government environmental requirements:**
The project will meet all required environmental standards and will only partner with service providers that can assure these standards are met. The project developers have a demonstrated record of meeting the environmental requirements in many projects in the US and across the globe.[5] Furthermore, a creation of new sources of water for Arizona will enable the restoration of the Colorado River ecosystem which benefits the entire basin and will positively impact the environment by reviving the existing natural environment of the Colorado River basin.

10. **Qualifications, industry experience, reputation and financial capacity:**
IDE, who will be part of the project team, was founded in 1965 and operates four hundred desalination units in over forty countries. It has been granted more than sixty patents in the field of desalination and has developed, constructed, and

[3] See Ashkelon, Israel Project Technical Brochure, https://www.ide-tech.com/wpcontent/uploads/2018/06/Ashkelon-Israel-Project2.pdf
[4] See IDE's website for further information on its record and projects. https://www.ide-tech.com/en/watertalk/?data=item_1
[5] See IDE's commitment to environmental responsibility, https://www.ide-tech.com/en/about-us/ourwork/environmental-responsibility/?data=item_1

operated the largest desalination plants in the world, the US, China, and India among other accomplishments.[6]

11. **Feasibility of the project:**

As previously stated, IDE has constructed, operated and maintained the largest desalination facilities in other areas of the world. The RFI respondent has been evaluating this project for over four years and has met with water users in Arizona to understand the feasibility of the project as well as the financial strength of those water users to ensure that this project will be financially feasible. As this project has the ability to provide an assured water supply with enough capacity to supply the entire state, the financial stability of the project is sound and, while it has significant capital needs, the applicant is confident that meeting these capital needs is feasible. Similarly, the applicant has done its due diligence to ensure that the Sonoran government is supportive of the project moving forward.

12. **Comments from water users, citizens and jurisdictions:**

The applicant has received letters of intent from a number of Arizona water users who intend to contract for a significant amount of the capacity provided from this project. As this project is considered, we look forward to sharing information with more interested parties.

13. **Safety record:**

As a leader in the development, construction, and operation of large-scale desalination facilities, IDE has a world-class safety record.[7]

14. **Existing, near-term and long-term water demands of beneficiaries of the project:**

Given that the State of Arizona is currently in the process of completing an updated Supply and Demand Assessment, a complete analysis of this requirement cannot be done at this point with a reliable level of accuracy. However, we do know with the current and anticipated future reduction of Colorado River water supplies, Arizona is losing control of its water future. There is an immediate and existing need for dependable water supplies within the CAP service area. There are also other existing, near-term, and long-term water demands in Arizona that cannot be satisfied by existing water supplies. Following the completion of the water supply and demand assessment we are prepared to supplement this answer. However, reports prepared by other entities indicate a water supply and demand imbalance of approximately one million acre-feet in Arizona over the next one hundred years if new sources of water are not obtained.

15. **Potential impacts to ratepayers:**

The potential impact to ratepayers will be dependent on which city, town or private water company serves each customer and the existing water supplies available to that city, town, or private water company. The cost of this water will be less

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[6] See IDE's history. https://www.ide-tech.com/wp-content/uploads/2018/06/IDE_Ingographics_Small_Fixed.jpg

[7] More about IDE's commitment to health and safety can be found here: https://www.ide-tech.com/en/aboutus/our-work/health-safety/?data=item_1

expensive than other available water supplies; for example, in 2017 the City of Buckeye estimated the cost of Central Arizona Groundwater Replenishment District ("CAGRD") water at $2,360 to $7,550 per acre-foot per year by 2041. More recent estimates by Buckeye place that cost between $8,000 and $10,000 per acre-foot which we would estimate to keep rising as the pressures on Colorado River water supplies become greater. Time is of the essence to ensure that the cost of water remains affordable to Arizona's citizens.

16. **Ability of applicant to repay financial obligations to the authority:**
The applicant will be fully privately funded and able to meet all contractual requirements and any obligations to the authority. The commitment to purchase water from the project by WIFA's approval is an essential next step to finalizing the commitments of a number of our anticipated capital providers.

17. Impact of agreement on ability to comply with A.R.S. 49-1303(E):
All upfront costs for the project will be funded by private investment. The authority will only be obligated to the cost of water delivery. For this reason, we do not anticipate any direct impacts on the ability of the authority to comply with the requirements of section 49-1303, subsection E related to the entering into an agreement with the applicant.

Thank you for leading at a critical time for Arizona's future. The Project Team maintains demonstrated global experts well versed and experienced in developing desalination and large-scale infrastructure projects to solve water solution needs. We are confident this solution is the best for Arizona. Included in this RFI response you will also see proposed operation and technical characteristics of the project as well as a term sheet that we hope will serve as the basis for future discussions and a definitive water purchase agreement. The team will make themselves available for any questions at any time and we thank you for your thoughtful consideration.

Sincerely,

Erez Hoter-Ishay
President
ZARETAW, LLC
Erez@zaretaw.com

Lihy Teuerstein
CEO
IDE Water Assets
LihyT@ide-tech.com

Providing Potable Water to Arizona

Project Team
(ZARETAW + IDE Technologies)

Water Infrastructure Finance Authority of Arizona (WIFA)

Desalination Plant, Puerto Peñasco

Seawater Intake
(Sea of Cortez)

↓

Pumping Station

↓

Pre-treatment

↓

Reverse Osmosis → Brine → Sea

↓

Post-treatment

↓

Product Water Pipeline, Mexico & USA

Pumping Stations

↓

Pipeline

↓

Reservoir

↓

Water Delivery to off-takers

IDE Technologies Your Water Partners

Providing Water to Arizona

ZARETAW + IDE Technologies Your Water Partners

PROJECT TEAM

Develop, Design, Construct, Own, Operate, Desalinate, Transport and Maintain

Sea

Water obtained from Sea of Cortez

Desalination Plant

Located in Puerto Peñasco, Mexico

Pipes/Pump

Approximately 200 miles spanning across Mexico and Arizona

Reservoir

Stores 4 days of water supply

Project will utilize renewable power source, mainly PV+ storage.

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA

WIFA

Purchase up to 1,000,000 acre-feet of water per year

Arizona Water Distribution Facility

Water for off-takers e.g. CAP

Turning the Dream into a Reality

- IDE's story begins in the young state of Israel, almost 60 years ago
- Turning the desert into a lush land using desalination was the vision that dreamers such as Ben Gurion strove to realize
- The Israeli desalination story intertwines with the birth of a new nation. It brings together forward thinking, state-of-the-art technology and a determined refusal to surrender to adversity
- This turned Israel from a semi-arid country with scarce water resources into a flourishing, water-resilient nation, where 70% of potable water originate from desalination

IDE Technologies

IDE - Water Treatment is in Our DNA

EXPERIENCE & UNRIVALLED TRACK RECORD

Established in 1965 with global presence across all industries, with more than 450 installed units in over 40 countries

RELIABILITY

Developed and operated the largest desalination plants based on P3 & BOT models

TECHNOLOGY LEADERSHIP

In SWRO, thermal and brackish RO desalination, Industrial Water Treatment and wastewater reuse, with more than 60 granted patents in the field

PARTNERSHIP

Building strong partnerships to ensure 100% risk mitigation and success on all fronts:

- Equity partnership - offering financial stability and flexibility
- Long-term, trusted relations with international lenders

EXPERTISE

In designing, developing, constructing and operating large-scale Water Treatment facilities, including In-house engineering powerhouse capabilities

Tradition of Excellence

- GWI Global Water Summit 2018 Desal R&D Olympics Gold Medal
- GWI 2014 Desalination Plant of the Year (Sorek Israel)
- The Fortune 2016 Companies that change the world (2nd place)
- GWI 2016 Desalination Plant of the year (Carlsbad USA)
- MIT Technology Review 2015 Top 10 Breakthrough Technologies (Sorek Israel)
- MIT Technology Review 2016 50 Smartest Companies (19th place)
- MIT Technology Review 2015 50 Smartest Companies (18th place)
- GWI 2011 Desalination Company of the Year
- GWI 2012 Highly Commended Water Deal of the Year (Sorek Israel)
- AMTA Membrane Technology Conference 2017 Membrane Facility of the Year (Carlsbad USA)
- World Technology Award 2016 (Environment)
- GWI 2009 Highly Commended Thermal Desalination Plant of the Year (Reliance Jamnagar Refinery India)
- Israel-Asia Chamber of Commerce 2010 Award for special achievments in Asia
- GWI 2013 Desalination Deal of the Year (Carlsbad USA)
- Euromoney 2007 Deal of the year (Hadera Israel)
- GWI 2008 Highly Commended Desalination Company of the Year
- GWI 2014 Distinction award Desalination Company of the Year
- Project Finance Magazine 2012 North American Water Deal of the Year (Carlsbad USA)
- Israel Cleantech Expo Award 2011 Company of the year
- GWI 2006 Desalination Plant of the Year (Ashkelon)
- Cyprus Industry Innovation Award 2007 Plant of the Year (Larnaca Cyprus)
- World Technology Award 2012 contender

Over 5 Decades of Global Distribution in +40 Countries

USA
Total Capacity
225,000 m^3/day

AUSTRALIA
Total Capacity
150,000 m^3/day

ISRAEL
Total Capacity
1,600,000 m^3/day

INDIA
Total Capacity
583,000 m^3/day

ITALY
Total Capacity
27,000 m^3/day

CYPRUS
Total Capacity
125,000 m^3/day

SPAIN
Total Capacity
78,000 m^3/day

CHINA
Total Capacity
200,000 m^3/day

LATIN AMERICA
Total Capacity
142,000 m^3/day

CENTRAL ASIA
Total Capacity
260,000 m^3/day

Corporate Social Responsibility (CSR)

- IDE assures acting in a responsible manner in the marketplace, workplace, community and toward the environment
- IDE assures that interests of all stakeholders (governments, local communities, customers, shareholders and employees) are at the center of our decision making
- IDE sees safety as a critical issue, above all other considerations
- IDE constantly seeks ways to provide more environmentally-friendly solutions
- Ethics and governance drives our social interactions

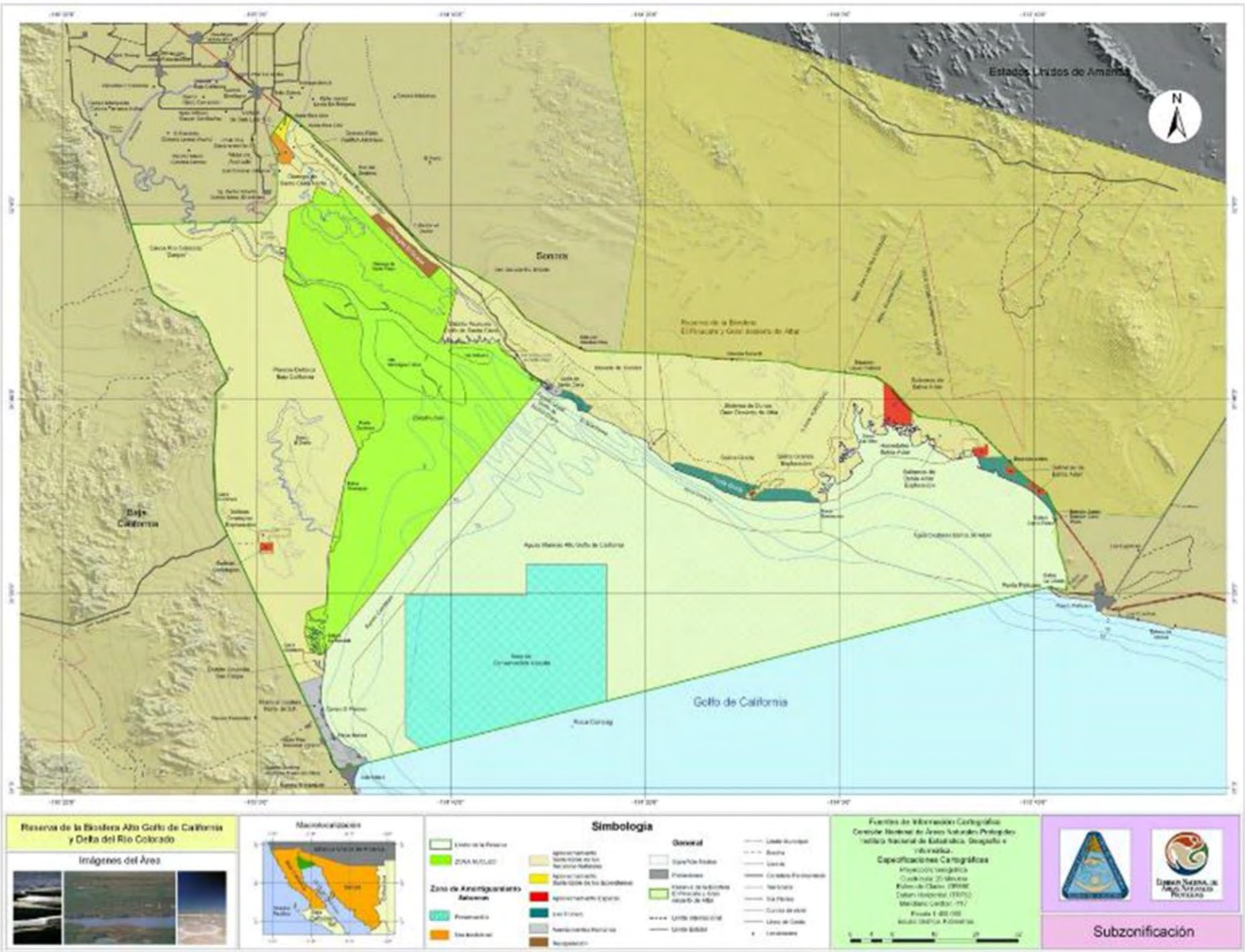
Environmental Standards

- Each IDE facility adheres to the strictest environmental standards and regulations
- IDE uses its strength, know-how and technologies to comply with such environmental issues, for example:
  - Sorek 1 - minimizing marine, shoreline and land impacts by using pipe jacking of long and large diameter pipelines, smart structural design and sludge treatment for reduced energy and chemical consumption
  - Carlsbad Plant - adhering to California's environmental regulation, for example, by using special intake structures with new screens technology to prevent fish and other marine life from entering the pipes and by utilizing state-of-the-art technology and design practices to reduce electrical demand
- In each plant, IDE rigorously monitors all environmental aspects of its plants, and has developed a specific HSSE plan for each plant

Environmental Standards

Potential Environmental Impact		Mitigation Measures
Impact	Source of Impact	
Alteration of the natural terrain (land area)	Earth and construction works	Pipe-jacking (tunnelling) for installation of onshore pipelines (seawater feed and brine)
		Measures for soil retention in plant area
Alteration of the seabed	Marine works	Pipe-jacking for installation of offshore pipelines (intake & outfall) to at least 600m from the shoreline; precisely controlled dredging for installation of pipelines from 600m; covering of the pipelines and restoration of the original bathymetry
Sediment resuspension	Marine works	Minimal dredging activities; minimization of drifting and sweeping of dredger suction head by precise positioning control
Marine habitat alteration and changes in sediment transport	Intake & outfall systems (piping)	Intake and outfall pipelines laid below the seabed
Entrainment and impingement of marine biota	Intake system (suction heads)	Intake heads designed for slow suction velocity
Accidental spillage or leakage of hazardous chemicals	Main plant (storage & handling of chemicals)	Safety measures for transportation, storage and handling of chemicals as prescribed in applicable legislation; placement of storage tanks for corrosive chemicals in secondary basins; chemical neutralization of any spill prior to disposal

High Sea of Cortez



IDE Technologies

Desalination, Distribution and Pipeline Route

IDE Technologies

Distribution Facility (Tie-In Point to CAP)

Water Purchase Agreement

- “Performance-based” contracting, linking off-taker’s payments to contractual performances of the Project Team
- Project Team shall develop, handle permitting, design, finance, erect, operate and maintain the project, committing to pre-agreed quantities and qualities of water
- Off-takers commit to the “Take-or-Pay” mechanism
- 100-years long or more

Water Purchase Agreement

The State of Arizona benefits from:

- Shifting most of the risks to the Project Team
- Access to fixed, long-term water tariff
- Long-term performance “warranty” and budget stability
- Technological innovation and operational efficiency - leading to improved cost, optimized schedule and outcome certainty
- Access to smart sources of capital

IDE Technologies

“Take-or-Pay” Mechanism

- “Take or Pay” guarantees project earns revenue sufficient to cover investment
- Water price, the basis of “Take-or-Pay” principle, is comprised of “Fixed” and “Variable” components
- Off-taker is obliged to pay Fixed Price component
  - As long as the desalination plant is available
  - Even if quantities actually consumed are reduced (or even nil)
- Off-taker pays Variable Price component for quantities actually purchased
- By implementing this principle, the Project Team will be able to secure the financing to the project, as it is not exposed to demand risks

IDE Technologies

Term Sheet for Water Purchase Agreement

Upon approval of this term sheet by the Water Infrastructure Finance Authority ("**WIFA**"), the terms are intended to be binding on the Project Company and WIFA with respect to negotiation of the Water Purchase Agreement. Upon approval, the parties will cooperate to complete an executable agreement between the parties.

Purpose:	Pursuant to A.R.S. §§ 49-1211 and 49-1303, the purpose of this agreement is to establish a relationship between ("**Project Company**") and the Water Infrastructure Finance Authority ("**WIFA**"), to create a sustainable source of water to end users in the State of Arizona.
Project:	The Project Company and its affiliates will, in phases, design, construct, own, operate and maintain an integrated water supply system consisting of a desalination plant for water procured from the Sea of Cortez and the infrastructure for a conveyance system and distribution hub. WIFA will provide a commitment on behalf of the State of Arizona to purchase, or cause to be purchased, up to 1,000,000 acre/feet of water per year for use by the State or purchase by other end users and WIFA will aggregate such off-takers in a portfolio of financeable contracts ("**Water Purchase Agreement** or **WPA**").
Agreement:	In consideration of the Project Company's efforts to design, construct, own, operate and maintain the Project, WIFA will establish an escrow account consisting of funds appropriated by the Arizona Legislature pursuant to A.R.S. §§ 49-1302 and 49-1303 for the purchase of desalinated water ("**Product Water**"). As outlined in the legislation, funds will be available over the course of three (3) fiscal years in the amount of $250 million in each of the three years for a total of $750 million. These funds will be deposited into an escrow account which will be used to secure WIFA's commitment to a WPA pursuant to which the Project Company will sell Product Water WIFA as further defined by the parties and the details further outlined in this term sheet. Project Company will commit to use renewable energy where commercially feasible. The WPA will require WIFA to cooperate with Project Company in obtaining downstream long-term water purchase agreements with the end-user. Parties agree to execute the WPA by **June 30, 2024**.
Term:	The WPA shall be effective upon execution between WIFA and Project Company. Upon execution, parties will cooperate in good faith to achieve identified benchmarks related to permitting, licensing, and analysis in order for Project Company to make a final investment decision ("**FID**") which will, unless adjusted by mutual agreement, occur on or before December 31, 2025. The term of the agreement will commence upon the ("**Commercial Operations Date**") or the date that Project Water is delivered to WIFA or its identified end users.
Contract Operations Period:	In accordance with accepted standards for an assured water supply, agreement shall continue until the 100th anniversary of the Commercial Operations Date.

Commercial Operations Date:	The Commercial Operations Date ("**COD**") for the Project shall be the date on which the Project is substantially complete, commissioned, tested and ready to deliver desalinated water at the Delivery Point/s with a commercial flow rate consistent with industry standards and otherwise in accordance with the testing and inspection period. The anticipated targeted initial COD is **June 30, 2029**.
Costs:	In consideration for the assured supply of the Product Water, WIFA or its water off-takers shall pay an agreed upon amount for Product Water. The funds in the escrow account may be used for payment of such costs as determined by WIFA.
Operation and Maintenance of the Project:	Project Company, or its Affiliates, will operate and maintain the Project in accordance with prudent industry practices and in such a manner that a proper interface is maintained at the Delivery Point and water can be delivered to WIFA in accordance with the terms of the WPA.
Permitting:	WIFA and the State will cooperate with, and assist the Project Company in obtaining the relevant permits, consents, licenses and approvals required for the implementation of the Project from any government/public agency, authority, utility owner and/or municipality.
Other terms:	The WPA shall contain provisions with respect to the scheduling of outages, forecast of delivery of Product Water and other customary provisions such as the requirements of the availability guarantee for the Product Water. WIFA will have the first right to purchase additional Product Water capacity if it becomes available for long-term purchase in the State of Arizona. Other contractual terms to be defined in the WPA as customary for a transaction of this nature including termination rights and remedies, standard representations, warranties and liability provision that are acceptable to the parties and consistent with Arizona law. WIFA may terminate the WPA at any time prior to the FID Date, subject to a termination fee relating to costs incurred and agreed to between WIFA and Project Company.

****CONFIDENTIAL DRAFT****

November 15, 2023

Mr. Chuck Podolak
Director
Water Infrastructure Finance Authority of Arizona
100 N. 7th Ave. Suite 130
Phoenix, AZ 85007

Dear Chuck,

On behalf of the North American Development Bank (NADBank), it is with great pride that we submit this response to the State of Arizona and the Water Infrastructure Finance Authority's (WIFA) request for information related to Long-Term Water Augmentation Fund **(RFI for LTWAF)** that illustrates our experience, capacity and willingness to assist WIFA with this specific undertaking.

For almost 30 years, NADBank has established a successful track record in financing environmental infrastructure projects, often in partnership with other public and private financial authorities and institutions. To date, more than two-thirds of the projects financed by the Bank have been in the water and wastewater sector, including water and wastewater treatment plants, water conservation projects and new water sources like desalinization plants.

NADBank is able to assist WIFA in the following capacities:

- Lead binational coordination of projects located on Mexican side of the border,
- Provide and leverage integrated financing solutions in the form of grants, technical assistance funding and loans, with the ability to bring other financing partners to the table, if needed,
- Structure innovative lending facilities, P3 transactions, et al., for both public and private-sector borrowers, and
- Build consensus by bringing other relevant stakeholders to the table.

We would like to request a meeting to best determine how NADBank can play a supporting role in advancing WIFA's goals of securing additional water availability.

Jesse Hereford will serve as our point of contact for communication between WIFA and the Bank. He can be reached at jhereford@nadb.org or via cell at 210.215.3416. We look forward to working with you, WIFA, and the State of Arizona to help determine the best solution possible for your long-term water availability needs.

Sincerely,

Calixto Mateos Hanel
Managing Director

John Beckham
Deputy Managing Director

North American Development Bank's Response to

Request for Information for Long-Term Water Augmentation Fund

(RFI for LTWAF)

Prepared for:

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA

<u>NADBank Point of Contact:</u>

Jesse Hereford, Head of Strategic Partnerships and Stakeholder Engagement

Email: jhereford@nadb.org or cell: 210.215.3416

A. General Information and Experience

1. **a. <u>Name of Respondent</u>: The North American Development Bank ("NADBank" or the "Bank")**

   NADBank is a binational financial institution established in 1994 by the Governments of the United States and Mexico to provide financing to support the development and implementation of environmental infrastructure projects along the US-Mexico border. The Bank offers loans, grants, technical and other assistance for projects and actions that preserve, protect or enhance the environment in order to advance the well-being of the people of the United States and Mexico.

   The Bank has a successful track record in financing environmental infrastructure projects, often in partnership with other public and private financial authorities and institutions. Historically, more than two-thirds of the projects financed by NADBank have been in the water and wastewater sector, including water and wastewater treatment plants, water conservation projects and water augmentation projects including desalinization plants and water re-use (or recycling) projects.

   The purpose of this RFI response is to outline ways in which NADBank can partner with WIFA of Arizona to achieve the goals set forth for the LTWAF of securing and developing additional water supplies for the state of Arizona. NADBank is able to assist WIFA in the following capacities, among others:

   - Lead binational coordination of projects located along the US-Mexico border, leveraging regional knowledge, expertise and relationships at the federal, state and municipal levels on both sides of the border,
   - Provide integrated financing solutions in the form of grants, technical assistance funding and loans, with the ability to bring other financing partners to the table when needed,
   - Structure innovative lending facilities, P3 transactions, et al., for both public and private-sector borrowers,
   - Provide technical advisory services to ensure compliance with international best practices,
   - Liaison with the International Boundary and Water Commission (IBWC) and its Mexican counterpart, CILA, and
   - Build consensus by bringing other relevant stakeholders to the table.

   <u>NADBank Team</u>:

   The team consists of a group of highly experienced professionals committed to fulfilling NADBank's mission, as a leader in binational cooperation, to catalyze environmental infrastructure investments along the US-Mexico border and achieve sustainable development outcomes in the communities the Bank serves.

Calixto Mateos, *Managing Director*, has more than 30 years of experience that includes the Banco de Mexico, Mexico's central bank, where he held positions as strategic planning project manager, risk manager as well as in stakeholder engagement.

John Beckham, *Deputy Managing Director*, has worked in international finance and development since 1991. Some of his relevant experience includes his time at the Inter-American Investment Corporation (IIC) for 19 years, where he held various positions, including Chief of Debt, Chief of Equity and Managing Director – Clients.

Salvador Lopez, *Chief Environmental Officer*, is responsible for ensuring that the projects being considered for certification and financing by the Bank are in conformity with its mandate as well as verifying the environmental integrity of all Bank operations. Salvador has more than 20 years of professional experience in environmental, water and other sustainability issues, including nearly 15 years of consulting experience with renowned firms like McKinsey and Company and CDM-Smith. During his tenure as a consultant, he was responsible for overseeing projects in diverse areas including the border, such as water resource planning and infrastructure, and climate change.

Carlos Carranza, *Director of Environmental Infrastructure Finance*, has more than 24 years of experience in the areas of structured finance and project finance. He has structured transactions for landmark renewable energy projects in Mexico and the US and has extensive experience as well in state and municipal projects in Mexico and municipal bond issuances in the US. Additionally, he has developed public-private partnership schemes for states and municipalities in Mexico. A few examples of successful financings include (i) the first renewable energy project to export electricity from Mexico to the United States; (ii) the first wind project in northern Mexico with a private off-taker; and (iii) the first project finance scheme with a water utility to fund a treated wastewater distribution system in the state of Nuevo Leon.

Kari Bergman, *Associate Director of Environmental Infrastructure Finance,* leads the Bank's efforts in the financing of green buildings, sustainable industrial parks, green manufacturing and the manufacturing of green products, as well as municipal bond purchases in the US. Prior to joining NADBank in 2018, she worked at IDB Invest, the private sector arm of the Inter-American Development Bank, where she managed a portfolio of infrastructure loans for projects located throughout Mexico, Central America, South America and the Caribbean.

Roberto Molina, *Associate Director of Environmental Infrastructure Finance,* has been working with NADBank for the last eleven years in the development and implementation of environmental infrastructure for water, renewable energy, air quality and sustainable buildings, among others. Prior to joining NADBank, he served as Director of Urban Infrastructure at the Sonora State Water Commission (CEA, by its Spanish acronym) and participated in the development of environmental infrastructure projects with binational resources. During his career, Roberto also has served as cabinet coordinator of the municipality of Hermosillo, Sonora, supervising the areas of planning, public works, trail and public services (IMPLAN, by its Spanish acronym).

Renata Manning-Gbogbo, *Director of the Technical Services and Grants Department* at NADBank, which manages the infrastructure grant programs, including the Project Development Assistance Program (PDAP) and Border Environment Infrastructure Fund (BEIF), both funded by the U.S. Environmental Protection Agency (EPA), as well as the Community Assistance Program (CAP) funded with NADBank resources. In this capacity, she is responsible for overseeing the development, certification and implementation of environmental infrastructure projects financed with grants; managing and promoting the grant programs; and coordinating with all project stakeholders. Renata has worked with NADBank since 2002 when she joined its sister institution, the Border Environment Cooperation Commission (BECC), where she held several positions including director of projects, project manager, strategic planning manager and senior policy advisor.

Jesse Hereford*,* *Head of Strategic Partnerships & Stakeholder Engagement*, has more than 20 years of experience in outreach and stakeholder relations. At NADBank, he oversees all U.S. outreach activities and seeks collaborative opportunities with border state agencies and legislatures. Prior to joining the Bank, Jesse worked in the private sector serving as chief liaison to elected and non-elected officials at the local, state and federal level on issues related to transportation and infrastructure. Jesse began his career working for a US Senator with his last post being Director of State Outreach.

Jesse Hereford will serve as the point of contact with WIFA. He can be reached at jhereford@nadb.org or via cell at 210.215.3416.

Oscar Duran, *Head of Institutional Relations and Communications*, is experienced in stakeholder outreach in Mexico. Oscar currently leads NADBank's institutional relations with governmental entities, the business sector and academic institutions in Mexico. Prior to his arrival at NADBank, for more than seven years, Oscar oversaw Banco de Mexico's institutional relations with governmental bodies, the business sector, academic institutions, as well as the relationship with the media and opinion influencers.

b. Ownership and Management Structures:

NADBank is jointly owned by the Governments of the United States and Mexico. Bank management consists of a three-person team appointed by the Board of Directors: Managing Director, Deputy Managing Director and Chief Environmental Officer. The Managing Director and Deputy Managing Director each may serve up to two terms of four years, while the Chief Environmental Officer serves a term of five years that may be renewed. The offices of Managing Director and Deputy Managing Director must be held by one US citizen and one Mexican citizen at all times; the positions must also alternate between nationals of the two member countries. The following table lists the members of the Bank's ten-member Board of Directors, which approves all financings made by the institution.

U.S. Members	Mexico Members
Secretary of the Treasury	Secretary of Finance and Public Credit (SHCP)
Secretary of State	Secretary of Foreign Affairs (SRE)
Administrator of the Environmental Protection Agency (EPA)	Secretary of the Environment and Natural Resources (SEMARNAT)
U.S. Border State Representative	Mexican Border State Representative
U.S. Border Public Representative	Mexican Border Public Representative

c. Statutory Authorities:

NADBank does not have any authorities to own and manage water rights or water supply facilities.

d. Relevant Experience:

In its near 30-year history, NADBank has financed more than 200 water and wastewater projects along the US-Mexico border in the form of loans, grants and technical assistance funding. The team boasts a mix of financial and technical expertise and experience financing projects on both sides of the border, including P3s.

Ensenada Baja California Desalinization Plant

One notable P3 project financed by the Bank was a desalinization plant in Ensenada, Baja California. The project consisted of the development, financing, construction and entry into operation of a reverse osmosis desalinization plant, including seawater intake works, pretreatment facilities and a conveyance system for discharging concentrate into the ocean. Other project components included a storage tank, pump station and water lines to connect to the drinking water distribution system in Ensenada.

The P3 collaboration involved the Mexican Federal Water Agency (CONAGUA, by its Spanish acronym), the Baja California State Water Commission as project sponsor (CEA, by its Spanish acronym), NADBank as lender and the private sector. OHL Medio Ambiente Inima S.A.U. carried out the project under a build-operate-transfer contract, and the plant began operations in 2018.

A. Potential Augmentation Opportunities

1. a. General Explanation:

With its almost 30-year history of financing water projects, NADBank has the ability to support a variety of augmentation project types on either side of the U.S.-Mexico border, including but not limited to water treatment plants, stormwater projects, water conservation projects and water augmentation projects including desalinization plants and water re-use or water recycling projects.

b. Estimated Annually Available Water Supply: N/A

c. Duration of Resource Availability: N/A

d. Environmental, Regulatory Considerations and/or Limitations:

NADBank's mandate is to invest in environmental infrastructure projects along the US-Mexico border. Both EPA and the Mexican federal agency responsible for the environment and natural resources, SEMARNAT, sit on the Bank's Board. All projects in which NADBank invests go through a stringent due diligence process to ensure compliance with federal, state and local environmental laws and regulations.

e. Jurisdictional and Political Considerations and/or Limitations:
NADBank's geographical jurisdiction is defined as 100 km (62 miles) north of the border between the US and Mexico and 300 km (186 miles) south. Therefore, the Bank would only be able to support WIFA projects within these boundaries.

f. Capital Investment, Repayment or Other Financial Considerations and/or Limitations:

NADBank is able to make loans for up to thirty years, subject to due diligence and the project specifics.

g. Approaches to Enhance the Sustainability, Security and Resilience of the Water Supply: N/A

2. Considerations for Potential Delivery and/or Ownership Models:

NADBank specializes in customized financing solutions that fit the needs of an individual project and is therefore able to consider all delivery and/or ownership models when vetting a financing opportunity.

In the Bank’s experience, some advantages of using a P3 model include:

- May free up public funds for use on other projects,
- May allow for an increase in total project size (cost) due to private sector participation,
- Gives rise to a larger pool of potential investors, often with an appetite for financing assets with longer useful lives, and
- Transfers certain risks (e.g., financial, project execution and operational) to a private sector entity with specialized expertise for handling such risks. This transfer of risk can lead to greater accountability and a higher likelihood of timely project delivery with fewer cost overruns.

3. <u>Recommendations for Prioritization</u>:

A few possible recommendations on how best to prioritize, finance and pay for proposed WIFA augmentation opportunities, including those utilizing P3 agreements, include:

- Utilizing NADBank as a financing partner and lead arranger for any project financing at the Arizona-Sonora border or for projects up to 62 miles north into Arizona or 186 miles south into Sonora. The Bank can help leverage WIFA funding by investing its own capital as well as helping to secure other funding sources to stretch the State’s funding further.
- Leveraging NADBank’s financing terms. NADBank has the ability to provide longer loan tenor tranches than a traditional commercial bank and sculpted amortizations based on project cash flows, which could make financing through the Bank more attractive. In addition, NADBank can lend to both public and private sector entities.
- Benefitting from the knowledge and expertise of an established green bank. NADBank has significant experience in diverse roles, including serving as:
    - Mandated lead arranger,
    - Technical advisor,
    - Financial modeling expert, and
    - Collateral agent.

With respect to P3 agreements, a strong legal framework can incentivize private investors to channel additional funding through a P3 scheme. WIFA could act as project sponsor but, as in the case of the Ensenada example, the selected P3 contractor would be able to bring additional financing to the project in the form of both equity and debt.

For P3s in Mexico, a few items related to the enforcement clauses should be considered:

- Cross-incentives: The private investor should be obligated to operate the project in compliance with certain standards, with the public entity obligated to cover the project investment by pledging its revenue.
- Support and structure: The long-term commitment of the public entity should be ensured by Congressional and Municipal approval of multi-year obligations, with sound revenue sources pledged to a Trust.
- Reserve funding: Borrower should be required to maintain a liquid reserve, which is then pledged to the Trust.

4. **Practical Market Capacity Constraints:** N/A

5. **Perspectives on challenges (financial, political, social, regulatory):**

NADBank manages operational, financial and other types of risk for each project financing.

Here at the Bank, we perform an internal credit risk assessments on all our loan proposals, and recurring evaluations of the loan portfolio on a yearly basis using credit risk scorecard methodologies developed by an internationally recognized credit rating agency. The scorecard methodologies are based on models that score quantitative and qualitative variables of technical, financial, and regulatory aspects of each loan based on the project type.

The technical assessment aims to capture the technical and construction risks of the project including the feasibility of the design, the quality of contractors and providers, and the status of permits. The financial assessment focuses on repayment capacity, financial performance, and stress scenarios for potential downsides. The scorecards also consider regulatory and political aspects that may impact the project through adjustments for the quality of the regulatory framework, adverse political conditions, and considerations for the sovereign government where applicable.

Based on these scorecards, each loan receives a letter rating on a standardized scale, and the probability of default is estimated using the risk horizon (remaining maturity) of the loan. This information is then used for monitoring and follow-up of the loan portfolio with institutional guidelines and reserve provisioning.

This process has proven very successful in managing the risks associated with the different types of projects financed by the Bank in both the U.S. and Mexico.

NADBank: A Green Bank for the U.S.-Mexico border since 1994

November 15, 2023

Jesse J. Hereford
Head of Strategic Partnerships &
Stakeholder Engagement
Cell: 210.215.3416
jhereford@nadb.org

NADBank

Established in 1994

Mandate

Develop and finance environmental infrastructure along the U.S.-Mexico border to improve well-being of the population:

- Projects located within 100 km (62 miles) north and 300 km (186 miles) south of the border

Structure

Owned & governed equally by the Governments of the United States & Mexico

Offices

San Antonio, TX & Ciudad Juarez, CHIH

Ratings

Aa1 - Moody's; AA+ – Fitch

NADBank Development Strategy

Project Types

WATER
» Water
» Wastewater
» Conservation
» Stormwater
» New Water Sources (Desal)

SOLID WASTE
» Municipal
» Industrial
» Recycling

AIR QUALITY
» Mobility
» Paving
» Border crossings
» Industrial emissions

SUSTAINABLE ENERGY
» Generation
» Storage
» Efficient use

SUSTAINABLE CITIES
» Urban development
» Sustainable buildings
» Industrial parks
» EV Charging stations

SUSTAINABLE PRODUCTION
» Green manufacturing and products (electric vehicles)
» Food value chains

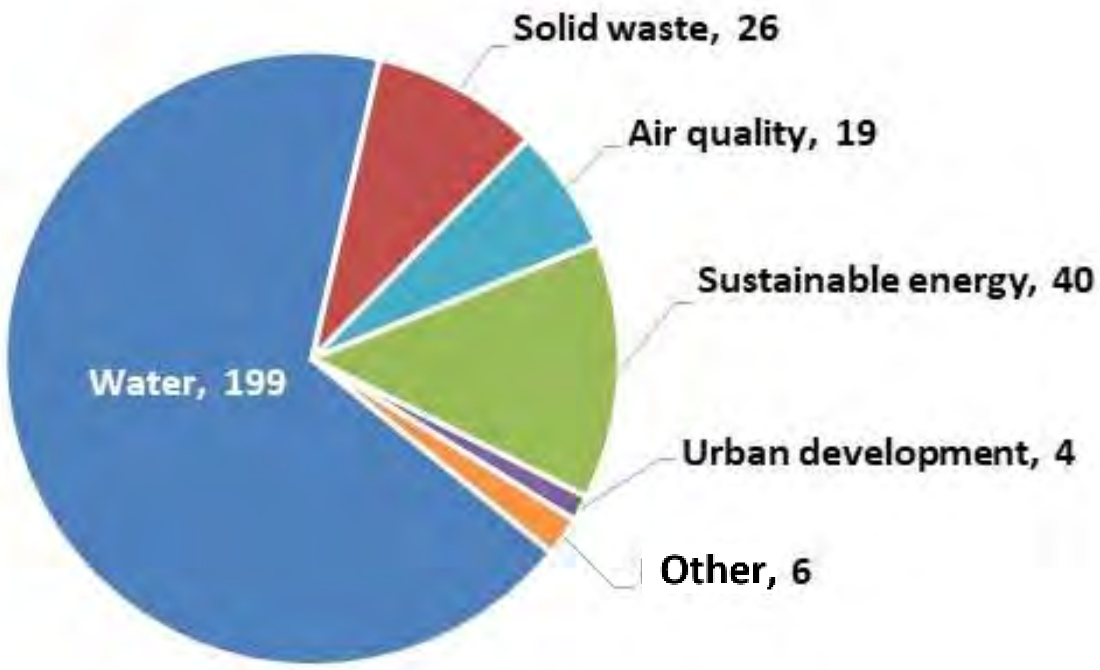
CLIMATE CHANGE
» Mitigation
» Adaptation

Projects Funded by Sector

Since 1994

301 Projects → **US$11.2 billion Total investment**

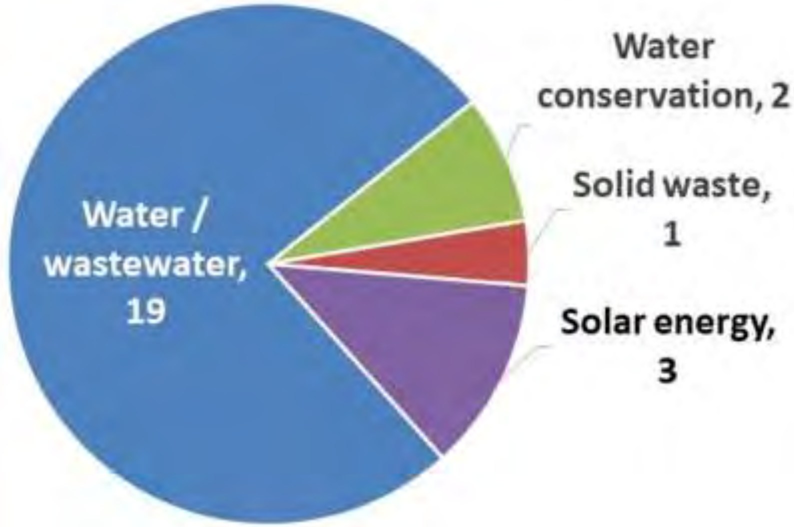
- **US$3.8 billion contracted through NADBank**
  - **US$3.0 billion in loans**
  - **US$0.8 billion in grants**

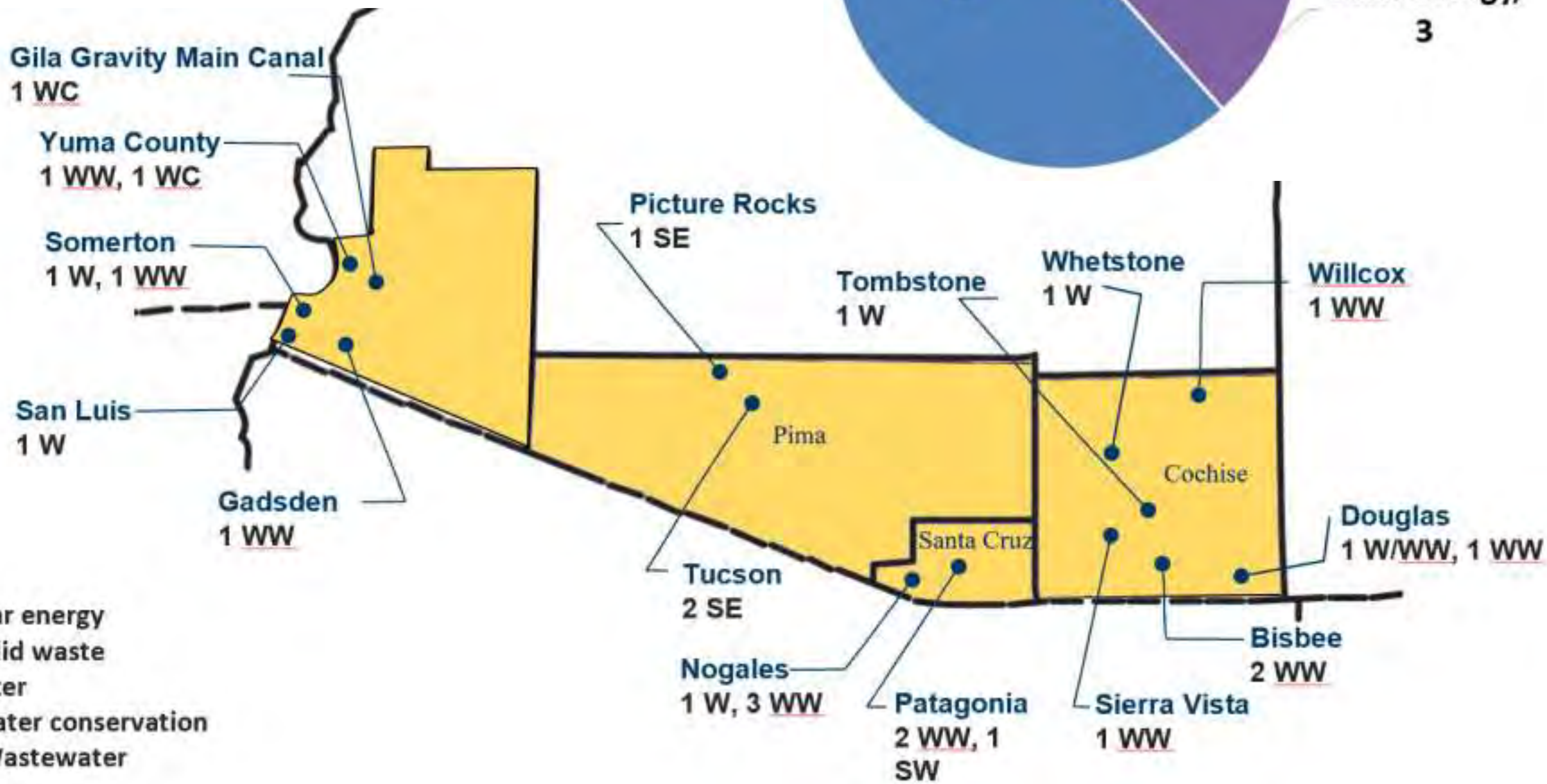


- **Water** – Drinking water, wastewater, stormwater, conservation, new water sources
- **Solid waste** – Landfills & equipment
- **Air quality** – Street paving, mobility, border crossings
- **Sustainable energy** – Solar, wind, biogas, biofuel, storage
- **Other**

NADBank-Financed Projects in Arizona

- **In AZ, 25 projects financed US$209.1 million in financing contracted**

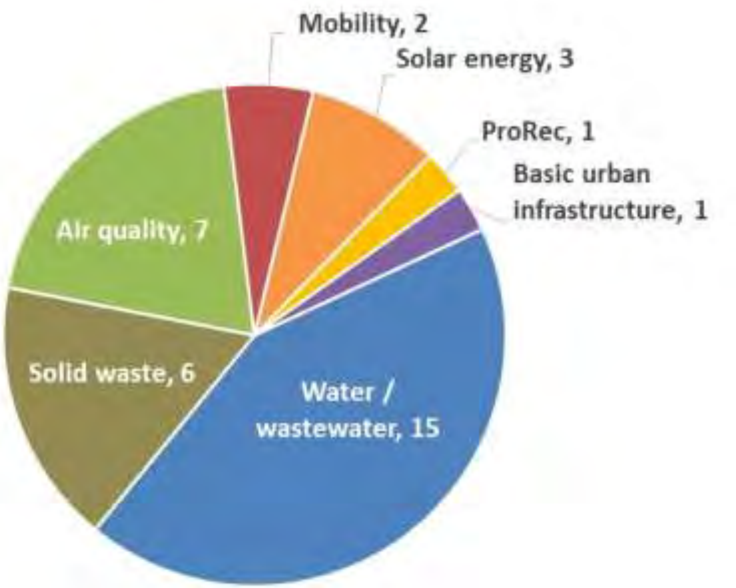


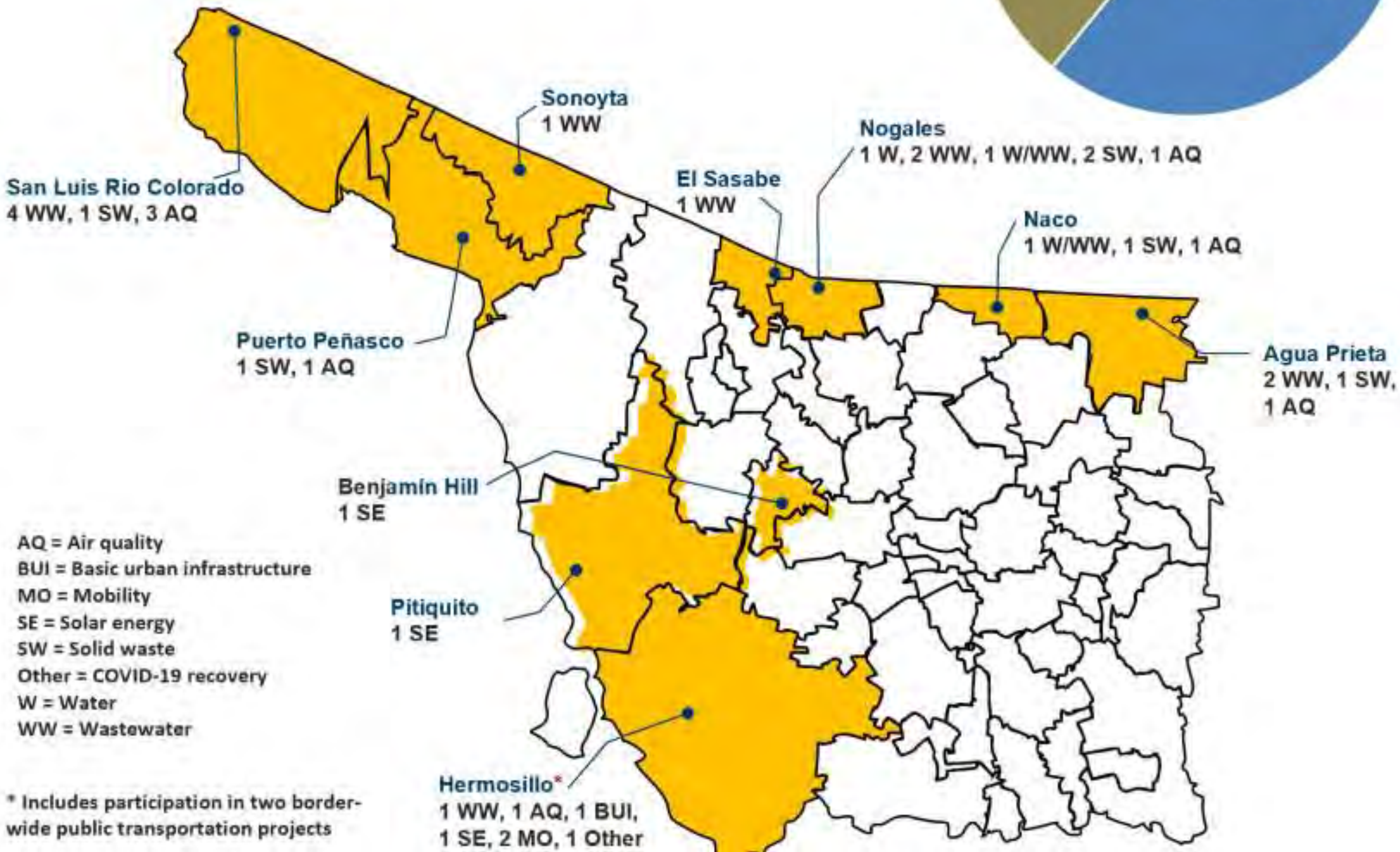


SE = Solar energy
SW = Solid waste
W = Water
WC = Water conservation
WW = Wastewater

Sonora Projects Financed

- **35** projects financed by NADBank
- **US$401.5 million** in financing contracted





AQ = Air quality
BUI = Basic urban infrastructure
MO = Mobility
SE = Solar energy
SW = Solid waste
Other = COVID-19 recovery
W = Water
WW = Wastewater

* Includes participation in two border-wide public transportation projects

NADBank programs

Loans

- Competitive, fixed or floating rates
- Terms of up to 30 years
- Technical support and project structuring services

Grants

- EPA-funded Border Environment Infrastructure Fund (BEIF)
- NADBank-funded Community Assistance Program
- Border 2025 Program administration

Technical Assistance

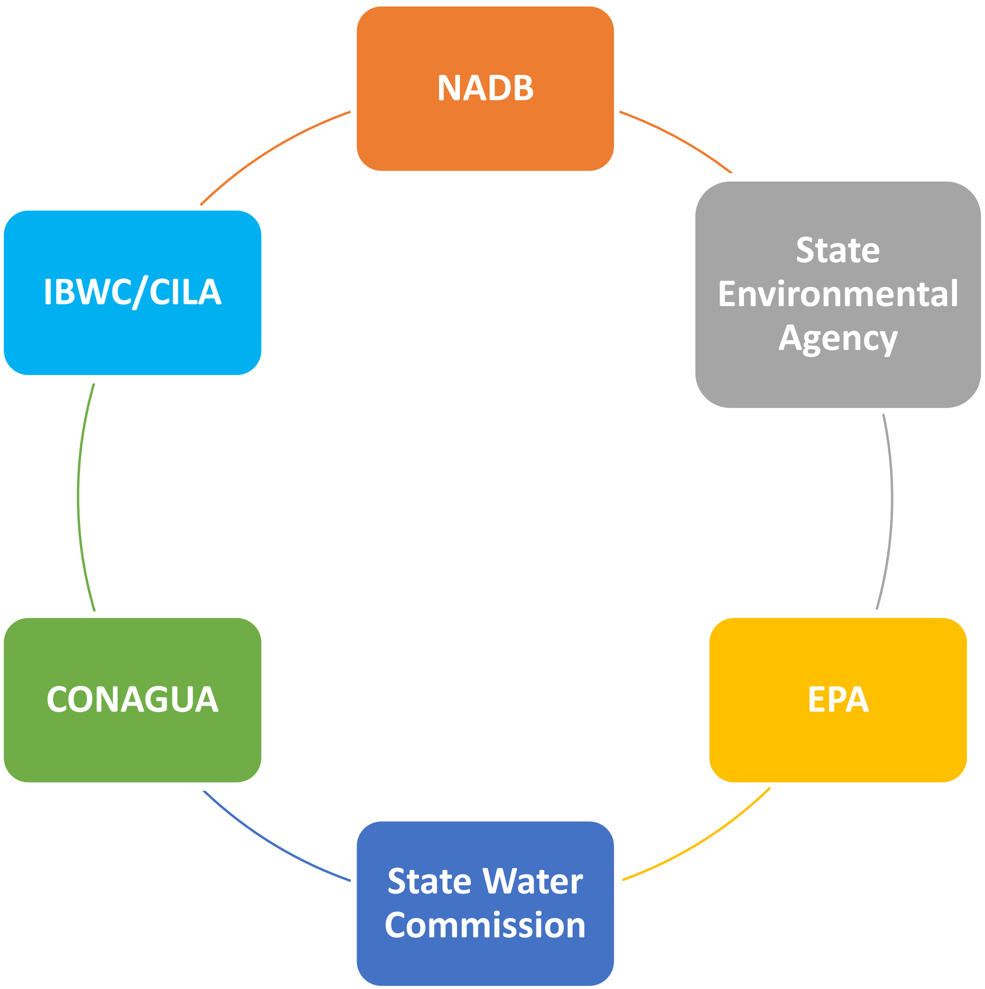
- Project development
- Capacity-building/Utility Management Institute
- Project Coordination

Financing Criteria

- Every project funded by NADBank must meet the following criteria:
  - **Technical viability:** The project must use technically feasible systems, processes and equipment.
  - **Financial self-sufficiency:** The project must be financially self-sufficient based on cash-flow projections generated by NADBank in its analysis of the project.
  - **Environmental and/or health benefits:** The project must address an environmental need on the border and not harm human health or ecosystems in the region.
  - **Contribute to sustainable development:** The project must contribute to the sustainable development of the community and the region as a whole.

Collaborative Efforts in the Border Region

Collaborating Agencies



Border Env. Infra. Fund (BEIF)

- Administer EPA funds of more than US$700 million, 136 projects; 69 in US & 67 in Mexico

AZ Dept. of Env. Quality

- Worked with communities and agencies along the AZ-SON border to mitigate and permanently eliminate transboundary spills.

TX Commission on Env. Quality

- Manage a binational fund aimed at improving air quality monitoring capabilities in the Paso del Norte air basin.

Ensenada Desalination Plant: a Case Study

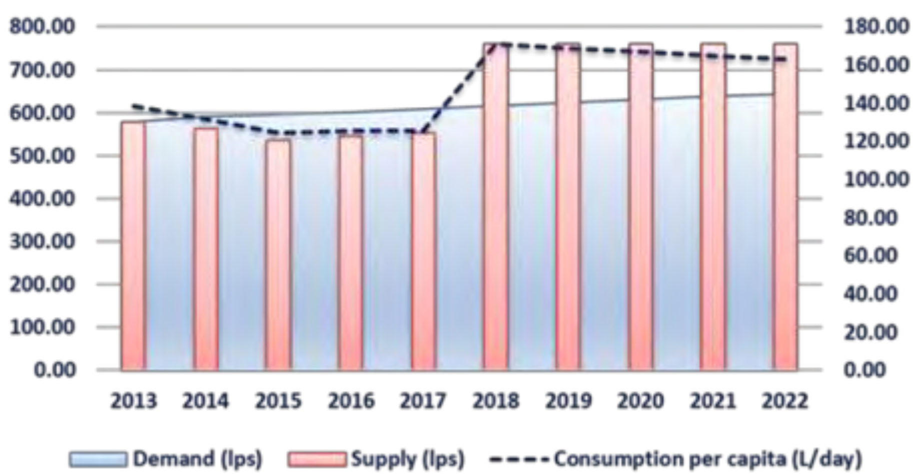


Ensenada, Baja California

- Ensenada is located 110 km (75 mi) south of the US-Mexico border.
- It is the largest municipality in Mexico.
- 3rd largest city in the State of Baja California with current population of 443,000, but expected to grow to 534,000 over the next 20 years (CAGR ~ 0.93%). Represents approximately 12.4% of Baja California State population.
- Main economic activities: port services, tourism and wine industry.
- The city is located in a semi-arid region that has experienced the worst drought in Mexico in the recent years. Due to climate change and with an expected 30% reduction in rainfall, this condition is just expected to worsen.
- NADBank estimates that energy efficiency is greater by desalinating in Ensenada rather than bringing water from the Colorado River (3.43 kwh/m3 vs 4.5 kwh/m3) thus contributing to less generation of Green House Gas emissions.

Water demand and supply

Aquifer	Status as of 1996	Deficit (Mm3/year)
Ensenada	overexploited	-6.635775
Maneadero	equilibrium	17.669958
La Misión	overexploited	-2.082832
Guadalupe	overexploited	-12.045470



- Currently, Ensenada does not have sufficient water sources, and those that could be exploited, are not adequate for human consumption.
- CESPE has been receiving temporarily water from the Colorado River Aqueduct.
- Mexican Standard for drinking water is set by NOM-127-SSA1-1994 which sets a maximum level on Total Dissolved Solids (TDS) of 1,000 ppm. Because of saline intrusion, TDS in overexploited aquifers are above 3,000 ppm.
- With the desalination plant in operation water supply in 2018 will total 760 lps. At current water consumption levels, this source will meet the city's demand requirement until 2037.

The Desalination Plant Project

Project scope includes design, construction and operation of a desalination plant that will provide 250 lps (5.7 mgd) of drinking water which includes:

- Direct offshore seawater intake
- Pretreatment, pump station and water main
- A reverse osmosis seawater treatment plant
- Post treatment facilities
- Conveyance system to discharge brine into the ocean
- Storage tank, pump stations and conveyance lines to connect to Ensenada’s drinking water system
- Ancillary civil works (buildings, roads, etc.)

NADBank Remarks

- GS Inima Environment (equity): at least 25% of the total project cost.
- Loan amount of up to 75% of the total project cost.
- Competitive fixed and variable rates.
- Attractive loan tenors of up to 20 years.
- Great relationship with commercial and development banks.
- NADBank can start approval process in earlier stages than commercial banks.

NADBank's Experience in diverse types of financial structures and roles:

- ✓ Mandated Lead Arranger, Technical and Modeling Bank, Collateral Agent, and Lender.
- ✓ Single tranche, A/B structures (NADBank providing longer tenor tranches), sculpted amortization based on Project cash flows.

Conclusion

- With limited public resources and an aging infrastructure, NADBank foresees Public-Private Partnerships as a viable scheme to continue financing water infrastructure.

- Because of water scarcity in NADBank's region, we expect that the development of desalination projects will continue to grow to meet water demand in the near future.

- Our recent experience in this type of projects along with our vast knowledge of the region is an asset for any party interested in seeking project financing.

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA
Request for Information For Long Term Water Augmentation
OceanWell

Lead Entity
OceanWell

Primary Point of Contact
Jonathan Haswell
Chief Business Officer
jonathan@oceanwellwater.com

A. General Information and Experience
Please briefly provide the following descriptive information to aid WIFA in understanding the identity, business and authorities of the Respondent and its team members.

a) **Name of Respondent, team members, and anticipated roles and responsibilities related to this opportunity.**
   OceanWell, 1300 El Camino Real, Menlo Park, CA 94025

OceanWell's team consists of 11 highly motivated and experienced individuals who would be involved in this proposed Long Term Augmentation project. Their specific skill sets and roles within OceanWell, and therefore this project, are detailed in b), c) and d).

- Robert Bergstrom, Chief Executive Officer and Board Member
- Charlie McGarraugh, Chairman and Board Member
- Michael Porter, Ph.D., Chief Technology Officer
- Jonathan Haswell, Chief Business Officer
- Michael Gerdes, PE, Director of Engineering Operations
- Mark Golay, PE, Director of Engineering Projects
- Kalyn Simon, Director of Engineering
- Jamie Spotswood, Director of Business Development
- Tim Quinn, Ph.D., Water Policy Strategist
- Brian Thomas, Ph.D., Water Finance Strategist
- Fred Hung, Board Member.

.

b) **For privately held and investor-owned entities, describe your ownership and management structures.**

OceanWell is a mission-driven organization committed to addressing water scarcity globally, starting here in the Western United States. The company operates at the intersection of infrastructure development and climate technology innovation. It is owned by its founders, employees, and a set of private investors. OceanWell investors include Jon Hemingway, founder of Carrix, the largest owner/operator of ports infrastructure in the Western hemisphere, and several former senior financial professionals with experience in large infrastructure projects.

OceanWell is led by its founding team of seasoned professionals from the water, subsea energy, coastal construction, and technology start-up spaces. OceanWell's Founder & CEO, Robert Bergstrom, is a 25-year water industry veteran who founded

Seven Seas Water, a $500M, 500-person global desalination company now owned by Morgan Stanley.

Structurally, OceanWell's management comprises three components: the Executive Management Team, the Board of Directors, and Functional Partner Firms.

Executive Management Team: four people sit on the OceanWell Executive Management Team: the CEO, CTO, CBO, and Chairman. The Exec team is responsible for leading the company's daily operations and ensuring the strategic goals are met through effective implementation.

> ***Robert Bergstrom, CEO:*** Robert Bergstrom is CEO and Founder of OceanWell and a 25-year veteran in the water industry who previously founded Seven Seas Water, a $500M, 500-person global desalination company now owned by Morgan Stanley
>
> ***Michael Porter, Ph.D., Chief Technology Officer:*** Porter, a multidisciplinary scientist and former engineering professor, transitioned OceanWell's technology from theory to validated practice. His commitment to environmental health and sustainable adaptation is the driving force behind the technological advancements at OceanWell.
>
> ***Charles McGarraugh, Chairman:*** An ex-Goldman Sachs Partner and financial engineer, McGarraugh has led fintech startups and serves as Chief Investment Officer at Altis Partners. His passion for environmental solutions matches his financial acumen.
>
> ***Jonathan Haswell, Chief Business Officer:*** Jonathan is an experienced founder and start-up leader who has scaled and led large technical teams, first in the software sector, later in mobility, and now in climate tech. He sold his last business in 2020. Haswell joined OceanWell to lead business development, capital-raising, and scale operations.

Board of Directors: OceanWell currently has a three-member board whose role is to provide strategic oversight to the executive team leadership and adhere to the company's mission and financial responsibilities. The board members are Robert Bergstrom, Fred Hung, and Charlie McGuarraugh.

Functional Partner Firms: OceanWell's partnership with specialized firms like Trendsetter Engineering, Dudek, Best Best & Krieger LLP (BBK), and WestWater Research support its development and readiness for complex water management projects:

Trendsetter Engineering: A leader in the oil and gas sector subsea solutions, providing OceanWell with subsea engineering and fabrication services. They specialize in unconventional challenges, prioritizing safety and quality.

Dudek: This employee-owned firm assists OceanWell with environmental, planning, and permitting services. They are known for their comprehensive approach to infrastructure projects.

Best Best & Krieger LLP (BBK): They aid in government outreach, policy discussions, and identifying federal funding opportunities, leveraging their expertise in law and advocacy.

WestWater Research: Specializing in water market research and economics, they are anticipated to join the OceanWell team in 2024 to develop capabilities in legal water exchange.

c) For public agencies, describe your statutory authorities including any authorities to own and manage water rights and water supply facilities.

n/a

d) Describe each member's involvement and experience with existing water augmentation projects, programs or initiatives, municipal and industrial provision, and non-consumptive provision.

Robert Bergstrom, Chief Executive Officer: With 25 years in the water industry, Bergstrom is the founder of Seven Seas Water, a Caribbean-based desalination company. Seven Seas designed, built, and currently operates desalination plants that completely replaced municipal water supply for the US Virgin Islands (St. Thomas, St. John, St. Croix) with state-of-the-art reverse osmosis designs. In doing so, municipal water costs were cut in half. During his tenure at Seven Seas, the company augmented water supplies on other islands, including the Bahamas, Curacao, St. Maarten, and Trinidad.

Kalyn Simon, Director of Engagement: Kalyn brings expertise in managing water and climate technology innovations and partnerships to OceanWell. In her outreach-focused role, she engages with over 100 groups, including environmental and ocean-conservation NGOs, water districts, and government agencies, to bring a holistic approach to developing and implementing OceanWell's technology. Simon works with organizations like Orange County Waterkeeper, Los Angeles Waterkeeper, and the Sierra Club of California to proactively communicate the new possibility for an environmentally safe water supply presented by OceanWell. Her tenure at Elemental Excelerator, where she reviewed and managed numerous water technology companies, has equipped her with a keen sense of the skills needed to bring novel water solutions to fruition. Simon holds a Master's in Business Administration from Santa Clara University and a Master's in International Studies from the University of San Francisco.

Michael Gerdes, PE, Director of Engineering Operations: Gerdes brings extensive experience in R&D development and offshore subsea operations. His expertise in project management and equipment development is critical to bringing deep-sea desalination to fruition.

Mark Golay, PE, Director of Engineering Projects: A former military officer and construction diver, Golay's experience with the US Army Corps of Engineers in coastal navigation projects guides his leadership in OceanWell's Engineering Projects, with an emphasis on environmental considerations.

Fred Hung, Board Member: Mr Hung is the Co-founder of Iv3 Aqua. Mr. Hung was also the co-founder and former President of Seven Seas Water US Virgin Islands, AquaVenture Holdings' first acquisition in 2007. He spent more than 20 years at Seven Seas Water. AquaVenture Holdings was sold to Culligan Water for $1.1 billion in 2020. Prior to entering the water business, Mr. Hung was Vice President at Allison-Williams Company, where he was involved with equity and debt transactions. A Chartered Financial Analyst (CFA) and Certified Public Accountant (CPA, Mr. Hung has a BBA (Finance) from the University of Minnesota Twin Cities. Mr. Hung grew up in Hong Kong (where he is a permanent citizen) and has US citizenship.

Jamie Spotswood, Director of Business Development: A former corporate financier and analyst at a commodities hedge fund, Jamie brings over 10 years of financial services experience, driven by a passion for clean technologies and large-scale solutions. He's been involved in the financing of OceanWell projects to date both in the US and Internationally.

Timothy Quinn, Ph.D., Water Policy Strategist: Dr. Quinn recently retired from a 40-year career in California water management, where he was involved in virtually every major policy development over the past three decades. He started his career in water as a researcher at the RAND Corporation and Ph.D. student at UCLA in the 1970s. Dr. Quinn represented the Metropolitan Water District of Southern California in major policy negotiations and water marketing transactions for more than 20 years. From 2007 to 2018, he led the Association of California Water Agencies, representing about 450 public agencies delivering more than 90% of California's water. Pertinent career highlights include:

Water Augmentation Projects:

Dr Quinn was instrumental in advancing water augmentation projects in California, significantly contributing to the state's water management strategies during times of drought. As the Chief Metropolitan Water District (MWD) negotiator, he was crucial in creating statewide Drought Water Banks. These early experiments in water marketing were highly successful, generating over 1 million acre-feet (MAF) of water for regions grappling with drought conditions.

His expertise also resulted in him becoming the lead negotiator in numerous water marketing transactions, which cumulatively produced hundreds of thousands of acre-feet of water, and he managed several initiatives to increase storage capacity for Southern California. He was a key team member in developing significant storage projects such as Diamond Valley Lake, the Arvin-Edison groundwater bank, and the Semitropic Groundwater Bank, collectively adding over 3 million acre-feet of storage capacity to the MWD system.

Furthermore, his leadership was crucial in securing the passage of six water bonds in California. These bonds raised billions of dollars, earmarked for local resource development, underscoring his significant impact on the state's water resource management and augmentation efforts.

Policy and Best Practice / Advocacy and Partnerships:

Dr. Quinn has played a pivotal role in shaping Southern California's water management and conservation landscape. As an organizer and leader of the first Integrated Resources Plan for the region, he prioritized local water resources within a broader regional portfolio, marking a significant shift in resource management. He was instrumental in developing financial incentive programs to encourage water conservation and recycling. These programs have since become fundamental to Southern California's water supplies.

His leadership also extended to forming Best Management Practices (BMP) for urban water conservation, achieved in collaboration with environmental NGOs. This initiative culminated in the BMP Agreement, a landmark achievement signed by 354 entities, including 199 urban water suppliers and 38 environmental NGOs. Additionally, he was an early proponent of water marketing in California — a concept initially met with skepticism but has since evolved into a credible tool for water management.

His vision and dedication also led to the establishing of the San Joaquin Valley Water Collaborative Action Program (CAP). As its founding executive officer, he directed efforts towards ensuring safe drinking water for all, significantly reducing groundwater pumping and enhancing flood management. These efforts were aimed at improving the replenishment of water in the San Joaquin Valley groundwater basins, demonstrating a commitment to sustainable and equitable water resource management

Dr. Quinn was central to the passage of the Sustainable Groundwater Management Act (SGMA) while he was Executive Director of the Association of California Water Agencies (ACWA). Prior to 2014, ACWA had steadfastly opposed state involvement in local groundwater basins. After seven years of Dr. Quinn working with the ACWA Board of Directors, ACWA strongly supported SGMA and was actively involved in crafting the legislation.

Dr. Quinn has significantly influenced OceanWell's strategic direction, particularly in its engagements in California. His deep-rooted connections within the state's water management sector have been instrumental in introducing OceanWell to key partners and establishing a productive working group, which now consists of 21 members (described below). Moreover, he has instilled his trademark collaborative spirit into OceanWell's culture. This approach, vital in water management, now forms the foundation of OceanWell's strategy, promoting a culture of cooperation and mutual benefit. His ethos of collaboration is a defining characteristic of how OceanWell operates and engages with various stakeholders.

As OceanWell explores innovative water sources in the Western United States and seeks to develop effective public-private partnerships, Dr. Quinn's comprehensive expertise and experience are invaluable. His deep understanding of both technical and political aspects of water management makes him an essential resource in navigating the complexities of introducing new water solutions and establishing successful collaborations.

Brian Thomas, Ph.D.**:** Mr. Thomas' career demonstrates significant expertise in public sector water management, resource planning, and finance, mainly through his major water agency and initiative roles.

His experience is especially relevant in his involvement with the California Department of Water Resources, the Delta Conveyance Finance Authority, the Las Vegas Valley Water District/Southern Nevada Water Authority, the Metropolitan Water District, and the Cities of Anaheim and Riverside Public Utilities, as well as a nearly ten-year career as an Independent Registered Municipal Advisor.

As the Executive Director of the Delta Conveyance Finance Authority and his ongoing work with the Department of Water Resources, Mr. Thomas has dealt with many challenges associated with advancing complicated, large-scale water resource projects. In addition, Mr. Thomas has served as part of the owner's consulting team for the Sites Project Authority, a 1.5 million acre-foot off-stream reservoir project in Northern California, helping the Sites team develop a long-term financing plan. This project, when completed, would be the largest off-stream reservoir in California since the construction of the San Luis Reservoir. As Assistant General Manager and Chief Financial Officer at the Metropolitan Water District, Mr. Thomas was responsible for all financial activities, playing a pivotal role in the strategic planning and implementation of water-related financial strategies and projects.

Mr. Thomas' comprehensive experience in these roles, particularly in financial management and strategic planning for large-scale water projects, positions him as an invaluable asset to OceanWell. His expertise in navigating the intricacies of public-private partnerships and financial structuring to achieve the sustainability of water resources is instrumental in helping OceanWell finance and implement effective water augmentation solutions. His involvement in these roles highlights a comprehensive understanding of water provision's municipal and industrial aspects and perfectly aligns with Ocean Well's objective to ensure they're strategically addressing water scarcity through innovative partnerships and projects.

The Working Group

As mentioned above, a major initiative of OceanWell's is the current collaborative Working Group, consisting of 21 water agencies encompassing California's Central and South Coasts, from Monterey County down to San Diego County and inland as far east as Riverside County.

The current members are:

Monterey County		
	Monterey Peninsula Water Management District	Dave Stoldt, General Manager
	One Water Monterey	Paul Sciuto, General Manager Alison Imamura, Principal Engineer
	Marina Coast Water District	Remleh Scherzinger, General Manager; Garrett Haertel, District Engineer
Central Coast		
	Central Coast Water Authority	Ray Stokes, General Manager
	San Luis Obispo County Department of Public Works	Courtney Howard, Water Resources Manager; Angela Ruberto, Water Resources Engineer
	United Water Conservation District	Mauricio Guardado, General Manager
	Public Works Agency of Ventura County	Joseph Pope, Director of Water and Sanitation
Los Angeles County		
	Las Virgenes MWD	Dave Pedersen, General Manager John Zhao, Director of Engineering
	Calleguas Municipal Water District	Anthony Goff, General Manager; Kristine McCaffrey, Manager of Engineering
	Los Angeles Department of Water and Power	David Pettijohn, Manager of Water Resources Development; Sabrina Tsui, Water Resources

		Manager
	West Basin Municipal Water District	E.J. Caldwell, Interim General Manager
	Inland Empire Utilities Agency	Christiana Daisy, Deputy General Manager; Cathleen Pieroni, Manager Interagency Relations; Michael Hurley, Water Resources Manager
	Metropolitan Water District of Southern California	Deven Upadhyay, Executive Officer; Warren Teitz, Resource Development Team Manager
	Santa Clarita Valley Water Agency	Matt Stone, General Manager; Steve Cole, Assistant General Manager
Riverside County		
	Eastern Municipal Water District	Joe Mouawad, General Manager; Lanaya Alexander, AGM Planning Engineering & Construction
	Western Municipal Water District	Craig Miller, General Manager; Ryan Shaw, Director of Water Resources
	Elsinore Valley Water District	Harvey Ryan, Board Treasurer
Orange County		
	Municipal Water District of Orange County	Charles Busslinger, Director of Engineering
	Irvine Ranch Water District	Paul Cook, General Manager; Paul Weghorst, Executive Director of Water Policy
	Moulton Niguel Water District	Joone Lopez, General Manager; Rodney Woods, Director of Engineering; Laura Rocha, Water Resources Manager
San Diego County		
	City of San Diego	Juan Guerreiro, Director of Public Utilities Department

It should be noted that membership in the OceanWell workgroup does not constitute support for the OceanWell project or a commitment to purchase water. It does indicate that an agency has sufficient interest in the technology to stay informed as it develops and provide advice to improve the ultimate result. Furthermore, it shows OceanWell's commitment to collaboration and partnerships in order to find augmentation solutions

Potential Augmentation Opportunities

1. **WIFA is seeking to develop a list of potential water augmentation opportunities that result in new water supplies for the state of Arizona. Augmentation opportunities that include new or augmented supplies within the state and from outside the state will be considered. Please provide a general description of potential water augmentation opportunities that you have identified or believe may be valuable for WIFA to consider. For each opportunity, please include:**

a) **General explanation of the augmentation supply and delivery strategy.**

Context

The Colorado River, once a robust lifeline of the West and a critical water source for over 40 million people in the basin states, is now on the brink, with reservoirs like Lake Mead nearing "dead pool" levels — a point at which water can no longer flow downstream from the dam [1]. This acute crisis demands immediate action in dramatically reducing water usage and exploring ways to augment the water supply, particularly in the lower basin states, to mitigate the severe economic and environmental repercussions of a new era of water scarcity. This crisis, unforeseen when the river's management policies were conceived, necessitates immediate and significant demand reductions across the board. Beyond conserving and rationing, there's an urgent need to increase the river's water supply — widening the "water pie"— especially for the lower basin states. Such measures are crucial to cushion the economic and environmental shocks of transitioning to a sustainable water management system, ensuring that the needs of the population, agriculture, and ecosystems are balanced and met.

OceanWell is ideally positioned to assist in creating a soft landing for the lower basin states by increasing supply to accompany demand management. OceanWell has innovated a new approach to ocean desalination that retains the significant benefits of onshore ocean desalination without its drawbacks by providing a drought-proof and climate-proof supply source. The subsea reverse osmosis (SRO) technology proposed by OceanWell operates at a depth of about 400 meters in the ocean's aphotic zone. At this depth, the natural hydrostatic pressure of the ocean provides the energy for the RO process, and, unlike the warmer, sunlit, organically rich photic zone where onshore facilities operate, there is relatively little organic life. As a result, Ocean Well water costs significantly less than traditional desalination and eliminates the negative environmental impacts that hinder the implementation of traditional onshore projects. In short, SRO is a highly attractive source of water supply that can be scaled into the Arizona water portfolio as the state sees fit – and OceanWell can build it once the technical development process is completed (expected in 2028).

OceanWell recognizes that even an elegant and sustainable supply solution must be brought to life within an institutionally and politically complex arena on the Colorado River. Traveling this road will not be easy, but it will be well worth the effort.

This RFI details the potential to collaborate with Arizona to augment its water supplies using an innovative out-of-state source and conveyance method: water produced in an OceanWell Water Farm on the California coast, which is legally exchanged with Colorado River water, making it directly conveyable to Arizona agencies and users.

OceanWell supplies will be developed off the coast of California and delivered to inland public water agencies, some of which are located in the service area of the Metropolitan Water District of Southern California (MWD). This will reduce demands for MWD water and allow MWD to negotiate agreements that increase the availability of Colorado River Water to Arizona. MWD, the Central Arizona Project, and the Southern Nevada Water Authority are already developing such arrangements regarding MWD's Pure Water recycling project. The same arrangement can result in the delivery of OceanWell water to Arizona. OceanWell stands ready to assist this process in any way possible.

Supply Strategy

In the U.S. and California specifically, there is an abundance of water in the ocean. Still, conventional onshore land-based desalination is expensive, environmentally harmful, and, subsequently, very difficult to permit and deploy, meaning that its adoption along the Western coast of the United States, at a large scale, has been hindered. Desalination, however, presents a compelling avenue for addressing utility-scale water scarcity, given that the oceans hold 97% of the Earth's water, and a viable option for widespread implementation within the region, which is what OceanWell aims to achieve.

OceanWell has developed a deep ocean durable solution to desalination, creating a clean, elegant method for affordable, abundant, environmentally sound fresh water. OceanWell does this with vastly improved energy efficiency, almost no onshore plant, a benign brine outfall, and an intake system designed to prevent marine life mortality (with patents on various aspects of the overall subsea reverse osmosis system).

Addressing the issue of high costs associated with conventional desalination is critical. OceanWell's solution exploits hydrostatic ocean pressure at depths of 400m+ to naturally power a reverse osmosis process and make fresh water. This leads to an approximate 30-40% energy savings. This efficiency, combined with lower operational equipment and maintenance requirements, significantly diminishes the costs compared to contemporary onshore systems, enhancing the technology's economic viability from the outset and continuing to do so as the system evolves.

The extensive coastal land use required by traditional desalination methods has been a source of both environmental impact, restricted public access, and a considerable financial burden. OceanWell's subsea modular designs eliminate the need for large-scale terrestrial facilities. Being subsea also means resilience to extreme weather and rising sea levels, and their modular nature allows for rapid scalability, all while maintaining a negligible visual and ecological presence along the shoreline.

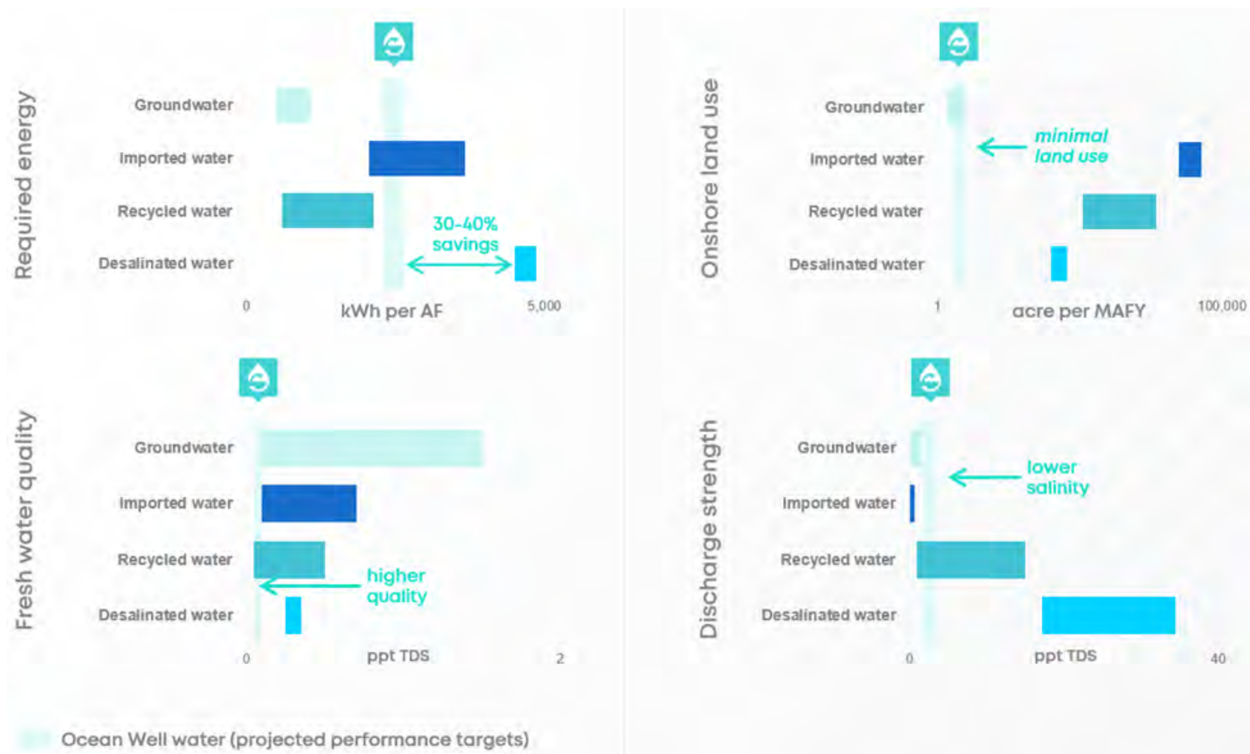


Figure 1 | *The OceanWell compared to alternative sources of supply.*

This next-generation approach to desalination presents an extremely large-scale opportunity to create a new source of water that can be supplied to Arizona via legal water exchange. This proposed solution will reduce the need for costly infrastructure and maintenance and provide an efficient and sustainable new water supply. The modular design also reduces the risk of overrun costs associated with land-based infrastructure projects.

As mentioned, the natural pressure of the ocean drives the RO process, cutting its required pumping energy by as much as half [2,3]. Current seawater desalination technologies require artificial pressure-driven RO, where land-based pumps push feedwater through downstream membranes. This artificial pressure environment is highly energy and capital-intensive because the volume of feedwater is much greater than that of freshwater recovered, requiring more energy for pressurization and expensive componentry for pressure containment.

The novel SRO system (see Figure 3) combines advancements from the subsea energy sector [4,5,6,7] with those from the desalination sector [8,9,10,11]. By removing the need for artificial pressure and instead leveraging the natural hydrostatic pressure of seawater, OceanWell is pioneering a more efficient, cost-saving, and environmentally friendly way to create a resilient water supply.

This lower pumping requirement reduces the cost, carbon footprint, and ecological impacts of harvesting freshwater from the deep sea. As well as requiring >90% less land presence than a typical onshore plant, the deep sea also provides a secure location for water production to take place. The innovative technology presents a fundamental shift in water processing, with OceanWell's Subsea Reverse Osmosis (SRO) membranes submerged in the aphotic zone where the weight of the water column above maintains a natural, constant feed pressure to supply the process. At this depth, the ocean is cold, and receives less than 1% of sunlight, inherently reducing the harm OceanWell's pod can have on marine life. Furthermore, unique systems are in place specifically designed to resist fouling without the use of chemicals while also eliminating the mortality of entrained microorganisms by returning them to their natural waters unharmed.

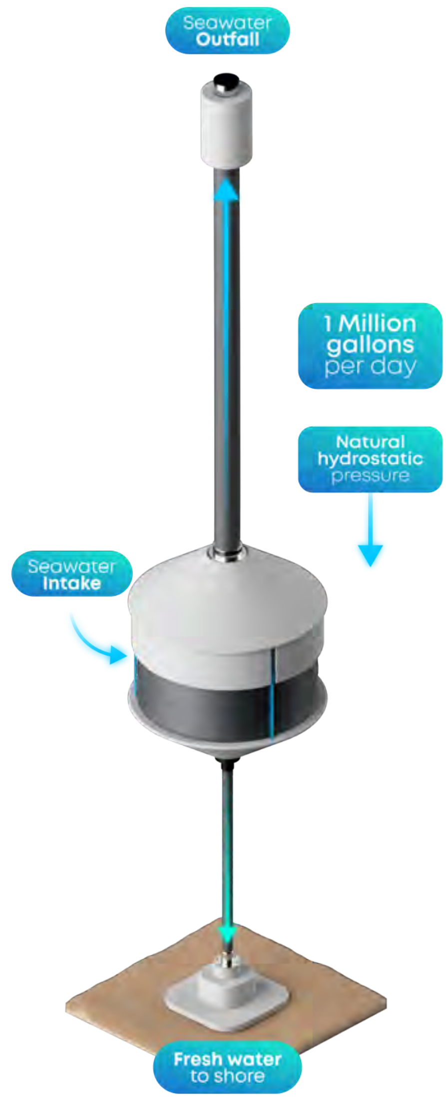


Figure 2 | OceanWell 1MGD pod design

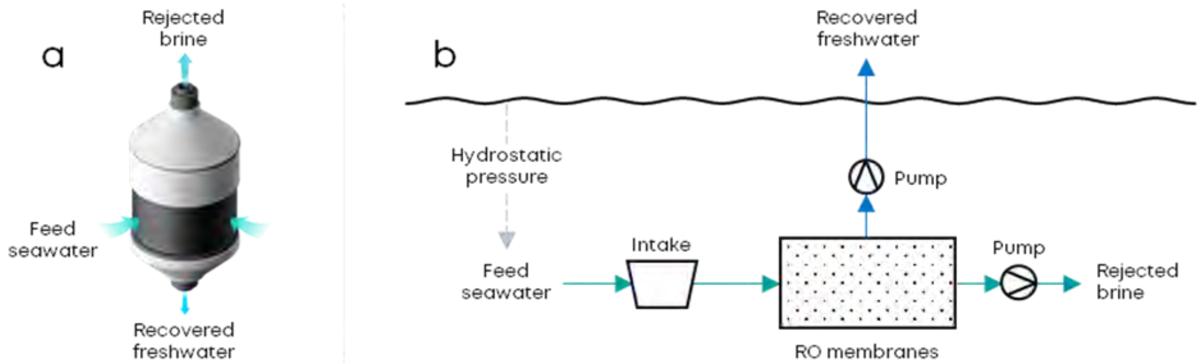


Figure 3 | Process diagram of our submerged reverse osmosis (SRO) technology package, where submerged pumps pull feedwaters through upstream filters that are fed by the hydrostatic pressure of a deep water source.

OceanWell's technology constitutes a revolutionary leap in the realm of desalination, eschewing the constraints associated with land-based operations and providing a sustainable, cost-effective alternative that is in harmony with the oceanic environment. Compared to other technologies in the emerging field of offshore desalination, floating and submerged, OceanWell's core differentiator is the environment-first approach to the design. The engineering ethos behind OceanWell prioritizes a minimalist design, utilizing the least number of parts necessary to deliver a robust and effective solution. This adherence to simplicity in design ensures that the system is both durable and sensitive to the marine environment it operates within, representing a thoughtful response to the complexities of legacy desalination practices. As a result, the economic, environmental, social, and security benefits of the OceanWell are expected to exceed that of today's state-of-the-art seawater desalination technologies.

Delivery Strategy

OceanWell's subsea pods can produce one million gallons per day (MGD), boasting a modular and scalable architecture that enables production to be accurately aligned with immediate demand and swiftly expanded in response to growing needs. This efficient design permits individual OceanWells and entire Water Farms to be deployed within weeks or months — a stark contrast to the years or even decades required to establish conventional desalination plants. This accelerated installation timeline significantly reduces the lead time to operation, ensuring that infrastructure investment is proportional to actual demand without the drawbacks of premature capital expenditure.

OceanWell is actively collaborating with its partners in California to establish Water Farm #1, designed to serve OceanWell's inaugural client, the Las Virgenes Municipal Water District (LVMWD). LVMWD signed an MOU with OceanWell that envisages drawing 10 MGD from Water Farm #1 [12].

Prior to the deployment of Water Farm #1, it is anticipated that other municipal water agencies, especially those within the California working group, will express interest in participating in this venture and securing a portion of their water supply from this novel source.

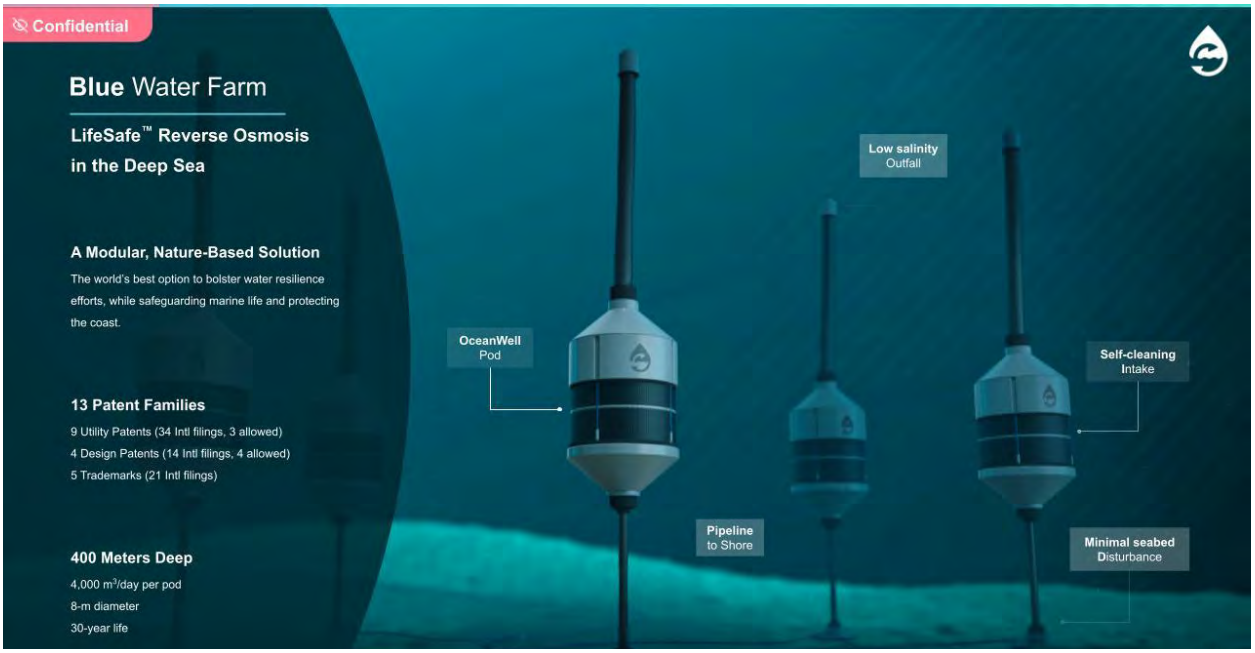


Figure 4 | OceanWell Water Farm

OceanWell's Water Farm is at the core of this proposal; the scalability of this Water Farm allows for the addition of capacity to deliver the amount of water needed to Arizona agencies, partners, and end-users. For modest initial demands in Arizona, say less than 10 MGD, OceanWell can incrementally expand this first Water Farm with additional wells. A dedicated cluster or "Farm" could be established for more substantial needs to meet the specified volume requirements.

While the OceanWell system is inherently more cost-effective to construct and operate than traditional desalination plants, economies of scale further enhance its cost advantages. The infrastructure required for subsea control, power, and freshwater transfer back to shore represents a significant expenditure; hence, optimizing the utilization of these is critical to achieving the most favorable economics. This exemplifies the approach to scalable solutions that adapt to evolving water demands.

OceanWell's ability to most efficiently collaborate with WIFA and Arizona agencies to deliver this new water supply hinges on developing the framework for the legal exchange of Colorado River water across state lines. This is needed to permit new water created out of state by OceanWell on the coast to be delivered in-state via legal exchange.

To achieve this, the vision is that OceanWell water produced on the California coast would be physically supplied to public water agencies in Southern California. These agencies, in turn, will work with the Metropolitan Water District of Southern California (MWD) to forgo a corresponding volume of allocated Colorado River water, which MWD will then coordinate with entities like the US Bureau of Reclamation (USBR), the California Department of Water Resources (CDWR), the Arizona Department of Water Resources (ADWR), the Central Arizona Project (CAP), and others to deliver to Arizona via legal exchange.

When MWD, the CAP, and the Southern Nevada Water Authority (SNWA) effectively finalize their ground-breaking endeavors regarding the legal exchange of Colorado water across state lines, it will pave the way for alternative out-of-state water sources to be recognized as viable solutions, OceanWell included. OceanWell is particularly interested in such developments, embracing any chance to partake in and contribute to this pioneering work. The facilitation of interstate water exchange is a crucial advancement that would significantly amplify the reach and effectiveness of the OceanWell Water Farm supply solution.

An Illustration of the Augmentation Opportunity: Capacity and Cost

<u>For illustrative purposes only,</u> the following hypothetical roadmap outlines a collaborative strategy to incrementally develop an augmentation supply starting with a modest 5 MGD, stepping up to 50 MGD, which can be expanded further as and when needed and all financed within WIFA's stated $1 billion resource.

1. *Test Offtake Agreement for 5 MGD:* With WIFA's support, Arizona agencies could secure a small water allocation from California's first Water Farm. This step involves formalizing an offtake agreement to field test the legal exchange process once Water Farm #1 is operational and MWD/CAP/SNWA have finalized the process of legal water exchanges across the California, Arizona, and Nevada borders.

2. *Expansion to 50 MGD with a Dedicated Water Farm:* Upon successfully completing the first step, Arizona agencies could scale their supply to 50 MGD by developing a dedicated Water Farm with OceanWell pods on the California coast. This Public-Private Partnership (PPP) would cost less than $500 million and present a more affordable solution than existing desalination facilities of the same capacity such as in Carlsbad in San Diego.

3. *Incremental Capacity Increase and Recycling of Resources:* If and when there is a need for further capacity expansion, additional 1 MGD OceanWell pods could

be added to the existing Water Farm. Alternatively, entire 50 MGD “fields” could be added to substantially increase the Farm’s capacity. Using private sector financial partners to refinance the original construction cost, WIFA’s resources could be efficiently recycled to increase the capacity in 100 MGD increments every few years, subject to permitting and legal exchange arrangements.

b) **Estimated annually available water supply, if estimates exist. Also, provide any information available on the reliability and sustainability of the supply along with any information on annual or seasonal variation of the supply, if available.**

Estimates of Arizona’s requirements for additional out-of-state water vary widely, and OceanWell’s scalable technology will be able to meet these demands by scaling up WaterFarms when and where necessary. While the potential water supply from OceanWell's technology is substantial, the near-term practical supply opportunity is dependent on the capacity that MWD and CAP are willing to agree to for a legal water exchange.

Regarding actual deployment and operational scaling, if OceanWell does prove a compelling solution for Arizona partners, the organization proposes starting with a modest volume of five to 50 MGD, or about five to 50 thousand acre-feet (KAF), annually. This initial phase would enable a thorough evaluation of the system's performance and impact, setting the stage for future expansion to meet the larger demand projections. This phased approach ensures an agile and responsible scaling of the technology, aligning with environmental considerations and the practicalities of integrating a new water source into existing supply frameworks.

Because OceanWell operates in the aphotic zone, where the water is colder and cleaner, it negates the seasonal surface fouling issues, such as algae blooms common in other desalination methods. This ensures a consistent and reliable base load supply.

c) **Duration of resource availability if there is the potential that the supply may not be available in the long-term or in perpetuity.**

The proposed project would be available in perpetuity, though maintenance would be required according to the expected lifespan of some of OceanWell’s components. OceanWell's planning, engineering, and modeling efforts are aligned to a practical facility lifetime of 30 years. The 30-year projection reflects the expected lifespan of some of OceanWell's key subsystem components, such as pumps. These components are integral to the farms' operation, and their lifespan significantly determines overall operational life. By aligning the facility's projected lifespan with its critical components, OceanWell ensures a realistic and pragmatic approach to its water supply’s long-term viability and maintenance.

Our system has been specifically designed for simple, cost-effective intervention and maintenance with globally available non-specialist vessels.

d) Environmental and/or regulatory considerations and/or limitations.

OceanWell has been developed as a transformative solution to the challenges posed by traditional desalination methods, which have drawn criticism from environmental and regulatory bodies for their ecological impact. By leveraging the unique conditions of the aphotic zone — 200 meters below the ocean surface where sunlight is scarce — OceanWell's operation minimizes interference with marine life, avoiding the mortality issues prevalent in surface operations. Its innovative LifeSafe intake system exemplifies its commitment to conservation, actively safeguarding sea organisms by preventing their lethal entrainment to the system.

The aphotic zone operating environment also provides some other points of system design elegance: unlimited free feed water and pressure derived from the water column at 400m depth. Together, these remove the economic incentive for an aggressive recovery rate typically pursued by conventional desalination solutions. OceanWell will operate a low recovery rate in the range of 5-15%, depending on the specific bathymetry of the location. This low recovery rate means the non permeate outfall is a very low strength brine, typically about 5% above ambient.

OceanWell's operations will also be distinguished by their notably minimal onshore footprint, limited to a control station and conveyance tie-in point. This reduced requirement – significantly less than that of a conventional desalination plant – not only presents a more environmentally considerate approach but also lessens the need for extensive coastal infrastructure. The emphasis on offshore facilities mitigates typical regulatory complexities and environmental challenges often faced by more traditional water infrastructure projects.

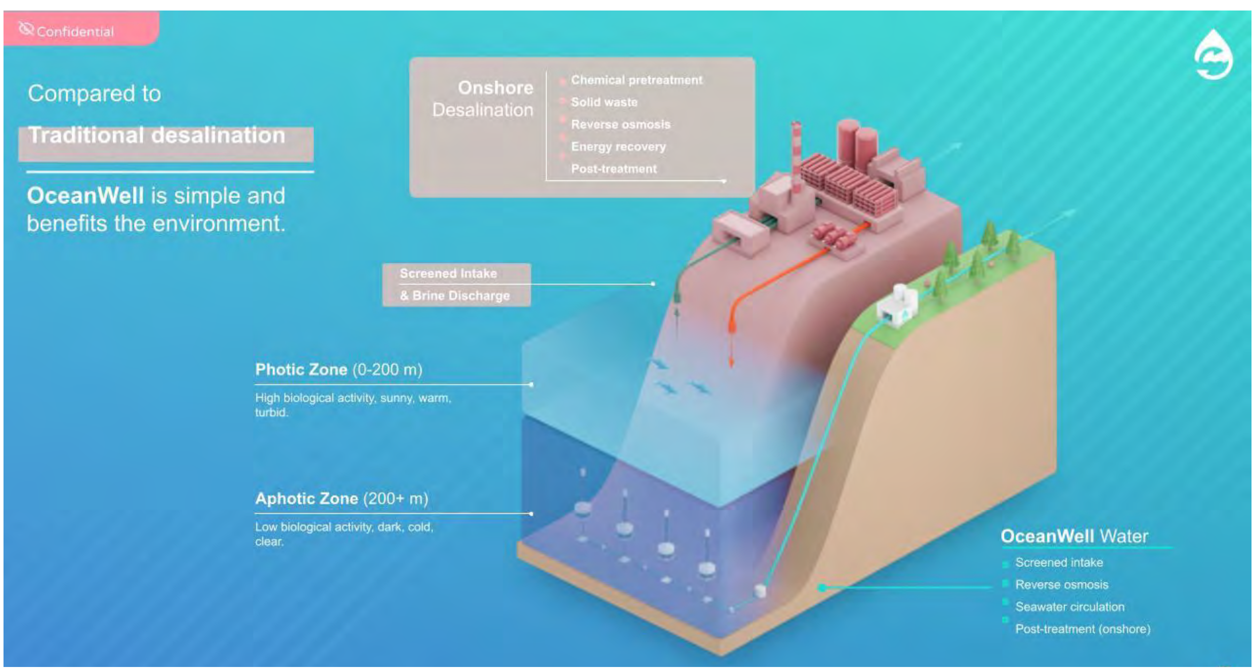


Figure 5 | Comparison with OceanWell placement versus traditional onshore desalination plants

Permitting requirements

OceanWell and its regulatory consultant, Dudek, are actively engaged with several federal, state, and local permitting agencies to advance its innovative subsea RO desalination projects. This involves the following agencies and permits:

- **NEPA Lead Agency**: This is the U.S. Army Corps of Engineers (USACE) for a pilot project in Hawaii. Likely to be the same lead agency for other projects. An Environmental Impact Statement may be required for permanent Water Farm installations.
- **US Army Corps of Engineers (USACE)**: OceanWell has received its first authorization under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act for its pilot in Hawaii. Both are crucial for Water Farm project compliance and implementation.
- **Environmental Protection Agency (EPA**): The company has received its first National Pollutant Discharge Elimination System Permit for its pilot testing in the Gulf of Mexico. It will also need these for permanent Water Farm installations.
- **NOAA Fisheries**: NOAA will advise the other Federal agencies on potential impacts to endangered species and fish habitats. OceanWell is committed to addressing any impacts to marine life.

OceanWell is engaged with a few of the following at the state and local levels:

- **CEQA Lead Agency**: This will likely be the city, water district, or State Lands Commission. An Environmental Impact Report is likely required, aligning the project with California's environmental regulations.
- **Regional Water Quality Control Board (Water Board)**: OceanWell will seek a Section 401 Water Quality Certification for work in State waters.
- **California Coastal Commission (CCC)**: The project requires a Coastal Development Permit and Consistency Certification, both essential for operations in the State's coastal zone.
- **State Lands Commission (SLC)**: A land lease for the umbilical/pipeline route in State waters will be pursued, critical for the project's infrastructure.
- **Local Government**: OceanWell will obtain a Local Coastal Development Permit for the terrestrial portion of the project, ensuring local compliance and support.

e) Jurisdictional/political considerations and/or limitations.

OceanWell's water supply solution relies on the concept of "legal water exchange," commonly practiced within California but less so across state lines. Delivering water to Arizona will require intricate water rights exchanges on the Lower Colorado River, involving the active participation of key stakeholders, the Metropolitan Water District (MWD), and the Central Arizona Project (CAP). Collaborative efforts are underway with entities like MWD, CAP, and the Southern Nevada Water Management Authority (SNWA), who are developing strategies for inter-state exchanges. OceanWell is fully committed to supporting and expediting this process in any way possible in order to solve this scarcity by leveraging the abundant ocean water available to us.

f) Capital investment, repayment or other financial considerations and/or limitations.

The estimated construction cost for a 50 MGD OceanWell Water Farm in California is around $500 million. While private sector financing supported by long-term offtake agreements is viable, the Water Infrastructure Finance Authority of Arizona's direct financial involvement would be more advantageous and a high-impact use of its available capital fund. WIFA's support, likely at a lower capital cost, would reduce the overall expense of the produced water.

Conversely, if the speed and scale of water supply are prioritized, WIFA and OceanWell could capitalize on the rapid construction and installation capabilities of an OceanWell Water Farm, typically ranging from one to three years (this is separate from permitting and offtake agreement timelines). WIFA's capital fund could initially finance the construction, and after a certain period, the project could be refinanced in the private sector. This approach would allow the recycling of WIFA's capital for a second-stage development, progressively scaling up to meet the desired water supply volume through a series of such cycles. This concept is discussed in response to question 3 below.

g) Approaches to enhance the sustainability, security, and resilience of the water supply.

OceanWell has a holistic approach to addressing water sustainability, security, and resilience by emphasizing the importance of building broad-based coalition support. This approach lays the foundation for long-term political durability to develop and implement long-term reliable water supply.

OceanWell has actively engaged with various stakeholders across California, Arizona, and other Western States. The outreach team has established connections with over 100 relevant individuals, agencies, and coalitions in the water industry, revealing substantial interest and support in the absence of significant opposition. This reflects OceanWell’s dedication to a collaborative approach, fostering constructive relationships and garnering support from key stakeholders within the water supply sector.

OceanWell’s water production source is one of the most secure base load solutions yet conceived. It boasts several key advantages, including immunity to seasonal variation, resilience to the challenges posed by climate change, and a minimal risk of disruption from seismic activity. By designing for these unpredictable weather events, OceanWell promises an eco-friendly water source and positions itself as a safeguard against future environmental liabilities and the financial burdens of regulatory non-compliance that accompany this.

Furthermore, OceanWell is committed to continuous improvement in sustainability. While conventional desalination approaches are reaching their limits in terms of efficiency, OceanWell is just at the beginning of its journey, striving to enhance the sustainability of the solution further. This commitment underscores OceanWell's dedication to providing the most environmentally responsible water supply solution available.

In summary, OceanWell's collaborative approach, secure water source, and ongoing commitment to sustainability position us as a leading choice for enhancing water supply sustainability, security, and resilience in California, Arizona, and beyond.

2) WIFA may consider a variety of delivery and/or ownership models for augmentation opportunities, including long-term purchase contracts, a variety of P3 agreements (ref A.R.S. § 49-1211), or other models. Please provide information on factors that will positively or negatively influence your consideration of various potential delivery models.

OceanWell is committed to exploring a range of delivery models, prioritizing a collaborative approach to determine the most effective and mutually beneficial model for all stakeholders involved.

- **Preference for Build Own Operate (BOO) Model**: The company has a strong inclination towards the BOO model. This preference stems from the belief that there is significant potential for ongoing technological improvement, particularly by learning from the operation of initial deployments. The BOO model enables OceanWell to maintain control over the technology and its development, ensuring continuous innovation and optimization.
- **Financial Readiness for BOO Constructs**: OceanWell is building a team well-equipped to finance BOO constructs. Adopting the BOO model eliminates a significant obstacle for the regional deployment of the OceanWell technology, facilitating smoother implementation and integration into existing water systems.
- **Long-term Offtake Agreement**: OceanWell is particularly interested in exploring long-term offtake agreements as a potential delivery model. Such agreements would be central to the strategy, allowing for the scaling of water volume over time in line with increasing demand.

3) Given constraints on funds available for water augmentation projects, are there recommendations on how to best prioritize, finance and pay for proposed WIFA augmentation opportunities including those utilizing P3 agreements?

When considering the best ways to prioritize, finance, and pay for water augmentation projects within the constraints of available funds, particularly for opportunities involving Public-Private Partnerships (P3s) with WIFA, OceanWell presents a compelling model. Several key factors characterize this model:

- **Fast Build and Installation Time**: OceanWell's technology enables the rapid construction and deployment of an operating water farm, within 12 to 36 months, once permits and offtake agreements are in place. The variation in this timeframe primarily depends on the supply timelines for subsea electrical systems.
- **Efficient Capital Financing Proposition**: The short timeline from the initial financing phase to the commencement of operations (with permeate flowing and operating revenue commenced) is expected as three years or less. OceanWell's scalable architecture further enhances this efficiency in capital use. Unlike proposals requiring massive initial investments (like the recent $5 billion proposal for a 300,000-acre-foot solution from the Sea of Cortez [13]), OceanWell can achieve similar water volumes without the environmental harm and intensive land-based infrastructure needed for traditional desalination over a staged timeline, starting at a more manageable $400 million for capacity, equivalent to the Carlsbad facility (50 MGD) that required an estimated $1bn investment.
- **Opportunity for Public-Private Partnership and Capital Efficiency**: OceanWell proposes a model where WIFA could finance an initial capacity unit through construction and opening. Post-completion, OceanWell could refinance this capacity in the private markets, securing against the offtake agreement. This approach allows for a repeatable process to gradually expand to the desired capacity, contingent upon the availability of a corresponding volume of water for legal exchange through the Metropolitan Water District (MWD).

OceanWell's approach offers an efficient and scalable solution for financing water augmentation projects. The combination of a quick build-out timeline, efficient capital use, and a flexible, strategic public-private partnership model presents a viable path for WIFA to consider in addressing water scarcity challenges in Arizona. This approach mitigates the initial financial burden and aligns with the state's long-term sustainability and scalability goals.

4) Are there any practical market capacity constraints to deploy water augmentation plans (e.g., physical construction limits, current water pipeline manufacturing and delivery capacity in a given year, other supply chain constraints, labor or any other constraints that may impact the capacity to deliver a total augmentation plan)?

When considering potential market capacity constraints that could affect the deployment of water augmentation plans, OceanWell's model presents a notably efficient and flexible approach, especially when compared to traditional desalination plants or conveyance projects, which require land permits and heavy infrastructure investments. This efficiency is particularly relevant in Arizona, where OceanWell proposes a legal exchange of water rather than physical conveyance. This method significantly reduces the logistical and infrastructure demands that would otherwise be necessary for transporting large volumes of water.

For the construction and deployment of OceanWell's technology, the process involves fabricating the OceanWells at a subsea engineering partner's facility in Houston, Texas. After fabrication, these units are transported to California for installation. A key advantage of OceanWell's system is its design, which allows for installation anywhere in the world using commonly available, non-specialist vessels. This aspect dramatically reduces the dependency on specialized shipping and installation resources, making the deployment process more adaptable and less constrained by typical maritime logistics.

However, it is important to note that OceanWell does rely on third-party market providers for certain key resources, particularly subsea electrical systems and umbilical manufacturers. These components can have significant lead times, often in the range of 12 to 18 months. While this does not represent a traditional constraint, it requires careful planning and coordination to ensure that these essential components are available when needed.

5) If Respondents have perspectives on challenges (financial, political, social, regulatory) that may not be project/program specific, they are invited to share opinions that may aid WIFA in analyzing potential responses

N/A. (non core content save space for other sections)

1. Cover Letter

November 15, 2023

Mr. Chuck Podolak,
Director
Water Infrastructure Financing Authority of Arizona (WIFA)
100 N. 7th Avenue, Suite 130
Phoenix, AZ 85007
Submitted via email: LTWAF@azwifa.gov

Subject: Response to Request for Information (RFI) for Long Term Water Augmentation for Arizona

Dear Mr. Podolak and Board of Directors for WIFA,

In response to your RFI, OneWater P3 Gurus (OPG) is pleased to submit its qualifications to partner with WIFA as a lead developer in identifying a list of potential water augmentation opportunities from within or outside the state, ensuring it can go from concept to commissioning with minimal impact to the ratepayers of Arizona. OneWater P3 Gurus vision, expertise, and approach may be helpful to understand our value proposition of an unbiased partner.

Vision:

At OneWaterP3 Gurus, our vision is to revolutionize the way public owners navigate water-related public-private partnerships (P3s) and think of One Water concept. We strive to create a future where sustainable and innovative water solutions are seamlessly integrated through collaboration between the public and private sectors. Our goal is to be at the forefront of driving positive change and ensuring long-term water resource management for communities.

Expertise:

With decades of experience in the Water Industry and a deep understanding of various aspects of public-private partnerships, our team of seasoned professionals brings unparalleled expertise to the table. We have successfully worked on numerous P3 projects, specializing in design, construction, operations, finance, concession, and more. Our knowledge of the intricacies involved in structuring successful partnerships, managing risks, and optimizing outcomes allows us to provide valuable insights to public entities, helping them navigate the complexities of P3s and maximize their value.

Approach:

Our approach is rooted in collaboration, transparency, and tailored solutions. We will actively engage with WIFA staff and the Board to understand their unique needs and objectives, ensuring that our services are customized to meet their specific requirements. We take a data-driven approach, analyzing the commercial and legal elements of various contracts to quantify risks and evaluate the value provided by private partners.

Below is the detailed contact information as requested in the RFI.

Company Name: One Water LLC dba OneWater P3 Gurus

Main Office: Carlsbad, CA

Primary Contact: Sachin “Zak” Chawla

Email: zak@onewaterp3gurus.com

Website: **https://onewaterp3gurus.com/**

Telephone: +1 (760) 795 9145

OPG is delighted to submit our qualifications and experience for Long Term Water Augmentation for Arizona. Having a team that led the development, permitting, construction, financing, and operation of the largest desalination facility in North America in Carlsbad, gives you the depth and breadth of our team’s experience on both the private and the public side.

We look forward to collaborating with WIFA to ensure there is a solution for the state to build new water supplies in the future.

Best Regards,

Sachin “Zak” Chawla
President

Table of Contents

A. General Information and Experience

OneWater P3 Gurus is a leading expert in providing comprehensive services as an Owner's Representative and developer for public entities in the water industry. With a strong focus on achieving successful water projects and optimizing operations, our team offers tailored solutions to ensure long-term water resource management for communities. Our range of services encompasses overseeing every aspect of water projects, from design and construction to operations, maintenance, and financing.

Project Development for Large/Complex Water Projects:

Our proficiency spans securing project sites, conducting comprehensive environmental studies, and adeptly managing the permitting process. Our team is skilled in shaping project structures that optimize water costs, crafting compelling water pricing proposals, and negotiating water purchase agreements. Furthermore, we demonstrate expertise in facilitating non-recourse project debt, exploring financing avenues such as tax-exempt public funding, including Revolving State Loans, Private Activity Bonds, and WIFIA financing. At OneWater P3 Gurus, we place a strong emphasis on community engagement, cultivating relationships with the public, agencies, and environmental groups. Our commitment extends to the meticulous development and execution of all critical project contracts, ensuring a seamless and successful project lifecycle.

Design Services:

OneWater P3 Gurus excels in assisting public entities in selecting the right design firm and structuring commercial aspects of contracts. We streamline the design process, evaluate regulatory hurdles, and mitigate risks to ensure timely and cost-effective project delivery.

Construction Services:

Our team provides expert guidance on selecting the most suitable approach for capital projects, such as Design-Build or Construction Management at Risk. We navigate contract negotiations to ensure the best value and risk transfer for public entities while meeting budget and timeframe requirements.

Operations and Maintenance Services:

OneWater P3 Gurus offers comprehensive support to optimize operations and maintenance of water services. We evaluate contract operations, identify outsourcing opportunities, and negotiate contracts to deliver the best value. Our expertise extends to asset management, staffing, and succession planning.

Financing Services:

With extensive experience in facilitating financing transactions for capital projects, OneWater P3 Gurus works closely with financial authorities, lenders, and rating agencies to structure transactions and secure favorable financing terms for loans with WIFIA or State Revolving Funds.

At OneWater P3 Gurus, our mission is to support public entities in achieving their water project goals and fostering sustainable water resource management. With expertise in a wide range of services, we are committed to delivering excellence and driving success in the water industry.

Below is a brief description and experience in various areas of existing water augmentation projects by our team members. These same team members will be working with WIFA on finding and implementing the Long-Term water Augmentation for Arizona.

a. Carlsbad Desalination Project

1. Project Development and Program Management

At OneWaterP3 Gurus, we are passionate about bringing the best value to ratepayers through creative and well-executed public-private partnerships. We are committed to helping public entities strike the right balance of risk and reward in their partnerships, focusing on deliverables and considering the long-term nature of these collaborations. Our passion lies in maximizing the value of assets, optimizing operations, and ensuring the best outcomes for public entities and the communities they serve.

All our advisors have decades of experience of experience working on various Water and Waste Projects, overseeing operating budgets ranging from \$140M - \$500M annually and Capital budgets of \$50M - \$800M. The advisors have work in various capacities on both the private and public side of the water industry. These advisors are based all over the United States and can provide similar program management to the ones listed below as specific examples.

Bob Yamada brings decades of program management experience in the public sector, specializing in water resources. For over 30 years, he served in various water resources-related roles for a large Water Authority. Throughout his career, Bob has played a pivotal role in numerous significant projects and initiatives, showcasing his expertise in water resources management. He successfully led the development, negotiation, and administration of the Water Purchase Agreement for a 30-year Public Private Partnership for the Carlsbad Desalination Plant on behalf of a public agency. This project exemplifies his exceptional ability to navigate complex agreements and drive successful partnerships.

Bob's contributions extend to various areas of water resources management, including water facility permitting and environmental compliance, water infrastructure master planning, and facility planning. He has a deep understanding of water supply and demand forecasting, allowing him to effectively address the evolving needs of the community. His expertise in urban water management plan preparation and drought response ensures the efficient and sustainable use of water resources even in challenging times.

Josie McKinley, a civil engineering professional excels in the realm of program management, particularly in navigating the intricate landscape of permitting for complex projects. Her extensive experience, spanning nearly four decades, showcases her adeptness in managing approvals, permits, and budgets for significant initiatives. Josie has been instrumental in coordinating efforts with regulatory agencies, organizations, landowners, and stakeholders, ensuring seamless compliance and successful project outcomes. Notably, her involvement in projects like the Carlsbad Desalination Plant, Otay River Estuary Restoration, Carlsbad Desalination Plant modifications, and various other endeavors highlights her specialized expertise in overseeing the permitting aspects of multifaceted and critical engineering projects.

Sachin "Zak" Chawla brings an impressive track record in program management, with recently overseeing the management of Carlsbad Desalination Company with an annual operating budget of $140M and reporting to the Board of Directors. His responsibilities include overall administration and oversight of key principal agreements, such as a 30-year Water Purchase Agreement with SDCWA, 30-year O&M Agreement, 2012 $600M Bond Purchase Agreement, Collateral Trust Agreement, and Management Service Agreement.

As a general manager, Zak is adept at developing, monitoring, and tracking key performance indicators for overall operations and financial metrics of a program. Zak's strategic acumen is evident in his oversight of annual budget development and forecasting, ensuring sufficient resources are allocated to address changing priorities. Beyond internal operations, he skillfully managed relationships with all stakeholders in the region, including regulators, elected officials, and the community.

Suresh Jambunathan, a professional in the field, serves as our expert for water - energy nexus. His extensive career showcases executive leadership roles, where he has proficiently managed technical teams, driven process development, and excelled in contract negotiation and financial analysis. His multifaceted capabilities encompass process design, project management, and project financing. His areas of specialization include process and project development, operations, and maintenance of Energy & Water assets, as well as consulting and project development services in the domains of Energy and Water systems and process design. He also has hands-on experience with Design-Build-Operate-Maintain (DBOM) Water & Wastewater systems and DBOM Energy Recycling systems, which encompasses Combined Heat and Power (CHP), Waste Heat Recovery (WHR), and Demand-Side Management (DSM) projects.

Fred Edgecomb, our expert in Operations and Maintenance at OPG. With over 45 years of experience in water and wastewater management, Fred brings a wealth of knowledge and exceptional leadership to our team. His hands-on and educational background includes extensive experience in both the public and private sectors as well as a degree in business and a master's degree in public administration. Fred has successfully managed teams of all sizes, from small operations to large divisions, and is renowned for his hands-on approach and lead-by-example mindset. Fred's expertise in facility operation and maintenance ensures that our clients receive top-notch service with an unwavering focus on safety and permit compliance. He’s led the operations and maintenance teams for several design-build operate contracts as well as new construction projects for both public and private sector.

2. Project Delivery Oversight

OneWater P3 Gurus has provided oversight and advising on engineering design development, construction bids, and project delivery on multiple projects in the water industry. These projects have ranged from small water and wastewater treatment plants, to upgrades of existing facilities and building mega desalination plants and intake system to comply with the State regulations.

We believe that selecting the right design firm and structuring the commercial aspects of contracts are crucial to ensuring timely and cost-effective project delivery. At OneWaterP3 Gurus, we understand the importance of efficient designs within budget and time constraints. With our expertise, we assist public entities in the selection process, getting involved during the RFP stage, and negotiating commercial structures for their design needs. By evaluating regulatory and permitting hurdles and mitigating risks, we help streamline the design aspect of projects and reduce overall costs.

Also, expansion, upgrade, or construction of infrastructure requires careful consideration of partners and commercial structures. OneWaterP3 Gurus recognizes the importance of selecting the right approach for capital projects in the Water Industry. Whether it's Design-Build, Design-Bid-Build, Construction Management at Risk (CMAR), Lump Sum, or a Guaranteed Maximum Price, our team provides expert guidance on choosing the most suitable structure based on project size and risk. We navigate the complexities of contract negotiations, ensuring the best value and risk transfer for public entities, while delivering projects within budget and timeframe.

Zak Chawla has had experience working with various consultants and engineers develop RFPs, Contracts and Bids for large intake water systems and projects to create new Wetlands. These projects have ranged from $40M - $350M for the Carlsbad Desalination Company. Zak also oversaw the capital program management for multiple facilities in California that were going through upgrades of the system due to the aging infrastructure.

Pat Crain is a construction professional with a strong record of guiding projects from inception to completion. With proficiency in permitting, planning, construction, installation, and start-up, Pat consistently delivers projects on budget and within schedule. He excels in utilizing project controls and document management systems. Pat's leadership, team building, and communication skills are key to his success. In his previous role at Poseidon Water, he managed the construction of a 50 MGD seawater desalination plant, played a crucial role in interfacing with multiple stakeholders, and led the selection of process providers and contractors for the Huntington Beach Desalination Development Project. Pat has worked on different contract deliveries such as Construction Management at Risk (CMAR), Progressive Design Build, Design Bid-Build projects.

Jatin Raina's experience in the water sector includes overseeing global manufacturing engineering, facilities design, construction, and management. Jatin has successfully managed budgets for capital construction projects and delivered turnkey project execution, ranging from initial design to start-up operations. He has negotiated contracts, managed vendor relations, and ensured the efficient operation of water and wastewater facilities.

During his time at Kiewit Corporation, Jatin has played a vital role in the execution of mega infrastructure projects, including those related to water treatment, sewage treatment, and water distribution systems. He has expertise in strategic planning, project management, and procurement, ensuring the successful implementation of water-related initiatives. He served as a project manager, project controls manager, chief estimator, and procurement manager on several large-scale projects in the power generation, sewage treatment, highway, and rail transit sectors.

OneWater P3 Gurus advisors have helped owners negotiate the best risk transfer when structuring a P3 and implemented tracking mechanism to ensure projects are delivered on time and on budget.

3. Funding and Financing

Public entities often require financing for capital projects, whether through refinancing existing bonds or seeking funding for new initiatives. OneWaterP3 Gurus has extensive experience in navigating the complex landscape of financing in the Water Industry. We have successfully facilitated financing transactions ranging from $50 million to $1 billion. Our team works closely with financial authorities, lenders, and rating agencies to structure transactions, prepare offering memorandums, and negotiate contracts. By providing technical and operational expertise, we support public entities in securing favorable financing terms and achieving their funding goals.

We also work on identifying the best funding sources, whether it is municipal bonds or a combination of equity and debt financing. Our goal is to make sure that the rate payers in the community have a minimum impact.

Zak Chawla's leadership was instrumental in securing financing for capital improvement projects for the Carlsbad Desalination Plant, successfully leading the WIFIA loan financing and Financing of the Tax-Exempt Bonds with CPCFA, amounting to $350M in capital improvements projects and achieving financial close within a year. He consistently ensures compliance with financial standards, maintaining and improving the Bond ratings through annual monitoring meetings and discussions with rating agencies.

Arnaud Soupa is an experienced financial advisor with a robust application of fiduciary accountability and an ethical sense of purpose. With a focus on efficiency and delivery, Arnaud takes a proactive approach to financial control and administration, working collaboratively with all stakeholders to advance the business, monitor costs, mitigate risks, and provide rate stability. As an experienced executive leader, Arnaud has actively participated in the development and financial closing of three infrastructure projects, involving a total project finance investment of $570 million. He brings expertise in enterprise performance management, strategic planning, and execution.

Arnaud's skills span a wide range of areas, including business planning, project finance, financial planning, and analysis (FP&A), corporate governance, financial modeling, internal controls, and financial reporting. He is adept at managing international business protocols, contract negotiations, and change management. With a background in entrepreneurship and mergers & acquisitions, Arnaud brings a comprehensive understanding of the financial landscape and its impact on operations.

B. Potential Augmentation Opportunities

1. New water supplies for the State of Arizona.

a. General explanation of the augmentation supply and delivery strategy

Arizona current water supply as we know today is divided into the following major 4 categories.

- Colorado River - 36%
- Groundwater – 41%
- In-state Rivers – 18%
- Reclaimed Water – 5%

OPG believes that there is no one solution to the problem and a multifaceted approach needs to be used to address long term water augmentation supply. We believe the state can address a few that can be controlled and augmented with current engineering practices and commercial arrangements.

1) The Colorado River is Arizona's largest renewable water supply. Arizona has the right to use 2.8 million acre feet annually of Colorado River water. Mohave, La Paz, and Yuma County water users rely on Colorado River as their principal water supply. When fully utilized, the Central Arizona Project will deliver on average 1.5 million-acre feet of Colorado River water to Maricopa, Pinal, and Pima Counties.The Mexican Water Treaty of 1944 committed the U.S. to deliver 1.5 million acre-feet of water to Mexico on an annual basis, plus an additional 200,000 acre-feet under surplus conditions.

   By involving International Boundary and Water Commission, if Arizona can progress the conversation with Mexico, it can potentially build drought resilient infrastructure such as a seawater desalination plant/s in Mexico that would ensure that there are sufficient supplies for Mexico as Arizona uses more of the Colorado River water allocated to Mexico. This agreement can take various forms in terms of take or pay agreements and funding coming from Arizona to build these facilities using a public private partnership model.

2) Reclaimed water is treated to a quality that can be used for purposes such as agriculture, golf courses, parks, industrial cooling, or maintenance of wildlife areas. As Arizona's reliance of this is only 5%, we believe the state can issue incentives for various cities and municipalities to build more reclaimed water infrastructure to increase this portfolio. To minimize the impact on rate payers for building the reclaimed water infrastructure, these could also be structured under the public private partnerships model with long terms predictable revenue generating contracts which will attract a lot of equity investors that manage funds for pension funds with lower return on capital.

3) As Groundwater replenishment takes a very long time, and Arizona has been able to use this water stored over millions of years, the strategy to protect this resource and incentivize to replenish it using reclaimed water where feasible could be another area of opportunity.

b. Estimated added annual Water Supply

There are two potential sources of water supply as explained above that are explained above can be very reliable and sustainable over a long-term period without much seasonable variability.

1) **Seawater Desalination** – Seawater Desalination has progressed a lot in the last 50 years and there are nations that rely on it for a significant amount of water supply. The technology is well known, and more and more studies are coming out to show that environmental impacts are very less compared to what was

assumed by theoretical calculations done by some agencies in California and other areas. These plants all over the world have varied in size and can be scaled up from 50 MGD to 200 MGD per day at any location to ensure intake and discharge of the facilities comply with all the permits and environmental factors. 200 MGD is equivalent to 200,000 Acre-feet per year of new water supply can be created. So, depending on the need and desire to augment the long-term reliability for both Arizona and Mexico, this can be further evaluated and accomplished and with 5 such plants a 1 million acre-feet can be created for the next generation.

2) **Reclaimed Water** – By current statistics only 5% of the water used in Arizona in reclaimed. Arizona's approximate water usage is close to 7 million acre-feet divided into 3 major sectors, municipal use 22%, industrial use 6% and agricultural use 72%. Ignoring reuse of agricultural usage, that is 28% of the total water used for industrial and municipal customers which amounts to approximately 2 million acre-feet. If only 5% is currently reclaimed that leaves 1.9 million acre-feet that is currently not reclaimed. Assuming, infrastructure that cannot be build for half of this supply due to urban areas, and other restrictions for 50% of this unclaimed water, we believe Arizona can gain another 1 million acre-feet if it can mandate this reuse for cities and municipalities as this water would stay local and add to the resiliency of the growing urban population.

c. Duration of resource availability

1) **Seawater Desalination**: As described above both the augmentation with seawater desalination and reclaimed water are available for a long term as seawater desalination relies on sea water, which we know have existed for millions of years and with the advancement in other sources of energy and new technologies, the overall operating costs of these plants are going to continue to come down. The source water can be seasonally impacted in certain parts of the world with algae-blooms but these don't last that long and there is technology available to design the plant so it can continue to run even with these algae blooms.
2) **Reclaimed Water:** With regards to reclaimed water, it totally depends on the wastewater generated, so if a city of municipality is growing, even with conservation, the amount of wastewater generated would stay the same or go up and will continue to have this reclaimed water supply for the same time as there are people living in that area. As discussed above, this model fits very well for P3 investments as there is a stable return in the long term.

d. Environmental and/or regulatory considerations and/or limitations

1) **Seawater Desalination:** The two biggest environmental or regulatory concerns or considerations with seawater desalination in the impact to marine life with the intake and discharge. California came up with the most stringent regulation for the intake system in the world with 1 mm screen and 0.5 foot per second of flow in 2015. Carlsbad desalination facility completed all the permits to comply with this and financed this modification in 2023 and is the process of installing these new screens all while the plant is in operation. There is technology available to mitigate any of these concerns with intake, but it comes at a cost, so it will have to be studied at locations where these new plants in Mexico are going to be proposed. Israel and other countries don't have these restrictions, so it depends on the region. For the discharge there are also multiple options, it can be mixed with the existing discharge from a wastewater facility or augmented with mixing the brine with seawater as dilution. In the case of Carlsbad, the brine becomes background salinity within 600-800 feet and there are thriving communities of fish and other organisms that like the higher salinity for their survival.
2) **Reclaimed Water:** Reclaimed water regulations are well studied and implemented everywhere in the United Stated including Arizona. Based on the usage of this reclaimed water, permits and regulations can vary if you are utilizing this for landscape or indirect potable reuse by injecting in the groundwater. Similarly, there are technologies available for tackling with these conditions.

e. Jurisdictional/political considerations and/or limitations

1) **Seawater Desalination:** As Arizona is landlocked from all sides, it doesn't have the benefit of what the Western or other Eastern states can do in terms of seawater desalination, but it borders Mexico, which is has a vast access to Gulf of California with multiple sites that are prime for desalination. These large complex projects that may technically be feasible could die politically if certain considerations are not given. A most recent example was the Huntington Beach Desalination project which was the most studied project in the world and technically feasible but politically did not have the support of member agencies and the state regulatory bodies. Most people think that the project was killed by the California Coastal Commission, which was just the opposite.

   There are various steps to be taken and knowing that International Boundary and Water Commission (IBWC) is the lead agency with the Colorado River agreement, it can partner with Arizona to lead this negotiation along with experts like OPG to find a win-win situation. No, one country can solve this crisis themselves. As we continue the political support between the two countries and

Arizona officials, we also need to concurrently look at the environmental groups that will always oppose desalination. We need to come up with a Memorandum of Understanding much in advance on how to ensure minimal environmental impact and add a mitigation project that these environmentalists want in the region. These are the two biggest hurdles on large projects. If not carefully considered and maneuvered can cause millions of rate payer dollars to go to waste.

2) **Reclaimed Water:** Compared to Seawater Desalination, this potential solution has less of a regulatory hurdle as it is the one the has been bought by regulators, environmentalists, and rate payers in general. Though it could still have a political consideration or limitation as each City and Water agency are controlled by individual council and board that may be protective of its rate payers. Instead of each agency looking at is wastewater that can be recycled, this may be better if multiple agencies are part of the Joint Powers Authority to ensure that their rate payers are protected and these types are projects are developed where it technically, economically, and financially feasible. Based on the demographic of the rate payers, this financial burden can be allocated differently with the additional state incentive.

f. Capital Investment, repayment, or other financial considerations and/or limitations.

For Seawater Desalination, Reclaimed Water, Storage, or other large complex water augmentation projects, OPG believes the structure of public private partnership (P3) applies in helping address the capital investment, repayment, and risk transfer. The single most important thing to finance these projects other than evaluating if there is not technical risk is who is the Offtaker and whether that Offtaker has a good rating in the market to support the long-term revenue stream. In the case of Arizona large project like seawater desalination will be backed by the state to ensure that there is an offset to the Colorado River allocation and revenue being supported by a combination of United Stated and Mexico border agencies. Multiple large scale private equity firms would want to participate in this P3 deploying their capital for 20% of the investment in return for long term investments while the remaining 80% can be supported by the municipal bonds. The private equity firms will be willing to take the risk on permitting, construction and operations for the long term. The longer term this can be structured, the better it is for the ratepayers. The same applies for reclaimed water projects that could be backed by the state or local agencies with long term agreements to attract private investments.

As there are multiple opportunities in Arizona for water augmentation which may pull resources from different engineering, construction, and operations companies to spend effort to bid on it, OPG would ask WIFA to consider doing an RFQ as a next step to identify qualitied party/parties that can focus on these various projects. Once parties are selected, additional consideration can be given to which team is better suited for a seawater desalination project/s and which are better suited to implement reclaimed water projects under a progressive design build approach. This way each qualified contractor is guaranteed work in the future and is not wasting time bidding on it. This also brings more transparency in the process and the ability to make changes as we work in regulatory, political, or other environmental agencies. OPG has the experience and knowledge to ensure these projects reach the finish line.

g. Approaches to enhance sustainability, security, and resilience.

As discussed in the sections above, seawater desalination and reclaimed water are the two most drought resilient supplies of water that can be created for any community. Incorporating elements of renewable power, green hydrogen and other alternative energy used for these projects will make them more sustainable over a long term.

2. Delivery and Ownership Models for Water Augmentation Opportunities

As described in section 1(f), there are multiple ways to structure these models but based on our experience and knowledge of the current market dealing with large and complex water augmentation projects, the best way is to develop this is using a P3 model where there is a large Offtaker agreement that allows the projects to be financed with both debt and equity structure.

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By taking the above step, Arizona will not only attract US based private companies in engineering, construction, and operation but also companies around the world that have completed these types of projects elsewhere. Also, an imitative by a state to address issues will also increase the competition amongst equity firms that work with lower internal rate of return (IRR) to back these kinds of projects and take risk with technology and long-term operations.

3. Prioritize, finance, and pay for proposed WIFA augmentation opportunities.

Given the constraints on funds available for water augmentation projects, OPG would recommend that WIFA take on the permitting and initial Offtaker risk to do studies and other reports required by regulatory or political bodies. This would also allow WIFA to always be in the driver's seat to monitor projects that are in fact feasible and can be implemented. It also takes away the biggest risk for private equity, and contractors that would charge a premium to the rate payers for taking on that risk to reduce the burden on rate payers. This also helps in negotiations with the Federal, State, local and other Countries as WIFA and its representing would be leading that effort which would carry a large weightage compared to private entities that are often subject to criticism for making money. Once the permitting and the contractual structure can be established with various government agencies and Offtaker, there will be multiple parties that would put money in to make all the augmentation projects a reality and transfer the risk to the private sector for a long term.

4. Market Capacity Constraints

Yes, there are several market constraints to deploy water augmentation plans but none that cannot be mitigated. For example, if engineering and construction firms are qualified based on an RFQ instead of bidding on a RFP, which takes a lot of time, assumptions and internal discussions and approvals, WIFA may be able to attract a lot of players from the US and international market. All these resources are also working with water scarcity issues in other states so development time to bid on projects that can be won is important.

Based on OPG's experience, even if WIFA starts this process at the beginning of next year, not all water augmentation projects are going to come to fruition at the same time. Based on the work required on a particular site and location, political, environmental, and regulatory requirements, they may all have a different timeline for permitting, construction, procurement, and labor. This risk is best transferred to the company or group that is managing the project and they will ensure that individual projects are not competing as more information comes out in the market or WIFA can play a role in prioritizing these projects with the help of experts.

5. Perspective on Challenges

There are many challenges with implementing long term and complex projects and not all projects may have the same challenges. As outlined in the request below are some of OPG's perspectives on the challenges that will need to be addressed and our opinion on how to deal with them.

Financial: As described above the main challenge is to determine who are the final rate payers and how they will be impacted if these new projects come online. Communication and education are key to dealing with these challenges and that also from a very early stage. For example, we all buy bottled water or a cup of coffee that can cost $5 but when it comes to water bills increasing by the same amount per month, there will be several people that will be outraged if not addressed properly. The other financial challenge related to bankable Offtaker agreements, which helps finance any projects even if it costs billions of dollars.

Political: Political challenges are there all the time too as most of these elected officials want to make sure that their constituency is going to reelect them or their party. The project needs to be timed in such a way that there is support from the elected officials and that they will stay in power until certain critical steps can be taken and Offtaker agreements signed. Here communication is also important, so they are not surprised by what efforts are being taken in their jurisdiction. One such step is to find a couple of political staff and bodies that understand the issue and will be willing to go fight for the right solution as it could help the coming generation. We need to equip them with the right tools as everyone knows that historically the success or demise of a civilization depended on water.

Social: We touched on this subject above in the financial section above, but there are numerous ways we can address this. If you can show the long-term benefit to the community of having more reliable and resilient sources, they will know that society will be much better off in growing the economy which in the end helps with social element of uplifting everyone. There could be other environmental projects done to mitigate the impacts that also plays with the social support.

Regulatory: Regulations are made for a reason, so humans don't impact each other and the environment in a detrimental way. The staff at all these regulatory agencies are also humans whose job is to make sure they follow the guidelines. Our perspective is that the regulatory agencies don't deny projects, they follow the guidelines and rules made to ensure that projects are developed to comply with them. On occasions these regulations can change with political and social support for better or worse. In our experience if you keep the regulators engaged and keep them updated on the progress, they will work with WIFA and other organizations to ensure project can be approved.

Proposal for: Request for Information for Long Term Water Augmentation
Date: November 15, 2023

Contact Info:

Name:	Dr. Mark Witten
Title:	Founder/President
Entity:	Phoenix Biometrics, Inc.
Email:	mlwitten33@gmail.com
Mobile No:	520-395-6876

Title: Portable low-energy technology to desalinate brackish well water

Summary: Phoenix Biometrics, Inc. (PBI), an engineering, research, and technology service company, in collaboration with the University of Arizona, seeks to collaborate with WIFA to address the region's pressing water challenges, by offering portable, low-energy desalination services for brackish groundwater. This technology uses only 5-10% of the energy utilized by standard reverse osmosis desalination, for the same amount of water desalinated, needing only minimal capital requirements and therefore allowing flexible points of entry. The small energy expenditure can be powered with solar batteries, and allows portability of these desalination units. PBI is strongly committed to sustainability to ensure a reliable water supply in the face of evolving climate conditions. This proposal is to provide details on PBI's portable low-energy desalination technology for WIFA to consider as a potential augmentation project.

Request for one-on-one meeting:

Phoenix Biometrics, Inc requests a one-on-one meeting to provide further input and to discuss this proposal.

A. General Information and Experience

Phoenix Biometrics, Inc. is a University of Arizona start-up company, working closely with Tech Launch Arizona, the commercialization arm of the University of Arizona to commercialize a portable low-energy desalination technology, patented by the University of Arizona, and licensed to Phoenix Biometrics, Inc. Dr. Mark Witten is the founder and president of Phoenix Biometrics, Inc. He is a retired Research Professor of Pediatrics and Director of the Lung Injury Laboratory and AZ Airborne Particulate Research Center, at the University of Arizona Health Sciences Center, holding a long research career with over 70 contracts and grants. Dr. Witten is working closely with Dr. Sadhana Ravishankar and Dr. Bibiana Law, both experts in environmental microbiology at the University of Arizona to decontaminate and desalinate brackish well water in Arizona.

Dr. Sadhana Ravishankar is currently a Professor housed in the School of Animal and Comparative Biomedical Sciences, in the College of Agriculture, Life and Environmental Sciences at the University of Arizona, with extensive expertise in microbiology working over a decade with producers around the state and nation. Dr. Bibiana Law is a scientist in Dr. Ravishankar's lab, responsible for assisting industry in their microbiological and environmental needs.

Because brackish water in Arizona vary in salinity and quality, the roles of Drs. Ravishankar and Law is to customize the desalination system to the unique requirements of the brackish water. This includes pre-treatment (decontamination) and post-treatment as needed depending on the goal of the desalinated water, whether the water is for agricultural or human use. Dr. Witten is responsible for optimizing the desalination parameters for increased extraction of the salt for the source of brackish water, and optimizing the engineering of the desalination units for portability and sustainability.

B. Low-energy desalination technology:

Dr. Mark Witten, Inventor of the desalination technology holding one active U.S. issued patent (US Patent 8,628,625B2) and Founder/President of Phoenix Biometrics Inc., has been collecting preliminary data since summer 2021. The heart of this "low-energy desalination" process is a biofilm that is derived from a component of human lung surfactant (DOPC), which is sprayed upon silicon disks. This biofilm attracts salt to the pores in the biofilm (see photograph in Figure 1 – Appendix on page 7). After each extraction period, the silicon plates will be lifted from the desalination tank and the extracted salt is simply rinsed off and collected and the silicon plates reused to extract more salt. Very little energy is required as the saltwater only needs to move over the biofilm plate, thus this method is economical in both small- and large-scale capacities. The hypothesis is that this surfactant functions in the alveoli of the lungs to transport salt. This surfactant (DOPC) is synthetically made and readily available for purchase.

Efficiency

This patented and proprietary portable desalination technology uses a fraction (5-10%) of the enormous energy required for reverse osmosis or flash desalination. Currently, first passage of simulated seawater using this low-energy desalination technology extracted 28% of the total salt, compared to reverse osmosis that yielded 32% extraction. Meetings with water scientists at the Yuma, Arizona- U.S. Bureau of Land Reclamation desalination plant on December 1, 2021 confirmed that this portable low-energy desalination process will use only 5-10% of the energy utilized by standard reverse osmosis desalination, for the same amount of water desalinated.

Scalability

Our water activity addresses the water supply shortages and water quality issues, by turning salty brackish well water into potable water. These are portable desalination units that can be placed side by side, or be stackable to optimize gravity for the flow of water, and can be adapted to local, regional, or statewide water plans. There is no limit to the scalability as the technology is customizable and adjustable. Furthermore, only slow movement of the water is required, compared to 350 pounds per square inch pressure as required for reverse osmosis desalination. Our technology is not capital intensive, allowing smaller scale points of entry therefore more flexibility in locations. The small energy expenditure can be powered with wind or solar batteries, and the potable water, and lithium extracted from the salt, can serve as revenue sources, thus allowing sustainability.

Compatibility within Arizona

Our desalination technology extracts 25-30% of the salinity after each cycle, which currently takes one hour per cycle. It is compatible in Arizona because it can handle specific salinity levels. For example, with a goal of <650 ppm salinity for growing salt sensitive produce such as baby spinach or lettuce, if the brackish water in that location is 1250 ppm, two cycles would bring the salinity down to 648 ppm (using an average 28% reduction per cycle). If in another area, the brackish water is 3400 ppm, and the goal is to reduce the salinity to 2500 ppm to grow salt tolerant crops such as cotton, one cycle would be sufficient to reduce the brackish water to 2448 ppm. Thorough water testing and analysis of the brackish water source will allow an effective system. Having adjustable operating parameters, and being portable, these desalination units are customizable to the unique requirements of the region, and can be used in remote areas or during emergencies due to their mobility. It allows brackish water to become a reliable source of usable water for agricultural use, as well as human use (with appropriate treatments).

Project Experience and Collaborative Opportunities

Preliminary work by Dr. Witten to determine salinity parameters started with two inch diameter silicon disks, then adapted to four, then six inch silicon disks and now at 12 inch silicon disk, which is currently the largest commercially available silicon disk. A similar increase in desalination volume was seen each time, with extraction processes taking between 2-3 hours, and biofilm plates being reused 10-13 times before requiring cleaning and re-coating of biofilm. Recently, magnesium disks (instead of silicon disks) have increased the crystallization of the salt by 4-fold. The current prototype includes two 12-inch silicon disks placed inside an aluminum tub, that are able to desalinate 7 liters in one cycle. The desalination prototype has also been stored frozen at -70°C for 2 weeks, with no loss of effectiveness as well as heated to 40°C for 2 weeks, with no loss of effectiveness, therefore demonstrating the prototype's durability. The technology is customizable by the size of the water container and the number of disks inside the container to crystallize the salt for removal (E.g. 2 cubic meter water containers with these disks inside, stacked in a Christmas tree fashion, slowly moving powered with a solar panel with batteries). These desalination units can be placed side by side or stacked with interconnecting tubes, moved on the back of a semi-truck.

This desalination activity is supported by producers in the state, because intensifying droughts are increasing water scarcity, and alternative water sources for agricultural use are urgently needed. Producers are being affected by the intensifying drought in the Southwest, and some have already lost some allocations to Colorado river water, such as those in the Maricopa county. Well water is being used, but the salinity levels are higher than river water, and sensitive crops such as lettuce and spinach are unable to tolerate poor water quality. Furthermore, salinity levels are increasing in certain locations, causing issues to salt tolerant crops as well. No treatment is being done in regards to salinity as no economical technology currently exists to manage sodium and chloride unlike other salts that can be managed. This is causing some producers to withdraw land from agricultural uses, as well as struggle with the growth of crops.

Specifically, we are working with Duncan Family Farms who is providing us brackish water from Maricopa county to desalinate. We collaborate closely with Dr. Sadhana Ravishankar and Dr. Bibiana Law at the University of Arizona, with the producers, to decontaminate and desalinate the brackish water resulting in the submission of a grant proposal to the Water Conservation Grant Fund (WIFA). Letters of support are in the Appendix at the end of this proposal from numerous organizations supporting this technology (Duncan Family Farms, Church Brothers/True Leaf Farms, Yuma Fresh Vegetable Association, Umida AG, A Tumbling T Ranches, Barkley Company of Arizona, Smith Farms Company of Yuma, University of Arizona Cooperative Extension Regional Specialist for Field Crops). Simultaneously, this portable desalination technology can be used for potable water for human use, with adjustments pre- and post-treatments as needed depending on the water source.

<u>Big Picture/Environmental Impact and Brine Disposal</u>

We intend to advance this new desalination technology to solve the southwestern USA chronic drought for at least the next 100 years. Dr. Witten has started discussions via a formal presentation on the low-energy desalination technology to the Roosevelt County Economic Development Commission at Portales, New Mexico on May 10, 2023, with next steps to be discussed with the New Mexico water officials. We intend to build a salt water canal from Padre Island, Texas to an area south of Portales, New Mexico. At this site, we will build our desalination plant powered by wind/solar power and batteries at night. We will also build a holding reservoir for the sea water so that it can be treated with antibacterial agents before undergoing desalination. We will recharge the Colorado River at Lake Powell, the Rio Grande north of Albuquerque, the San Juan River, and send water to the Colorado cities of Pueblo, Colorado Springs, and Denver. We will also build a plant to chemically extract lithium and magnesium from the collected sea salt. At the present time, lithium is selling for $0.50 per gram on the world market and it estimated that the evolving electric car industry will require seven times more lithium than is currently being produced. There is an estimated 300 billion tons of lithium attached to sea salt in the world's oceans. There is also a known lithium deposit just north of the Yuma area according to the Arizona Geological Survey. We will then use the collected sea salt to start sea algae farms in large greenhouses in the Portales area. Sea algae grows very quickly and can extract huge amounts of carbon dioxide from the atmosphere. The US Air Force has successfully made synthetic jet fuel from sea algae which has been proven to be a cleaner jet fuel on jet engine efficiency/wear compared to oil-derived jet fuel. The jet fuel from the sea algae is needed to pump the sea water from sea level up to 4,010 feet which is the elevation of Portales, as well as to pump the fresh water to Lake Powell. Finally, there are sufficient nutrients in sea algae to make food pellets for animal and human consumption. In summary, we will have four sources of revenue from our Portales plant; fresh water, commercial elements of lithium and magnesium, synthetic fuel derived from sea algae, and food pellets made from sea algae.

<u>Cost Component</u>

We will measure the effectiveness of this desalination activity by tracking all inputs associated with the desalination units, to compare to the output of desalinated water. Currently, a thorough cost analysis has the portable desalination technology producing fresh water at $470 per acre-foot, which is considerably lower than the Israeli reverse osmosis company quote to Arizona of selling fresh water from the Sea of Cortez at $2,500 per acre-foot. (This $2,500 quote for use of reverse osmosis also included mixing their water with Arizona aquifier water, which is problematic as the aquifier water is too high in salinity.) This is also lower than the $6 billion request by Yuma farmers for giving up 4 million acre-feet over 4 years, which equates to $1,500 per acre-foot. We will continuously adjust our cost analyses as we move forward.

Cost calculations for estimate:

One kilogram of the surfactant (DOPC) from Lipoid of Germany has been quoted at $14,000 USD. This DOPC is mixed with acetone and chloroform to make 400,000 milliliters of DOPC solution that can coat 20,000 12-inch silicon disks. By increasing the water temperature to 80-86°F we hope to increase the first passage salt extraction rate from 30% to 36%. We also believe that we can separate the salt/DOPC complex after desalination and reuse the DOPC compound again with perhaps a negligible DOPC loss in the recycling process.

We calculate that ten passages of the low-energy desalination process at a 36% salt extraction will have a remaining approximately 631 ppm salt concentration which is very close to the USA national standard for drinking water of 500 ppm salt. We estimate that the 20,000 silicon oxide or metal oxide disks can desalinate 240,000 L of seawater or 240 cubic meters. It is currently difficult to estimate just how many times we can re-use the silicon or metal oxide disks before it is necessary to re-coat the disks with recycled DOPC biofilm. In preliminary experiments using 6-inch silicon disks, we were able to conduct a maximum of 13 trials before we re-coated the silicon disk. If our loss of DOPC in the recycling process is negligible, we perhaps can re-use the recycled DOPC 10-20 times. We will use renewable energy sources of solar/wind and batteries at night to power our low-energy desalination process.

Previous biosensor experiments demonstrated that the DOPC phospholipid compound is very durable as heating the biofilm to 40°C for 2 weeks resulted in no loss of effectiveness, as well as freezing the biofilm to minus 70°C for two weeks had no loss of effectiveness.

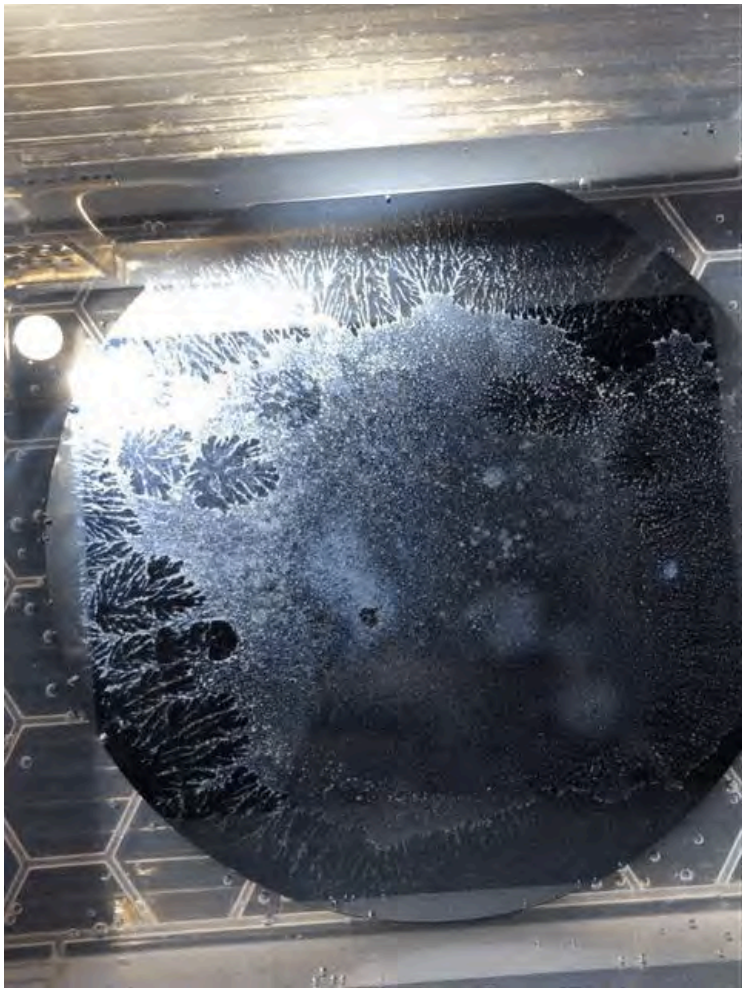
Consequently, we have estimated that one kg of DOPC can be used an average of 150 trials to produce 36,000 cubic meters of desalinated water or 29.19 acre-feet of water. An Israeli reverse osmosis desalination company has offered to produce desalinated seawater to the State of Arizona at $2,500 acre feet from the Sea of Cortez, Mexico. We estimate we can produce desalinated water at $479.62 USD per acre foot or 19.2% of the cost of the Israeli reverse osmosis desalination company.

Note this is to desalinate seawater from 35,000 ppm. Costs are dependent on the number of cycles of extractions required. For brackish groundwater requiring only one cycle, such as from 3400 ppm to 2500 for water to grow cotton, the cost would be estimated at $47.96.

We intend to be as close as possible to 100% sustainable. To further this end, we plan to eventually develop the capacity to extract the elements lithium and magnesium from the sea salt. We will also use the sea salt to establish sea algae farms to eventually make synthetic fuels and food pellets from the sea algae as well as remove large amounts of carbon dioxide from the atmosphere.

Appendix

Figure 1. Photo of salt accumulation on silicon disk from Yuma brackish water



October 13, 2023

Dear WIFA board,

This is a letter in support of the Water Conservation Grant Fund Committee's recommendation to the WIFA board members to approve the project, "Portable low-energy technology to desalinate brackish well water and conserve Colorado river water", submitted by Dr. Sadhana Ravishankar and Dr. Mark Witten, from the University of Arizona.

Duncan Family Farms produce more than 8,000 acres of certified organic produce. We are committed to making a strong contribution to an improved environment for sustainable production. As mentioned in a previous letter of support back in May, we would like to express again that we are committed to engaging closely with Dr. Ravishankar and Dr. Witten to provide the brackish water to test and desalinate, and to provide industry expertise to assist in optimizing the desalination technology.

We are deeply concerned about the intensifying drought and declining reservoir levels prompting cuts to water supplies from the Colorado River in the near future. Our Maricopa farms are currently having to pump groundwater to irrigate our crops, but this water is of poorer quality due to higher salinity. As an update, we actually had to give back 288 acres this year due to the water crisis, and will not be farming those acres. Currently, no economical treatment exists to manage sodium and chloride salts, but sensitive crops such as lettuce and spinach require a desalination solution such as the technology proposed in the grant proposal. We look forward to this grant proposal being finalized, as this innovation is critical to the sustainability of the leafy green produce industry. We are excited for a portable desalination solution that can be powered with wind or solar batteries.

Sincerely,

Pete Guerrero
Chief Operating Officer
Duncan Family Farms®
17072 W Indian Road, Goodyear, AZ 85395
Phone: (623) 853-9880 | Fax: (623) 853-0730 | Cell: (602) 376-1185
Arizona | California | Oregon | New York
http://duncanfamilyfarms.com

A TUMBLING T RANCHES
14929 W. Broadway Road
Goodyear, AZ 85338

October 16, 2023

Dear members of the WIFA board,

I would like to provide this letter in regards to the project submitted by Dr. Sadhana Ravishankar and Dr. Witten at the University of Arizona, titled, "Portable low-energy technology to desalinate brackish well water and conserve Colorado river water", to the Water Conservation Grant Funding program.

I am a third-generation Arizona farmer and our farm operation, A Tumbling T Ranches, grows cotton, alfalfa, and grains in Goodyear and Gila bend areas of western Arizona on approximately 5,000 acres, as well as another 600 acres in California. Embracing water-efficient technologies and drought/salinity tolerant crop varieties, implementing precise irrigation techniques, and exploring alternative water sources have allowed us to thrive. Our current crop rotations do not include vegetables or other salt sensitive crops due to the high salinity of our irrigation water.

The Southwestern United States is grappling with an increasingly severe water crisis exacerbated by prolonged droughts. Presently, there is no cost-effective treatment to reduce sodium and chloride salts in high salinity water. High salinity water presents numerous challenges such as soil degradation, crop yield and quality reduction, increased water demand to leach out excess salts, infrastructure and equipment damage, increased operational costs, sustainability concerns and environmental impact.

I support the Water Conservation Grant Fund Committee's recommendation to the WIFA board to approve this innovative project, as low-energy desalination technology can ensure a more sustainable and resilient approach to water management in the face of ongoing climate challenges. There is a pressing need for research into solutions such as this novel desalination technology.

Sincerely,

Ron Rayner
14929 W Broadway Road,
Goodyear, AZ 85338
frrfarm@gmail.com

Cooperative Extension
Urban & Small Agriculture Production

4341 E. Broadway Road
Phoenix AZ 85040-8807
602-827-8213
Fax: 602-827-8292
https://extension.arizona.edu/urban-ag

October 17, 2023

Dear members of the WIFA board,

I am writing in regard to a grant application titled, "**Portable low-energy desalination technology to desalinate brackish well water to conserve Colorado river water**", submitted to the Water Conservation Grant Fund (WCGF) program. I support the WCGF committee's recommendation to approve this grant, as I work with multiple large and small agriculture producers that would find this technology extremely useful.

I am a University of Arizona Cooperative Extension Agent and Regional Specialist for Field Crops, Integrated Pest Management, and Urban and Small Agriculture Production with state-wide Programmatic area. Of the greatest concerns of farmers in the state of Arizona are the reductions imposed on the Colorado River water supply and the huge impact on agriculture. We have water from wells in the state with high salt levels and Colorado river water of higher salinity and poor water quality, being used for irrigation resulting in areas with only certain tolerant crops to be planted. A low energy desalination technology would reduce salinity and improve water quality, leading to more crop choices, higher crop yields, better produce quality, and increased profitability to farmers. As higher salinity water often degrades soil quality over time due to excessive salt content, using desalinated water can preserve the health and fertility of the soil.

In terms of water conservation savings, using desalinated water would help water savings by avoiding the need to leach salts out of the soil. As more and more salts are accumulated from use of brackish water or high salinity Colorado river water over-time, more leaching of salts from the soil is required, leading to the use of more water simply for this purpose. An example is alfalfa that, despite being salt-tolerant crop, still needs at least one irrigation to leach salt. This crop needs ~ 6 acre-feet of irrigation water divided into 10 irrigation times per year. The leaching irrigation is ~ 0.6 acre-foot. About 270,000 acres of alfalfa are planted in Arizona. An estimate of water savings of 162,000 acre-feet of irrigation water per year in this crop alone. This saving will proportionally increase in other less-tolerant crops to salt.

4341 E. Broadway Road
Phoenix AZ 85040-8807
602-827-8213
Fax: 602-827-8292
https://extension.arizona.edu/urban-ag

In summary, I support this project, as a low energy desalination technology has the potential to make the farming landscape more economically viable, sustainable, and resilient in the face of water challenges exacerbated by climate change.

Sincerely,

Ayman M. Mostafa, Ph.D.
University of Arizona
Cooperative Extension & Dept. of Entomology
Interim Director, Maricopa County Cooperative Extension
Area Programmatic Agent & Regional Specialist

Field Crops Integrated Pest Management
Urban Agriculture Production, Small-Scale and Beginning Farmer

YUMA FRESH
VEGETABLE ASSOCIATION

"Through a unified voice, the mission of YFVA is to promote and protect the Yuma vegetable industry."

October 13, 2023

Dear WIFA board,

This letter is on behalf of the Yuma Fresh Vegetable Association, Yuma, Arizona to express our support for the proposed project, "Portable low-energy technology to desalinate brackish well water and conserve Colorado river water" which was submitted to the Water Conservation Grant Fund for ARPA funding.

We support the Water Conservation Grant Fund Committee's recommendation to the WIFA board to approve this project submitted by Dr. Sadhana Ravishankar from the University of Arizona, with Dr. Mark Witten, in collaboration with producers to conduct research to decontaminate and remove salts from brackish water, using a novel portable low-energy desalination technology.

Yuma Fresh Vegetable Association (YFVA) consists of members from the produce agricultural industry who come together cooperatively to solve issues related to Yuma Agriculture. Climate change accelerating drought and heat stress are critical issues facing the Yuma agricultural industry that YFVA focuses on. YFVA strongly believes in supporting the next generation of agriculture innovators, and providing healthy and safe food and agricultural sustainability are our highest priorities.

Brackish water presents a set of challenges, including salt buildup in the soil, reduction in crop quality and yields, reduced crop variety, increased costs, harm to soil health, and reduced productivity. Balancing the need for water availability with concerns with water quality is a complex challenge for growers, and innovations such as these are urgently needed. We support this project, as this project will assist in the sustainability of the produce industry in light of changing climate pressures.

If you have any questions regarding Yuma Fresh Vegetable Association or our support, please feel free to contact us.

Sincerely,

Mike Pasquinelli

Mike Pasquinelli
President

October 16, 2023

Re: Support Letter for WIFA board

Dear members of the WIFA board,

As Vice President of Technical Services for Church Brothers Farms and True Leaf Farms, I fully endorse the grant submitted by Sadhana Ravishankar from the University of Arizona titled, “Portable low-energy technology to desalinate brackish well water and conserve Colorado river water”. We are a vertically-integrated family owned and operated company based in Salinas, CA that produces a full line of fresh vegetables year round with an in-house farming/harvest program and state-of-the-art processing plant, True Leaf Farms in San Juan Bautista, CA and Yuma, AZ (Winter Season). We grow crops on over 40,000 acres in California, Arizona, and Mexico.

Solutions to water scarcity due to intensifying drought and changing weather patterns is a top priority for the Southwest region. Therefore, we are greatly interested in the project goal of developing economically feasible and efficient methods to desalinate higher salinity water. I support the Water Conservation Grant Fund Committee’s recommendation to the WIFA board to approve this project, as innovations such as this desalination technology that is unique in its low energy requirements, is portable, and can be powered with wind or solar batteries are urgently needed.

The vision for Church Brothers Farms is to anticipate, innovate, and deliver solutions for our customers’ needs by consistently providing the best quality and great tasting fresh vegetables. The Church Brothers Farms also believes in collaboration and working together as a team to achieve the best results. Through this grant, we believe that we can continue to achieve these goals, and hence, strongly support this project.

Sincerely,

Francis Adenuga
Church Brothers Farm/True Leaf Farms
VP of Technical Services
francis@trueleaffarms.com
(831) 623-7122

Umida AG

October 11, 2023

Dear members of the WIFA board,

I am pleased to write this letter in support of the proposed application titled, "Portable low-energy technology to desalinate brackish well water and conserve Colorado river water," submitted by Dr. Sadhana Ravishankar with Dr. Mark Witten at the University of Arizona, to the Water Conservation Grant Funding program.

I first heard about this project when I joined the September 25, 2023 Water Conservation Grant Fund Committee meeting online, and this project was being discussed. I contacted Dr. Ravishankar and her team to learn more about this innovative desalination technology. I support the WCGF committee's recommendation to the WIFA board to approve this grant, as it is unique in its low energy requirements and portability. In terms of water conservation savings, the use of this desalination technology would allow producers to avoid the need to leach salts from the soil each season, amounting to 10-acre inches to 12-acre inches per acre that this technology is applied to annually.

An additional advantage of the proposed solution is groundwater quality. When soil is leached from salts, the salts and agricultural chemicals are leached into the local aquifer resulting in increasing salinity and groundwater contamination.

If you have any questions, please feel free to reach me at my contract information below.

Sincerely,

Joseph Gallegos

Joseph Gallegos
Founder/CEO
www.UmidaAg.com
562-301-5598 c
559-708-4537 o

-https://www.epa.gov/ingredients-used-pesticide-products/monosodium-methanearsonate-msma-organic-arsenical

-Chronic Arsenic Poisoning Probably Caused by Arsenic-Based Pesticides: Findings from an Investigation Study of a Household: https://doi.org/10.3390/ijerph13010133

BARKLEY Co.
of ARIZONA

October 16, 2023

Dr. Sadhana Ravishankar
School of Animal & Comparative Biomedical Sciences
The University of Arizona
1117 E. Lowell St., ACBS 212
Tucson, AZ 85721

Dear Dr. Ravishankar,

I am happy to provide a letter of support regarding your grant proposal "Portable low-energy technology to desalinate brackish well water and conserve Colorado river water" to the Water Conservation Grant Funding program.

Barkley Company of Arizona is a custom farming operation located in Yuma, Arizona. Annually, we farm over 5,500 acres of winter and spring vegetables. We are concerned about water scarcity, due to climate change and intensifying drought in this region, and research is urgently needed in this area.

We believe this project addressing innovative technologies for high value produce is critical to the future of Arizona's agriculture. We are excited regarding this submission, strongly support your research efforts, and look forward to collaborating with you.

Sincerely,

Janessa Thelander
Barkley Company of Arizona
Food Safety Manager

P.O. Box 2706 • Yu1na, Arizona 85366 • (928) 343-2918 • (928) 343-2940 *Fax*
www.barkleyco1npany.co1n

Smith Farms Company

Yuma, Az

May 14, 2023

To Whom It May Concern:

As President of the Yuma Irrigation District's Board of Directors and President of Smith Farms Company of Yuma, specializing in the production of conventional and organic vegetables, I am pleased to provide a letter of support for the grant proposal "Portable low-energy technology to desalinate brackish well water and conserve Colorado river water," submitted by Dr. Sadhana Ravishankar of the University of Arizona, in collaboration with Dr. Mark Witten of Witten Technologies. This grant is being submitted to the Water Conservation Grant Funding program.

I fully support funding for this project that aims to decontaminate and desalinate brackish well water, to address the water supply shortages and water quality issues. Water desalinated by this technology will help conserve Colorado river water. I will be pleased to provide the brackish well water from Yuma. Dr. Witten is a close collaborator of mine. We have discussed in-depth the water crisis and solutions, including visits by Dr. Ravishankar and her team and Dr. Witten to my farm. Additionally, a previous visit together with water scientists at the U.S. Bureau of Land Reclamation desalination plant in Yuma, AZ confirmed that Dr. Witten's portable low-energy desalination process will use only 5-10% of the energy of standard reverse osmosis desalination. Fouling of reverse osmosis membranes by microorganisms is an additional issue, and the work Dr. Ravishankar's team will be conducting to decontaminate using sustainable practices is critically important.

Climate change is exacerbating drought, and urgent action is needed. Currently, the Yuma area Water Districts uses one million-acre feet per year of Colorado River water to support it's 4 billion agricultural enterprise. However, this is not sustainable with the intensifying droughts and climate change predicted in the future. Preliminary data from desalinating Yuma brackish well water was highly promising, and I believe kick-starting this project is critical in addressing the water crisis that Arizona is facing. This funding will allow sufficient decontamination and desalination work to be conducted, and further grow and build collaborations, to attract additional investments in this technology.

Sincerely,

Mark Smith
President, Yuma Irrigation District
President, Smith Farms Company of Yuma
msmith@smithfarmsyuma.com

May 14th, 2023

To Whom It May Concern:

I would like to express my support for Dr. Sadhana Ravishankar of the University of Arizona for her grant application titled, “Portable low-energy technology to desalinate brackish well water and conserve Colorado river water” being submitted to the Water Conservation Grant Fund for ARPA funding.

Duncan Family Farms produce more than 6,000 acres of certified organic produce. We are committed to producing clean, healthy, life-giving food and making a strong contribution to an improved environment for sustainable production. We are deeply concerned about the intensifying drought and declining reservoir levels prompting cuts to water supplies from the Colorado River in the near future. Our Maricopa farms are currently having to pump groundwater to irrigate our crops, but this water is of poorer quality due to higher salinity. Currently, no economical treatment exists to manage sodium and chloride salts, but sensitive crops such as lettuce and spinach require a desalination solution such as the technology proposed in Dr. Ravishankar’s application. We have a long-standing collaborative relationship with Dr. Ravishankar. We are committed to engaging closely with Dr. Ravishankar and Dr. Witten and provide brackish well water to test and desalinate, and to providing industry expertise and assist in optimizing the desalination technology.

Over the past 11 years, we have been able to collaborate with Dr. Ravishankar, her lab members, and her students at the University of Arizona on numerous related research and service activities. Dr. Ravishankar’s knowledge has been indispensable to guiding Duncan Family Farm’s food safety approaches, using supported data, for our organic leafy greens.

Our long-standing collaboration with Dr. Ravishankar includes many research and extension areas including:

a) Assessment of Duncan’s compost, soil and plant tissue samples regarding food safety in 2012-2017. Sadhana’s lab assessed numerous parameters including survival of foodborne pathogens in the raw materials and finished product, resulting in recommendations for safer composting that we have implemented.

b) Collaboration on her large-scale lab studies of wash water containing plant-based antimicrobials in 2014/2015. We donated the bulk organic spinach needed for these studies and are pleased to continue to support Sadhana in her work.

c) Duncan's participation in "The Clean & Green Produce Workshop - Food Safety from Farm to Fork" in 2015. Our personnel enjoyed the hands-on workshop of various topics such as the effectiveness of numerous organic sanitizers and how coring tools can transfer contamination.

d) Duncan's collaboration in the CONSERVE project involving water sampling/ treatment during the years 2016-2020 with sampling and testing of our return flow pond. The findings and recommendations allowed us to make decisions regarding the maintenance of our return flow pond.

e) Duncan's role as an Advisory Committee member in the CONSERVE project. The problems we face are complex and often require multi-disciplinary collaborations, which this and other collaborations with Sadhana have allowed us to be part of and continue to foster.

f) Duncan's participation at the annual Food Safety Conferences hosted by the University of Arizona Food Safety Consortium chaired by Dr. Ravishankar.

g) Ongoing/future collaborative plans for research on interventions for unwashed leafy greens employing various methods and formulations.

This project focuses on a solution to significantly address the water crisis that Arizona is facing, by investigating both the water shortage and water quality issues. We are excited that a potential portable desalination solution that can be powered with wind or solar batteries exists, as such solutions to provide alternate sources of water are urgently needed.

Sincerely,

Pete Guerrero
Chief Operating Officer
Duncan Family Farms®
17072 W Indian Road, Goodyear, AZ 85395
Phone: (623) 853-9880 | Fax: (623) 853-0730 | Cell: (602) 376-1185
Arizona | California | Oregon | New York
http://duncanfamilyfarms.com
Safety. Excellence. Integrity. Community. Team. Respect.

November 15, 2023

Water Infrastructure Finance Authority of Arizona
LTWAF@azwifa.gov

Re: Resilient RFI for LTWAF

To Whom it May Concern:

Arizona has a rich history of planning for the scarce nature of our water supply and is taking action to expand conservation and augmentation. It is our view that the Long-Term Water Augmentation Fund ("LTWAF") will help catalyze the development of additional water supplies for Arizona by encouraging innovation and providing resources to overcome potential obstacles facing water augmentation projects.

Resilient develops and invests in transformative and multi-faceted water solutions. The LTWAF may benefit from and leverage our experience in project development, deep financial resources, and partnership capabilities, in novel ways that overcome resource constraints and achieve your desired outcomes.

To assist the Water Infrastructure Finance Authority (WiFA) identify and prioritize potential water augmentation opportunities, we have assembled a team that includes Carollo Engineers, a firm with proven expertise assessing water augmentation options. Carollo has been working for municipalities throughout Arizona and North America since 1933. Through the fields of water treatment, distribution, wastewater collection, and wastewater treatment, Carollo has been credited for laying the groundwork for the rapid growth in Arizona of the last several decades. They understand the importance of your work because it will prioritize water supply solutions needed to support this strong and growing economy into the future.

Our team is eager, available, and committed to helping you realize your vision for a sustainable, robust water supply for the State of Arizona. Please feel free to contact me at 202.297.9003 should you have any questions regarding this Request for Information. Resilient appreciates the opportunity to work with WIFA and other Arizona stakeholders on this important water augmentation effort.

Sincerely,

RESILIENT INFRASTRUCTURE GROUP

Ben Vitale

Ben Vitale
Chief Executive Officer and Founder

General Information and Experience

Resilient's project team has been specifically formed to satisfy WIFA's needs for this important project. Carollo complements our team with added in-depth infrastructure, treatment, and master planning knowledge of Arizona's precious water resources and history to efficiently support the development of potential water augmentation opportunities.

a. Name of Respondent, Team Members, and Anticipated Roles and Responsibilities

RESILIENT™ INFRASTRUCTURE GROUP

Resilient Infrastructure Group (Resilient) develops and invests in transformative water solutions. Resilient coordinates and manages complex, multi-disciplinary decision making to achieve site-specific technical, financial, and sustainability objectives.

Resilient leverages their combined experience in brown and greenfield development, funding, and operation of stormwater and industrial water reuse, desalination, ultra-filtration, and other systems to develop, finance, own and operate water augmentation solutions. Leveraging the varied experience of the team, Resilient offers cradle-to-grave water services including:

- "As a service" water and wastewater advisory, implementation, and management services.
- Flexible and innovative financing structures enable clients to reach immediate and long-term business, financial, and sustainability goals.
- Long-term asset management provided by best-in-class and reliable operators.

Resilient develops and invests in site-specific water infrastructure under long-term outsourcing agreements with industry and communities that are facing growth pressures, tightening regulations, and complex water sustainability risks.

carollo®

Throughout their 90-year history, **Carollo Engineers (Carollo)** has applied sound, proven engineering principles to advance the application of water technologies and engineering excellence. Unlike their competitors, all of their work is performed in the areas of water, wastewater, and reuse, resulting in a level of understanding of key planning, supply, treatment, and conveyance issues that few can match. Carollo has provided planning, design, and construction management services for water and wastewater utilities serving populations ranging from less than 5,000 to more than several million. From their Arizona offices, they provide full-service engineering, including utility infrastructure (pipelines and pump stations), process specialists, civil, environmental, structural, SCADA, electrical, and instrumentation and control engineers.

Carollo is known for their "think differently" philosophy that results in better answers, such as increased capacity, better treated water quality, lower capital and operational costs, and ease of operation. Many of Carollo's clients choose them because of their proven ability to creatively identify a range of alternatives and cost-effectively implement the best solutions.

Locally, Carollo's Phoenix office has 180 employees, including 55 registered professional engineers. Their staff include civil, sanitary, environmental, electrical, instrumentation, mechanical, chemical, structural, and control system engineers, as well as architects, planners, and specialists in other areas.

Team Organization

The following organization chart identifies key lead individuals with their anticipated roles and responsibilities. Our project team has been handpicked to bring best-in-class engineering solutions across finance, engineering, and management to your augmentation challenges. Additionally, this team is backed by a deep bench of local, multi-discipline support ready to tackle projects of all sizes and complexity.

WATER INFRASTRUCTURE
FINANCE AUTHORITY OF ARIZONA

Resilient Personnel
Carollo Personnel

Resilient Infrastructure Group
Ben Vitale, CEO
Paul Schuler, Executive VP

Investment / Financial
Damon Yuzon
Sid Singh

Water Resources Planning
Richard Humpherys, PE
Eric McLeskey, PE

Advanced Treatment/DPR
Corin Marron, PE
Jessica Dresang, PE

Infrastructure
Brian Bernard, PE

Project Collaborative Delivery
Dave Sobeck, PE

Stakeholder Engagement
TBD*

**Our extensive history of public engagement, and strong relationships that we can leverage, will allow our team to identify and engage the right support depending on the project and associated stakeholders.*

Ben Vitale
CEO

Ben is the Chief Executive Officer and Founder of Resilient Infrastructure Group, where he focuses on building the company's resources and capabilities to exceed client and partner expectations in water, wastewater, low carbon transportation, and other types of resilient infrastructure. Ben has more than 30 years of investment and technical management experience in the wastewater, renewable energy, agriculture, and technology sectors.

Ben holds a MM from Northwestern University's Kellogg School of Management and a B.S. degree in Computer and Electrical Engineering from Purdue University.

Paul Schuler
EXECUTIVE VICE PRESIDENT

Paul acts as Resilient's Executive Vice President of Sales and Service. In his role, Paul drives the growth of our "as a service" offerings and asset base, develops and manages client relationships, builds partnerships, and supports the integration of acquisitions. As a recognized water industry leader, he has served on the Water Environment Federation and the Pacific Northwest Clean Water Association boards and has presented extensively on water and wastewater issues.

Paul has a BS in Civil Engineering and an MS in Environmental Engineering from Virginia Tech, along with an MBA from the University of Oregon. Paul is a registered professional engineer in Oregon.

Damon Yuzon
INVESTMENT / FINANCIAL

Damon is Chief Financial Officer at Resilient, possessing more than 25 years of development, finance, and capital markets experience in distributed wastewater infrastructure and real estate development. He brings expertise in multifaceted development-based project finance, complex transaction negotiation and structuring, and asset disposition. Prior to joining Resilient, he was Principal/Strategy Co-Lead for the Water, Waste, and Energy Fund at Equilibrium Capital, where he founded and built the firm's water, waste, and energy strategies.

A Chartered Financial Analyst, he earned an MBA from Purdue University – Krannert School of Management, and holds a Bachelor's degree from the University of Oregon – Charles H. Lundquist College of Business.

Sid Singh
INVESTMENT / FINANCIAL

As Director of Investments at Resilient Infrastructure Group, Sid focuses on the development, structuring, underwriting, and diligence of project investments working closely with partner companies and clients. Sid has 20 years of finance and project experience, with the last 10 years specifically focused on infrastructure in the water, energy, and agricultural sectors. His recent projects include wastewater re-use facilities, clean energy plants for public and private hosts, distributed energy management systems for commercial customers, and hydroponic greenhouse farms.

Sid earned his BS degree in Engineering from Columbia University.

Richard Humpherys, PE
WATER RESOURCE PLANNING

Richard is a Project Manager and Vice President with 34 years of experience dedicated to infrastructure planning, water resources, hydraulic modeling, and improvement studies for water, wastewater, and reclaimed water systems. He is a recognized expert in the field of water resources, water and wastewater system evaluations, and master planning. Richard has worked with many communities on and off the Colorado River, as well as at the state level with ADWR on water augmentation. Perspectives from these experiences will be applied to help plan future water resource needs.

Richard holds a BS in Agricultural and Irrigation Engineering and a MS in Civil Engineering from the University of Utah. Richard is a registered professional engineer in Arizona and New Mexico.

Eric McLeskey, PE
WATER RESOURCE PLANNING

Eric is a Project Manager and Vice President with 18 years of experience in civil and environmental engineering. He is a recognized water resources planning expert that has completed dozens of studies and master plans for both large and small Arizona utilities. Throughout his entire career, Eric's primary focus is on water resources specifically in Arizona. He brings to the team expertise in water resource strategy. Eric also brings a keen understanding of Arizona's current and future needs through his recent project experience.

Eric holds a BS in Conservation Biology from Brigham Young University and an MS in Environmental Engineering from Utah State University. Eric is a registered professional engineer in Arizona, Nevada, and Texas.

Corin Marron, PE

ADVANCED TREATMENT / DPR

Corin has 15 years of experience in the planning and design of municipal water, wastewater, and advanced water treatment facilities. She is a strong project manager with background in DPR serving on the Technical Advisory Group (TAG) at the state level, and is an Arizona water reuse leader. Corin's expertise is focused on water quality studies, regulatory compliance, and permitting. She is recognized for her ability to listen to client's needs, use Carollo's vast resources to provide clients with the best possible solution, and facilitate collaboration between her clients, project teams, and stakeholders.

Corin holds a BS in Biological Engineering from Ohio State University and a MSE in Environmental Engineering and Water Resources Engineering from the University of Texas at Austin. She is a registered Environmental Engineer in Arizona and a Professional Engineer in Texas.

Jessica Dresang, PE

ADVANCED TREATMENT / DPR

Jessica has over 22 years of experience in the planning, design, construction, and permitting of federal, industrial, and municipal water/wastewater treatment and research facilities. Her technical expertise expands into advanced treatment systems, including membrane bioreactor facilities, order control, solids handling, pump stations, chemical storage and delivery systems, pipeline design, and hydraulic modeling. Jessica has extensive experience in construction administration services for various project delivery methods and in the review and development of permit documents.

Jessica has a BS in Chemical Engineering from the University of Arizona and an MBA in Business Administration from Arizona State University. She is a registered Chemical Engineer in Arizona and a Professional Engineer in New Mexico.

Brian Bernard, PE

INFRASTRUCTURE

Brian has over 34 years of experience as a project manager for infrastructure planning, evaluation, design, rehabilitation, and engineering services during construction; collection and distribution system pipelines; wells; and pumping and boosting systems. His responsibilities have included project management, planning, design activities, modeling, resident engineering, cost estimating, procurement, community involvement, bid services, and permit submittal review.

Brian has a BS in Civil Engineering from Michigan Technological University and an MBA in Project Management from Keller Graduate School of Management. He is a registered Civil Engineer in Arizona and a Professional Engineer in Illinois.

Dave Sobeck, PE

PROJECT COLLABORATIVE DELIVERY

Dave is an Executive Vice President with Carollo and brings more than 22 years of experience. He has led the design of over $3B in water and wastewater construction for public and private sector clients throughout the United States, including over 20 Design-Build and CMAR projects. Dave's perspectives gained from this wide range of experience is what helps him best understand the goals and objectives of owners, designers, and constructors, and this understanding is critical to delivering successful projects.

Dave holds a BS in Civil Engineering and an MS in Civil and Environmental Engineering from Bucknell University. He is a registered Civil Engineer in Arizona and Michigan.

b. Describe Your Ownership and Management Structures (Privately Held and Investor-owned Entities)

Resilient is the water and wastewater platform and infrastructure portfolio company of Partners Group, a global private markets investment manager with over $144 billion in assets under management and more than 1,900 professionals worldwide. Resilient's team has over 150 years of combined experience in the water, wastewater, and related sectors, and we have built businesses and assets valued at over $2 billion. Recently, Resilient completed a major acquisition of the largest wastewater-to-renewable natural gas facility on a single dairy in the United States. Partners Group's water investment experience began with their development stage investment into the Carlsbad Desalination Plant and then in 2021 they invested in Resilient to build our distributed water platform.

WATER EXPERIENCE

- The first institutional and dedicated water and wastewater infrastructure asset development and holding company whose team has built a large-scale $300+ million, institutional-grade portfolio.
- Resilient manages the complexity that simplifies implementation for clients.
- Collective experience building and delivering site-specific water, wastewater, and resource recovery solutions for businesses, institutions, and municipalities.

Partners Group
Passion for Private Markets

- Partners Group, a publicly-traded, global private markets investment firm with $144 billion in assets under management and more than 1,900 employees across 20 offices worldwide.
- Clients can be confident about long-term and consistent operations resulting from Resilient's reach and scale.
- Resilient's service orientation compels us to go the extra mile.

RESILIENT™
INFRASTRUCTURE GROUP

- Capitalized for long-term growth to match clients' large-scale asset deployment plans.
- Flexibility to deploy capital and resources in early-stage development from concept discovery through operations.
- Capability to acquire and upgrade both operating assets and project portfolios in the United States and Canada.
- Managing over $150 million in assets.

c. Describe your Statutory Authorities Including Any Authorities to Own and Manage Water Rights and Water Supply Facilities (Public Agencies)

N/A

d. Each Member's Involvement and Experience with Existing Water Augmentation Projects, Programs or Initiatives, Municipal and Industrial provision, and Non-Consumptive Provision

Resilient

With over 150 years of total water experience and deep domain knowledge through equity investments in water solution projects and other water related investments, Resilient brings extensive experience in the development, funding, and operation of industrial and stormwater reuse, desalination, ultra-filtration, and other systems to offer sustainable water supply solutions while leveraging their financial experience to maximize the value of funding. The management team has experience with launching and deploying over $2 billion into the water sector.

Resilient is led by CEO **Ben Vitale** who is directly responsible for the day-to-day management and execution of a $200M portfolio of renewable natural gas, water treatment as a service, wastewater, transportation, and low carbon agriculture projects. Prior to founding Resilient, Ben helped launch and co-lead Equilibrium Capital's Wastewater Opportunity Fund I (~$200M) and Water & Wastewater Opportunity Fund II (target $300-400M).

Carollo Engineers

Carollo's Phoenix-based planning and design teams have been providing similar water resources planning solutions to those highlighted in the augmentation solutions section of this statement of qualifications for Arizona communities for more than 20 years. As illustrated in the map on this page, they have helped municipalities across the Valley and across the State solve challenging water problems. Carollo's experience brings broad perspectives and unique skill sets that will help Arizona plan for its water future.

Water Resources Planning

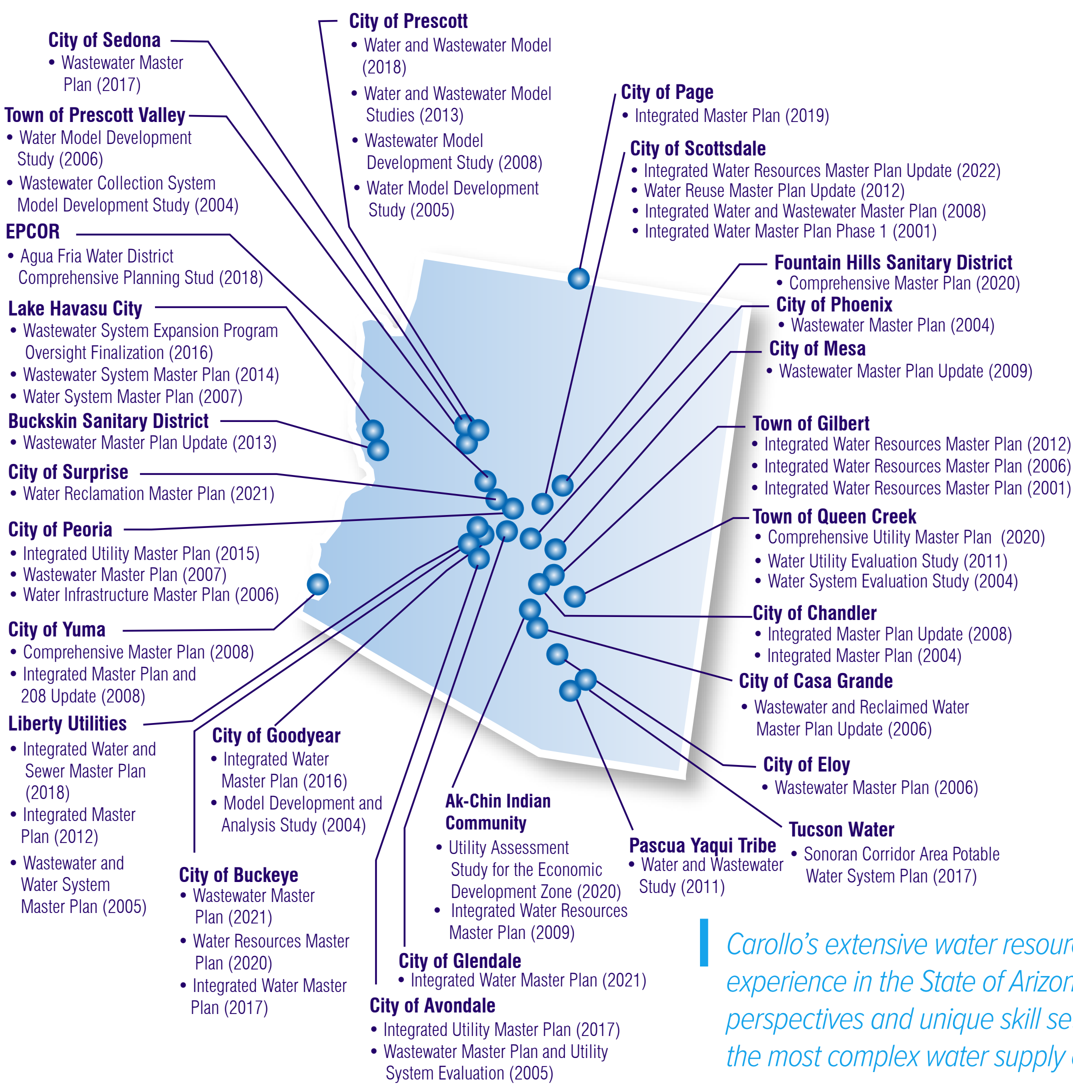
Carollo has completed 40 master plans for clients in Arizona alone. These projects have included water supply and resource evaluations, water quality and treatment analyses, area characteristic studies, water conservation alternative evaluations, hydraulic modeling, infrastructure evaluations, and financial analyses.

Water Demand / Flow Forecasting

Carollo applies state-of-the-art techniques to develop water demand, wastewater flow, and recycled water production projections utilizing Geographic Information Systems (GIS), customer billing data, and collection system flow monitoring results.

Infrastructure Evaluations & Conceptual Design

Carollo's experience designing and constructing water pipelines includes identification, evaluation, and recommendations of alternative pipeline routes based on cost-effective hydraulic considerations, easement requirements, and constructability. Our pump station designs serve many functions including raw water delivery to treatment plants, well water pumping, and treated water delivery to distribution systems.



Carollo's extensive water resources planning experience in the State of Arizona brings broad perspectives and unique skill sets to effectively solving the most complex water supply challenges.

Groundwater Hydrogeology & Modeling

Carollo offers decades of experience in teaming with local groundwater hydrogeologists to complete projects that involve groundwater modeling, including relevant, recent experience applying the ADWR's Salt River Valley (SRV) groundwater model for permitting/re-permitting of underground storage facilities, Analysis of Assured Water Supply (AAWS) program applications, and groundwater quality evaluations.

Permitting

Carollo has significant experience with permitting required for the ADWR, ADEQ, MCESD, and other agencies. Their team is keenly aware of what regulators are looking for within their permit applications and knows exactly what to prepare for pre-application meetings to get the most benefit of the time spent working with agencies ahead of the application process.

Research

Water resources planning often requires customized approaches to address the unique needs of each system. Carollo has worked with dozens of clients within the state alone to develop water resources and infrastructure planning solutions through research that has included confirming regulatory requirements, identifying new water supply opportunities, exploring mutually beneficial partnering opportunities for neighboring utilities, and executing due diligence in developing technically feasible infrastructure plans.

Direct Potable Reuse (DPR)

Carollo Engineers are leaders in advanced treatment for potable reuse in general, as illustrated by example projects across the United States (and in Arizona) as shown on the map on the following page.

WHERE Carollo Has Done it Before // Carollo's relevant experience translates into confidence in their ability to deliver sound augmentation opportunities.

Long-Term Water Augmentation Study

Arizona Department of Water Resources

The Governor of Arizona's Water Augmentation, Innovation, and Conservation Council retained Carollo to complete a state-wide water augmentation project. The purpose of this project was to identify water augmentation options that the twenty-two water resource planning areas could implement to augment water supplies. Objectives included:

- Identify state-wide water augmentation opportunities, particularly for rural areas.
- Look for Arizona's next large water supply.
- Combine multiple water augmentation methods to increase water supply benefits.

The project team identified augmentation options for new water sources that included ocean desalination, brackish groundwater desalination, and groundwater transfers. Best practices that improve water use efficiency were identified and fit within the categories of agricultural water conservation, enhancing aquifer storage, increased reclaimed water utilization, and municipal water conservation. Some water augmentation concepts require further development to become viable methods that reliably increase water supplies and include weather modification, phreatophyte management, and watershed management. Arizona also has significant impediments to water augmentation that include Little Colorado and Gila River water rights adjudications, unresolved Indian water rights claims, and a lack of groundwater management planning in some areas of the State.

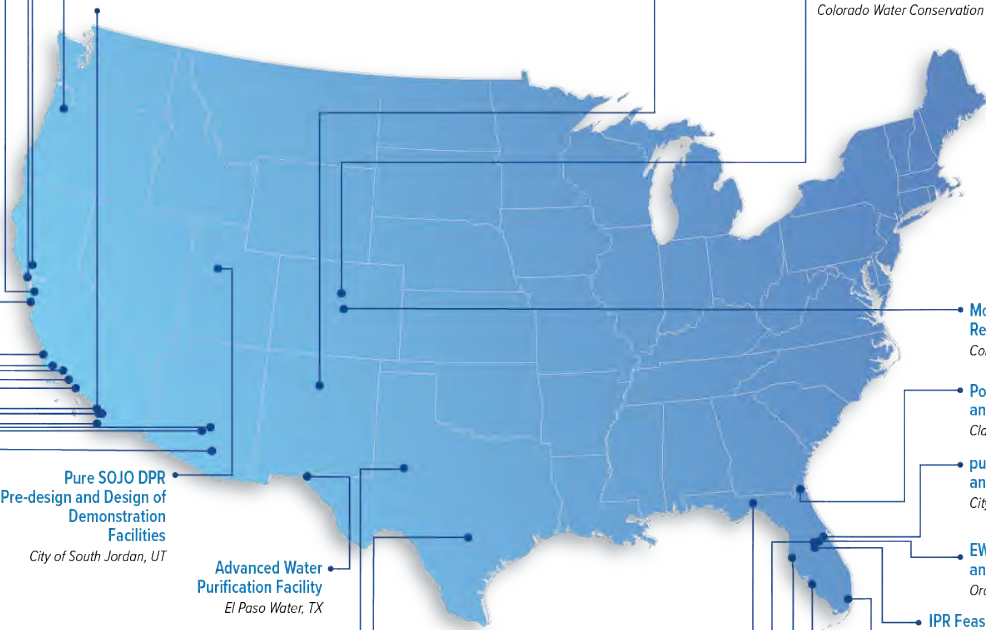
The Carollo team worked with a multi-disciplinary steering committee that represented water interests throughout the state to evaluate each water augmentation idea, and refine water augmentation concepts to select those that would be the most beneficial to Arizona residents.

CAROLLO'S DPR EXPERIENCE

300+ Reuse and Reclamation Projects

60+ Potable Reuse Projects Over the Past Ten Years

30B Gallons of Reclaimed Water Each Year



Potential Augmentation Opportunities

Resilient's project team delivers fact-based evaluations of water supply options that get Arizona closer to actionable strategies for augmentation. We submit the following augmentation opportunities for WIFA to consider that include new or augmented supplies within Arizona and from outside Arizona.

1. List of Potential Water Augmentation Opportunities

OPPORTUNITY NO. 1	Exchange Agreement with Colorado River Contract Holders in California

a. General Explanation of the Augmentation Supply and Delivery Strategy

California needs to strengthen its water supply reliability, especially with the drought experienced and water supply cuts underway and continuing along the Colorado River. One way for California water suppliers to increase water supply reliability is to beneficially use reclaimed water to supplement potable water supplies, instead of discharging this water to the ocean. Arizona can provide a key benefit to California water users with Colorado River contracts, while also shoring up its own water supplies by providing the financing to construct reclaimed water facilities in California used to increase potable water supplies that reduce the need for Colorado River water.

California municipalities benefit by having an increased, reliable water supply that is drought proof. In exchange, Colorado River contract holders in California give up a portion of their Colorado River supplies to benefit Arizona water users. This water could be left in Lake Mead to shore up lake levels and avoid water delivery cutbacks. Arizona water users could also take direct possession of Colorado River water no longer used by California water users. The following types of projects could be funded:

1. Advanced treatment to convert reclaimed water to a potable water standard.
2. Wastewater treatment to a standard that allows reclaimed water to be recharged into the aquifer for storage and recovery through wells, and the conveyance infrastructure needed to recharge the reclaimed water.
3. Water treatment and conveyance infrastructure needed to deliver reclaimed water for industrial and agricultural uses, freeing up other water sources for potable water use.
4. Brine management infrastructure and treatment that recovers brackish groundwater and concentrates brine so it can be disposed of in a landfill.
5. Groundwater injection facilities that prevent saltwater intrusion into groundwater aquifers.
6. Ocean desalination facilities that produce potable water.
7. Any other infrastructure or exchange agreement that improves water delivery to Colorado River water contract holders and produces a reliable water supply.

b. Estimated Annually Available Water Supply

The volume of water that would become available to Arizona depends on the exchange agreements that could be negotiated with California water users. The volume of water could be hundreds of thousands of acre-ft/year. The water supply provided in California would be a constant supply that could also be stored to supply seasonal peaks. The water supply to Arizona could be stored in Lake Mead until needed and could be available to supply peak demands within the constraints of the CAP canal system (which allows a peaking factor up to 1.32 times the annual average supply).

c. Duration of Resource Availability

This water supply could be available in perpetuity as long as parties to the agreement can fulfill their obligations. Financial arrangements of the exchange may need to be adjusted over time as the infrastructure paid by Arizona water users needs to be expanded, replaced, or upgraded.

d. Environmental and/or Regulatory Considerations and/or Limitations

Each project completed would need to satisfy the requirements of California and the jurisdictions where the water treatment and conveyance infrastructure is constructed. Any water treatment process that uses Reverse Osmosis (RO) treatment would generate a brine stream that needs to be managed to avoid discharges that could be harmful to the environment.

e. Jurisdictional/Political Considerations and/or Limitations

Reclaimed water treatment and storage facilities would need to be designed, constructed, and permitted according to laws in the state of California. Easements and right of ways would need to be obtained for reclaimed water pipelines.

f. Capital Investment, Repayment or other Financial Considerations and/or Limitations

The treatment and conveyance infrastructure will vary depending on the specific projects that are developed.

g. Approaches to Enhance the Sustainability, Security and Resilience of the Water Supply

Reclaimed water is one of the most reliable, drought-proof water supplies available. Reclaimed water development projects are sustainable, because the water supply is available in perpetuity as long as wastewater is being produced that needs to be managed. Reclaimed water use is more environmentally friendly than disposing of the reclaimed water into the ocean. Reclaimed water facilities can be designed with redundancy and reliability needed to effectively manage the infrastructure risks associated with this water supply.

Rendering of the future El Paso Water Advanced Treatment Facility in El Paso, Texas designed by Carollo Engineers. It will be the first large-scale direct to distribution potable reuse facility in the United States.

OPPORTUNITY NO. 2 — Groundwater Desalination in Arizona Alluvial Aquifers

a. General Explanation of the Augmentation Supply and Delivery Strategy

Brackish groundwater is located in the following areas in Arizona:

1. The Buckeye waterlogged area in the Cities of Buckeye, Goodyear, and Avondale. The current high water table is problematic for buildings, water and wastewater treatment facilities, and agriculture in the area.
2. Yuma County.
3. The Arizona water resource planning areas of the Colorado River Mainstream south, Lower Gila, Gila Bend, Lower San Pedro, Cochise, and Upper Gila.

Brackish groundwater could be extracted through groundwater wells and delivered to an RO treatment facility that would remove dissolved solids to meet potable water standards. This water supply could be delivered to communities that need additional potable water supplies. RO treatment would produce a reject stream that would require additional management and associated capital and O&M costs.

b. Estimated Annually Available Water Supply

Up to 50,000 afy of water supply could be obtained from the Buckeye waterlogged area. Brackish groundwater near Yuma could yield up to 10,000 afy. Additional investigations are needed in other areas of the state with brackish groundwater, but initial assumptions indicated these areas could yield 6,000 – 10,000 afy.

c. Duration of Resource Availability

The groundwater in the Buckeye waterlogged area is believed to be available in perpetuity because the pumped groundwater would be replaced by surface and groundwater supplies that flow to the waterlogged area. Withdrawal limits in other areas would need to be established through groundwater modeling.

d. Environmental and/or Regulatory Considerations and/or Limitations

The Buckeye waterlogged area is located within the Phoenix AMA. Currently groundwater pumping in the Buckeye waterlogged area is not subject to groundwater replenishment until 2034. ADWR could choose to require a groundwater replenishment obligation that would increase the cost of withdrawing groundwater in the waterlogged area.

Other areas of the state where brackish groundwater exists are not located in an active management area, so groundwater pumping is not restricted. Groundwater pumping limits for these areas will need to be established to prevent groundwater depletion.

e. Jurisdictional/Political Considerations and/or Limitations

Multiple entities could lay claim to water in the Buckeye waterlogged area, creating the need to evaluate and adjudicate water right claims to use the water.

f. Capital Investment, Repayment or other Financial Considerations and/or Limitations

The major cost components of a desalination project would be groundwater extraction, RO treatment, brine management, and conveyance to the points of use. Based on our previous evaluations, the capital and O&M costs associated with the required brine management facility would likely represent the more costly components of the brackish groundwater solution.

g. Approaches to Enhance the Sustainability, Security and Resilience of the Water Supply

A comprehensive groundwater modeling study would need to be completed to determine the sustainable water supply that could be extracted in each area.

In addition to surface water and reclaimed water supplies, brackish groundwater supplies can contribute to the overall water supply reliability of a community. The strategy of treating brackish groundwater can also be integrated with treatment of municipal or industrial cooling tower blowdown (which would have similar water quality) as part of larger regional solutions. This approach can further strengthen water resources and support resilience, even if one of the community's water supply sources is not available for any reason.

Thermal Brine Concentration Facility is a brine management solution for brackish groundwater.

OPPORTUNITY NO. 3 — Surface Water Treatment Along Arizona Canals

a. General Explanation of the Augmentation Supply and Delivery Strategy

Urban development is occurring in areas that have formerly been used for agriculture. As development occurs, water is no longer needed for agriculture and this water can be converted to municipal use - as long as there is a legal framework in place to cut over the agricultural water right to a municipality for potable water use. The water currently used for irrigation is often delivered through a canal system, and water treatment facilities will be needed to treat the water for potable use. For example, water treatment facilities could be constructed along the Buckeye canal and the RID canal to support development of potable water sources.

Infrastructure needed to supply water from canals includes a surface water treatment plant, storage, pumping, and transmission pipelines.

b. Estimated Annually Available Water Supply

The volume of water available for municipal use depends on the extent of land areas that are converted to municipal use and the water right that comes with these lands.

c. Duration of Resource Availability

Water supplies delivered through canals have supplies that are available in perpetuity, although canal water supplies may be restricted under drought conditions.

d. Environmental and/or Regulatory Considerations and/or Limitations

Surface water treatment plants produce a solid waste from the treatment process that can be disposed of in a landfill. Surface water treatment plants will need to be permitted in compliance with the laws of Arizona.

e. Jurisdictional/Political Considerations and/or Limitations

Water rights need to be established to convert irrigation water rights to municipal water rights. Our team has experience supporting communities with similar issues as part of our extensive integrated master planning efforts.

f. Capital Investment, Repayment or other Financial Considerations and/or Limitations

Capital funding for surface water treatment plants can come from public financing, impact fees, or from private partnerships. Water utility customers would pay for the debt payments for capital infrastructure, as well as ongoing operating and maintenance costs.

g. Approaches to Enhance the Sustainability, Security and Resilience of the Water Supply

Surface water supplies have proven to be reliable, although they may be subject to reductions during droughts.

In addition to groundwater and reclaimed water supplies, surface water supplies and associated treatment plants can contribute to the overall water supply reliability of a community by providing additional sources/flexibility in the event one of the supply sources is not available for any reason.

Union Hills WTP // City of Phoenix, Arizona

24th Street WTP // City of Phoenix, Arizona

Val Vista WTP // City of Phoenix, Arizona

Carollo Engineers has extensive experience designing facilities to treat surface water conveyed through canals including the City of Phoenix Union Hills, 24th Street, and Val Vista Water Treatment Plants.

WIFA / LONG-TERM WATER AUGMENTATION

OPPORTUNITY NO. 4	Alluvial Valley Groundwater Extraction Including the Harquahala Valley

a. General Explanation of the Augmentation Supply and Delivery Strategy

Southern and southwest Arizona has valleys with alluvial fill that are sparsely populated. Groundwater reserves in these areas could be quantified through hydrogeologic investigations, and valleys with sufficient reserves could recover water from the aquifers to strengthen water supplies in municipal areas. Arizona state law would need to be changed to allow groundwater stored in each aquifer to be pumped and delivered for municipal use.

The Harquahala Valley is one area where groundwater reserves have been quantified and Arizona state law permits this water to be extracted and delivered to municipalities that use the water for potable use. This water can be delivered via the CAP canal or by pipeline to nearby communities.

Infrastructure needed to implement these projects consists of wells, pumping stations, storage tanks, and pipelines. In some cases, water treatment infrastructure will also be required.

b. Estimated Annually Available Water Supply

The water supply from the aquifers in these valleys has not been quantified, with the exception of the Harquahala Valley, which can provide up to 80,000 acre feet per year. Withdrawal rates from these aquifers would need to be established to maintain aquifer viability over an extended time period. By themselves, these aquifers by would not be sustainable indefinitely. However, this water supply could be used in conjunction with other water resources to support an overall water resource program.

c. Duration of Resource Availability

Groundwater supplies would be available in perpetuity only if withdrawal rates matched recharge rates. However, these aquifers could be managed such that the water supply would be available for an extended period.

d. Environmental and/or Regulatory Considerations and/or Limitations

Arizona state laws would need to be modified to allow the extraction and transportation of these groundwater supplies, similar to the laws that have allowed groundwater to be extracted and transported to municipalities who use this water.

ADWR would need to establish rules for the management of each aquifer, including extraction and use of this groundwater to support the long term sustainability of these aquifers.

e. Jurisdictional/Political Considerations and/or Limitations

Groundwater in the Gila River and Upper Colorado River drainage areas may be subject to groundwater adjudications that will determine how much groundwater can be pumped and who has the right to pump this groundwater.

Land where groundwater could be extracted would need to be purchased to establish the water right to pump. Pipelines that deliver this water would require easements and right of ways to support construction.

Depending on the location of the valleys where pumping occurs and where the water is consumed, exchange agreements could be made that would reduce the infrastructure requirements to transport the water.

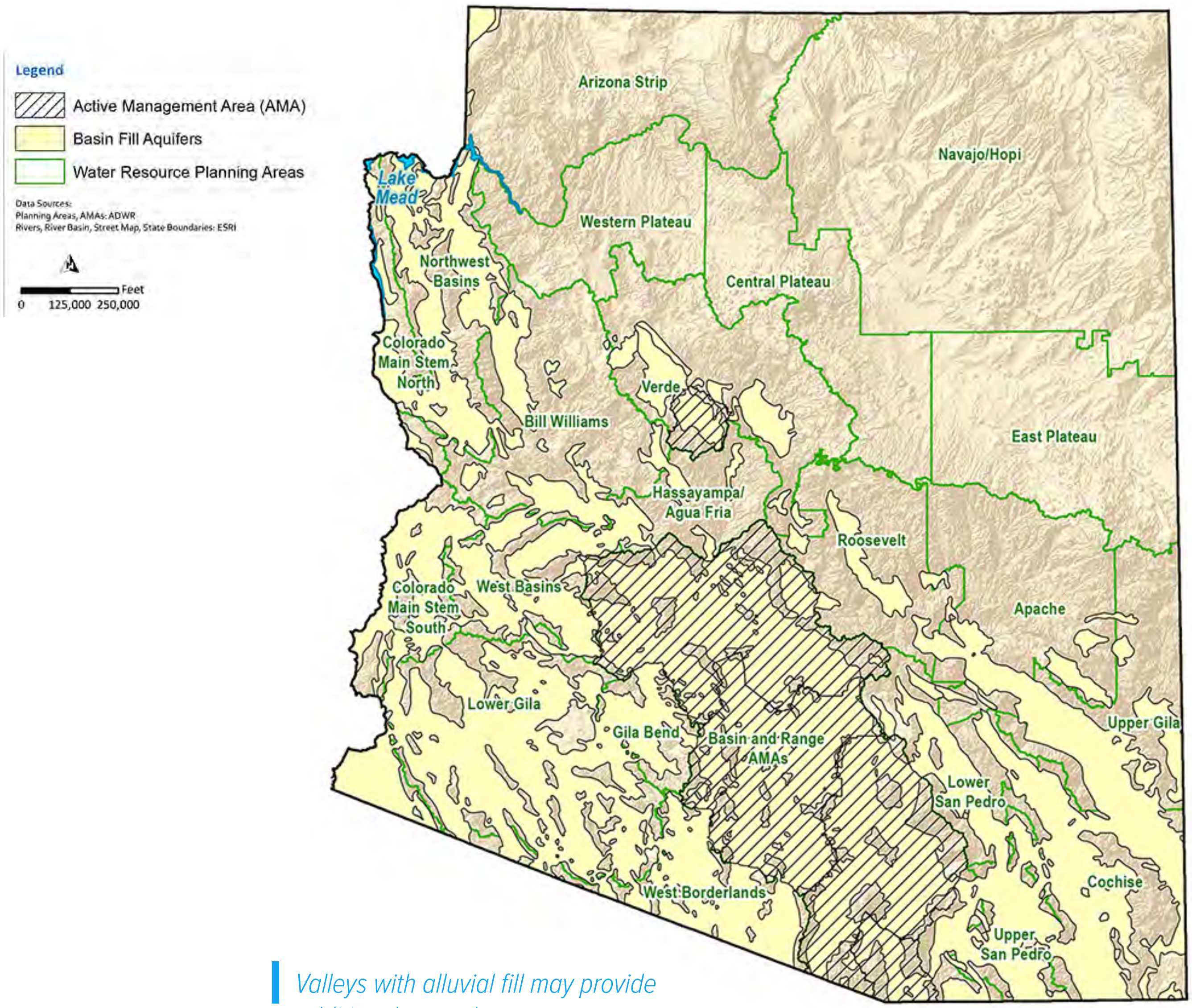
f. Capital Investment, Repayment or other Financial Considerations and/or Limitations

Capital investments needed to construct the wells, pumping, storage, and transmission facilities are expected to be substantial. Private investors that can provide capital for this infrastructure may play a key role in bringing these projects to fruition.

g. Approaches to Enhance the Sustainability, Security and Resilience of the Water Supply

Based on the likely remote locations, the infrastructure to extract and deliver this water would need to be designed with appropriate security. Redundant infrastructure would be needed to minimize the risk of disruption.

In addition to surface water and reclaimed water supplies, groundwater supplies and associated infrastructure can contribute to the overall water supply reliability of a community by providing additional sources/flexibility in the event one of the supply sources is not available for any reason.



Valleys with alluvial fill may provide additional ground water.

OPPORTUNITY NO. 5	Direct Potable Reuse

a. General Explanation of the Augmentation Supply and Delivery Strategy

Direct potable reuse (DPR) is when wastewater is treated to a potable water standard using advanced water treatment processes. This highly treated water is then delivered to potable water distribution systems. Arizona is in the process of establishing the regulations needed to permit treatment facilities that treat reclaimed water to produce potable water. Approximately 1/3 of potable water that is delivered to water distribution systems is returned to wastewater treatment plants. Currently, reclaimed water in Arizona is used in the following ways:

1. Recharged to the aquifer for aquifer storage and recovery schemes.
2. Used directly for irrigation or industrial uses.
3. Discharged to the environment without being reused.

Although reclaimed water is often used beneficially, using reclaimed water for DPR is the highest and best use for reclaimed water. As water supplies tighten, DPR will increasingly become the preferred way to use reclaimed water. Every wastewater treatment plant in Arizona could potentially be expanded for DPR, providing a reliable water supply that expands the potable water supply for many communities.

Infrastructure needed to implement DPR includes advanced treatment facilities, storage facilities, pump stations, and pipelines to convey the treated water.

b. Estimated Annually Available Water Supply

If all treated wastewater was used for DPR, the available supply could be up to 30% of current potable water deliveries for communities across Arizona. Variability in supply would be based on water demands and other seasonal variables (irrigation demands, etc.) that could have moderate impacts on the volume of wastewater produced and available for direct reuse.

c. Duration of Resource Availability

DPR water supplies are available indefinitely, as long as civilizations exist that produce wastewater.

d. Environmental and/or Regulatory Considerations and/or Limitations

Most DPR treatment processes incorporate Reverse Osmosis (RO), which produces a brine stream that needs to be managed. Managing this brine stream is often the most significant cost associated with providing DPR. Conversely, there are non-RO treatment options that continue to evolve.

e. Jurisdictional/Political Considerations and/or Limitations

One of the benefits of DPR is that the water is produced within the municipal jurisdiction where it is used, unless partnerships are developed with neighboring communities to provide advanced treatment services. Therefore, decisions on DPR can often be handled within a single jurisdiction.

Public acceptance of DPR as a potable water resource will be required wherever DPR is implemented.

f. Capital Investment, Repayment or other Financial Considerations and/or Limitations

Private partnerships, where the private partner provides the capital funding and ratepayers pay based on usage, is a helpful way for cash strapped utilities to fund DPR capital projects. Private partnerships may also be an effective way to provide services to more than one public agency and avoid the challenges that may come with inter-governmental agreements.

g. Approaches to Enhance the Sustainability, Security and Resilience of the Water Supply

DPR can be very sustainable because it avoids the need to find new water supplies that may not exist. DPR also makes ongoing use of water supplies within a municipality. The water supply is resilient because it will always be available, as long as a community generates wastewater.

In addition to surface water, ground water and reclaimed water supplies, DPR supplies and associated infrastructure can contribute to the overall water supply reliability of a community by providing additional sources/flexibility in the event one of the supply sources is not available for any reason.

Reverse Osmosis Facility for Direct Potable Water Treatment.

2. Potential Delivery Models for Augmentation Opportunities

For some surface, reclaimed, or groundwater sources where project costs and complexity are manageable, traditional funding and delivery models may be applicable. Projects could be funded through traditional municipal, state of federal mechanisms (including WIFA) and delivered using Design-Bid-Build (DBB), Construction Manager at Risk (CMAR), or Progressive Design Build (PDB).

However, for more complex (i.e. involving multiple entities) or costly projects, public-private or private project development efforts are an effective mechanism to spur innovation, work through multi-stakeholder involvement, and move forward on WIFA goals faster than a public-only approach when time is of the essence. A project development approach relies on definitive buyers for the volume, quality and timing of the water resources which are required under balanced long-term purchase contracts. WIFA can encourage this type of innovation and support the long-term commitments that allow the leveraging of typical project finance which expands WIFA's total capital to meet the goals.

In addition, project financing approaches require risk transfer and reduction, and WIFA has financial tools that can be used to balance or backstop risks. For example, if WIFA could offer water volume purchase backstops or credit enhancements, then these tools could help unlock earlier or higher levels of private project financing that could fill in specific project gaps.

By stretching WIFA funds further, this allows WIFA to develop a broader portfolio of augmentation solutions rather than concentrating resources a single large 'moon shot' scale project. Broadening WIFA's resources could also focus on early model projects that could be replicated or extended over time as both WIFA's and other resources are expanded over time.

3. Funding Recommendations

WIFA may be able to prioritize projects that meet specific augmentation volume goals. However, we recommend also using evaluation criteria such as source reliability and capacity of a project to provide a consistent local source of water resources, along with cost, social benefits and sustainability. In addition, some projects may be delivered more quickly and replicated over time to achieve scale, whereas more complex projects could take decades to deliver on their results to local communities. Measuring the risk and return of any project is required to make certain the protection and preservation of public capital, and the private sector is often very skilled at reducing risks through the project development process to reduce the potential of lost capital. These are some of the criteria to consider adding to the WIFA project evaluations like cost, social good and sustainability.

Private sector funding can be used effectively when a single large buyer or consortium of buyers enters into a water purchase agreement to acquire a volume of water sufficient to allow the financing of that covers the fixed costs. If the infrastructure can be phased or scaled-up, then the there may be a lower threshold volume to be contracted. Also, private sector funding can be tapped for development phases so long as there is certainty of project acceptance, and in the case where early risks are unacceptable to the private sector, perhaps WIFA funds could be a first-loss backstop to the private sector. WIFA could also offer to cover specific types of early development costs or match private sector funding in a way that reduces the capital at risk as well as extends WIFA's available capital to fund a broader set of projects. These are some example of how private sector funding could extend the funds available through WIFA in a way that shares risk.

4. Market Capacity Constraints to Deploy Water Augmentation Plans

Depending on the timing of the projects, there are a variety of potential market drivers and constraints that could impact project costs and schedule. As has been well documented, continued inflation since 2020 has significantly increased the associated capital cost of projects. Materials, equipment, and labor costs have all risen sharply, resulting in historic increases in overall project costs. While many commodity and equipment prices have begun to stabilize in recent months, project costs remain at historic levels and a variety of economic and political factors could drive additional cost increases in 2024 and beyond.

Similarly, equipment and material delivery times have experienced significant increases over the last 36 months, due to a variety of factors. Typical treatment and electrical equipment for the proposed water augmentation projects is currently being quoted at 50-60 months, with no indication of relief in the near future.

Finally, continued residential and especially industrial growth in Arizona will significantly stress A/E and construction industry resources. Municipalities will be challenged to expand their water, wastewater, and reclaimed water infrastructure to support residential growth. At the same time, large, complex, fast-tracked industrial projects, including ongoing and planned semiconductor and data center builds, will require massive, skilled resources to execute and offer highly competitive compensation, further straining the resource pool available to support traditional water augmentation projects.

Fortunately, there are a variety of approaches to minimize the impact of these risks, including alternate delivery, preprocurement of long lead equipment and materials, preprocurement of commodity materials (to lock in favorable pricing), etc.

5. Perspectives on Challenges

Seeking public consultation is an important step to seek understanding, share information, and build a foundation of support for major infrastructure projects. The stakeholder engagement component involved in permitting and the rights of way for conveyance across different jurisdictions and land ownership is a significant barrier that presents difficult to assess risks. WIFA could play a role in supporting consultation processes that increase the stakeholder understanding and buy-in for augmentation projects that have broad benefits and a long development timeline.

There are various rules and regulations that augmentation projects and infrastructure development must adhere to throughout the project lifecycle. WIFA has a unique position to understand what types of rules or enhanced regulations would support the faster development of augmentation projects or make it more streamlined to reach the water goals of the state.

Augmentation projects that fit more clearly within the current regulatory framework or that enhance bringing stakeholder groups or communities together to reach consensus may have overall higher chances of success or lower risks. WIFA might be able to develop a framework that assesses proposals along these dimensions in order to reduce the headline risks and protect both public and private capital allocated to projects. Stakeholder engagement and building goodwill early in the project lifecycle is important to build consensus and reduce these types of risks.

November 15, 2023
SOURCE Global, PBC
RFI for WIFA Long-Term Water Augmentation

Dear WIFA Board Member(s),

We appreciate your consideration of SOURCE Global's response to the RFI for Long-Term Water Augmentation where we identify an innovative, reliable, and sustainable solution to augment Arizona's water supply.

Solar Atmospheric Water Harvesting (SAWH) is a novel solution initially developed at Arizona State University which utilizes the state's abundant solar energy to convert atmospheric water vapor into safe, reliable, and high-quality drinking water.

SAWH's positioning as an off-grid and high-quality drinking water solution should be part of Arizona's supply augmentation toolkit. SAWH offers the most carbon-efficient gallon of water with turnkey implementation, minimal lead times, and low maintenance.

Thank you for your time and consideration.

Best Regards,

Colin Goddard
colin@source.co

A. General Information and Experience

Please briefly provide the following descriptive information to aid WIFA in understanding the identity, business, and authorities of the Respondent and its team members.

Name of Respondent, team members, and anticipated roles and responsibilities related to this opportunity.

Entity: SOURCE Global, PBC

Organization contact(s):

- Dr. Cody Friesen, Founder and CEO, SOURE Global, PBC
  cody@source.co

- Colin Goddard, VP of Business Development, North America
  colin@source.co

For privately held and investor-owned entities, describe your ownership and management structures.

Certified Public Benefit Corporation (PBC), founded and based in Arizona, USA

For public agencies, describe your statutory authorities including any authorities to own and manage water rights and water supply facilities.

N/A

Describe each member's involvement and experience with existing water augmentation projects, programs or initiatives, municipal and industrial provision, and non-consumptive provision.

Dr. Cody Friesen leads all aspects of Source Global's work and partnerships on key water augmentation projects globally. Colin Goddard leads the development of partnerships and water augmentation projects in the US, particularly with governmental, utility, and nonprofit partners.

B. Potential Augmentation Opportunities

1. WIFA is seeking to develop a list of potential water augmentation opportunities that result in new water supplies for the state of Arizona. Augmentation opportunities that include new or augmented supplies within the state and from

outside the state will be considered. Please provide a general description of potential water augmentation opportunities that you have identified or believe may be valuable for WIFA to consider. For each opportunity, please include:

a) **General explanation of the augmentation supply and delivery strategy.**

Water is both a finite and localized resource. A core challenge throughout history has been to convey water from its point of origin to where it is required, whether for agricultural, municipal, or industrial needs. Technological advances have helped to overcome this challenge from qanats in the Persian Empire to aqueducts in the Roman Empire to the Theodore Roosevelt Dam on the Salt River and 180 miles of canals throughout Arizona.

These advances achieved a core objective: transporting water from where it *is*, to where it's *needed*. However, conveying water through mega-projects also has downsides: high upfront capital expenditures, an elevated carbon footprint, long implementation timelines, and numerous environmental externalities.

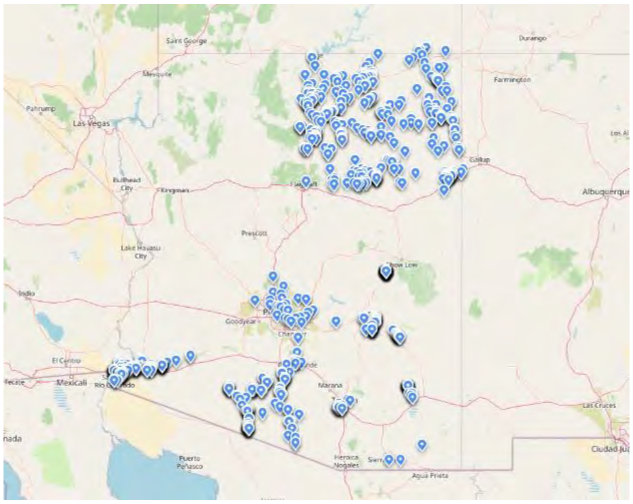
Access to safe, affordable, and sufficient water is a fundamental human right. Today, thousands of Arizonans have elected to augment their water supply by tapping into the approximately 307,000,000 acre-feet of water vapor available in the troposphere that passes over the State's boundaries each year.

Solar Atmospheric Water Harvesting (SAWH), a novel solution initially developed at Arizona State University, utilizes the state's abundant solar energy to convert the atmospheric water vapor referenced above into safe, reliable, and high-quality drinking water. By opting for a decentralized off-grid source, residents are bolstering resiliency, supporting self-sufficiency, reducing the extractive impact, and buttressing water security. Additionally, for the estimated 300,000 Arizonans[1] who rely on private wells as their primary source of drinking water and those households that are forced to rely on hauled water, the solution offers democratized access without the carbon footprint.

Arizona is the global leader in pioneering R&D in SAWH technologies. SOURCE Global, the Scottsdale-based Public Benefit Corporation, is a vanguard in the field through its innovative Hydropanel. There are already more than 2,900 Hydropanels operating in more than 990 locations across Arizona that collectively augment 2.5 acre-feet each year. By adopting SAWH, what was once a locally finite resource has become an on-demand ubiquitous resource produced exactly where it is needed.

It is important to note that SAWH is distinctly different from legacy "Atmospheric Water Generation (AWG)" methods which inefficiently convert power grid energy into water and do not function in arid, low-humidity environments.

[1] https://azdeq.gov/groundwater-protection



993 SOURCE sites and 2,943 Hydropanels as of Nov. 2023

Arizona is a leader with respect to utilizing and diversifying its water supply across municipal, industrial, and agricultural sectors. The Arizona Department of Water Resources 2019 report[2] entitled "Long-Term Water Augmentation Options for Arizona" encouraged a continued focus on implementable water supply solutions for specific purposes. State officials are currently investigating and evaluating a range of potential solutions to mitigate water stress including weather modification, ocean desalination, treatment, and use of brackish groundwater and reclaimed water.

It is critical that any drinking water solution achieves social acceptance. There are approximately 25,000 Arizonans currently obtaining drinking water from water systems with health-based violations[3]. Additionally, more than 320 community water systems have stated plans to provide bottled water as a primary Emergency and Backup Water Supply plan.[4] Further, hundreds of homes in Irrigation Districts with "Alternative Water Exclusions" indefinitely require drinking and cooking water to be purchased in a bottle or trucked and transported to the home without exception.[5] As such, the status quo results in an elevated carbon footprint, burden of single-use plastic waste, and extractive impact on local watersheds.

SAWH's positioning as an off-grid and high-quality drinking water solution should be part of Arizona's supply augmentation toolkit. SAWH offers the most carbon-efficient gallon of water with turnkey implementation, minimal lead times, and low maintenance.

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[2] https://new.azwater.gov/sites/default/files/Long-Term%20Water%20Augmentation%20Options%20final.pdf

[3] EPA ECHO Database

[4] https://app.powerbigov.us/view?r=eyJrIjoiM2UzODFhYjItZjNiMC00ZWVmLWI1YzktM2E3OWE4Y2I2MDhmIiwidCI6Ijg3MmQzYTFkLWVjMmItNGZjZC05ZDFjLWM0NTllYzhjZmIwNyJ9&pageName=ReportSection90c5c031ca8043a492cf

[5] ADEQ, "ADEQ Director Steve Owens Issues Consent Order for Wellton Mohawk Irrigation and Drainage District", https://legacy.azdeq.gov/function/news/2003/nov.html

There are real examples where other augmentation strategies will fall short of resolving the problems themselves and require additional investment, whereas, an SAWH augmentation strategy could be pursued in a more rapid, cost-effective, net-water positive manner.

b) Estimated annually available water supply, if estimates exist. Also provide any information available on the reliability and sustainability of the supply along with any information on annual or seasonal variation of the supply, if available.

The water supply available through SAWH is renewable in perpetuity and naturally recycled on a weekly basis as part of the hydrological cycle. To quantify this transboundary supply specific to Arizona, we take the state area as a fraction of the total area of Earth's surface and find this to be 5.79e-4 mi^2. We then multiply this term by the total water vapor in the troposphere, 1.25e16 kg, and calculate the proportion of water vapor in the troposphere above Arizona to be 7.23e12 kg. Converting this to Acre-feet using a factor of 1.23e5 kg/AF, we find the total available water supply is 5.87e6 or 5.87 million Acre-Feet. Recycled weekly, the total water supply on a yearly basis becomes 307 million Acre-Feet. In addition, increasing global temperatures are causing an increase in the capacity of the atmosphere to hold water which indicates that the available supply will only continue to increase into the foreseeable future.

c) Duration of resource availability if there is the potential that the supply may not be available in the long term or in perpetuity.

Tropospheric water vapor should be considered a water supply available in perpetuity based on the perennial role the atmosphere plays in the water cycle. The troposphere is defined as the lowest region of the atmosphere that extends from the Earth's surface to a height between 3.7 to 6.2 miles.

There are 12,500,000,000,000,000 kilograms of water vapor in the air. It's about six times all of Earth's rivers at any given time. And the average water molecule stays in the atmosphere for about a week. Because water molecules are constantly being replenished, there is an inexhaustible supply, meaning that availability and security of supply will never be an issue.

d) Environmental and/or regulatory considerations and/or limitations.

Currently, the Arizona Department of Environmental Quality defines water within the State of Arizona as: "Waters of the state, as defined in statute, are all waters within the jurisdiction of this state including all perennial or intermittent streams, lakes, ponds, impounding reservoirs, marshes, watercourses, waterways, wells, aquifers, irrigation systems, drainage systems, and other bodies or accumulations of surface, underground, natural, artificial, public or private water situated wholly or partly in or bordering on the state."[1] The unregulated nature of water vapor contained in the troposphere allows Arizona to be at the forefront in tapping this resource to augment its needs without the limitations accompanying legacy water sources.

e) Jurisdictional/political considerations and/or limitations.

Arizona can act unilaterally to tap this supply within state boundaries as water vapor in the air is not tied to adjudications, settlements, or the legal and political frameworks of ground or surface water supplies.

At SOURCE, we believe that any technology which can democratize access to high-quality drinking water has merit. We are seeking public and private and sector champions as well as advocates to support widespread deployment of the technology. We believe that Arizona is the ideal location for this partnership.

f) Capital investment, repayment, or other financial considerations and/or limitations.

When amortized over operating lifetimes, drinking water produced via SAWH technologies like Hydropanels are an order of magnitude cheaper than bottled water or jugged water options, and without the carbon footprint or waste burden. This is, in part, due to the decentralized nature of SAWH which neither requires extensive infrastructure investment nor elevated long-term O&M costs, as the key inputs (i.e., sunlight, air moisture) are free.

g) Approaches to enhance the sustainability, security, and resilience of the water supply.

SAWH technologies, which are commercially viable today, are also completely scalable (similar to a solar farm). Scaled deployments lower current cost curves even further, increase unit yield, and increase operational lifespans – which collectively have the net effect of enhancing the sustainability, security, and resiliency of the water supply.

2. WIFA may consider a variety of delivery and/or ownership models for augmentation opportunities, including long-term purchase contracts, a variety of P3 agreements (ref A.R.S. § 49-1211), or other models. Please provide information on factors that will positively or negatively influence your consideration of various potential delivery models. Does an alternative delivery or P3 agreement make the identified water augmentation initiatives more or less attractive business opportunities?

Long-term water purchase contracts, P3 agreements, and other delivery and ownership models for additional augmentation opportunities are equally viable with SAWH-based strategies.

3. Given constraints on funds available for water augmentation projects, are there recommendations on how to best prioritize, finance, and pay for proposed WIFA augmentation opportunities including those utilizing P3 agreements?

Prioritize SAWH strategies in areas with acute drinking water supply challenges. This includes extremely rural locations with low population densities and dependence on wells and other limitations that result in high cost-per-connections with respect to traditional centralized water infrastructure. This can include areas with reliance on bottled water or haul water long distances.

4. Are there any practical market capacity constraints to deploy water augmentation plans (e.g., physical construction limits, current water pipeline manufacturing and delivery capacity in a given year, other supply chain constraints, labor or any other constraints that may impact the capacity to deliver a total augmentation plan)?

Available space is the principal constraint in implementing SAWH augmentation strategies to ensure there is enough physical space at the location that can be converted into an SAWH asset to generate the volume needed at the location.

5. If Respondents have perspectives on challenges (financial, political, social, regulatory) that may not be project/program specific, they are invited to share opinions that may aid WIFA in analyzing potential responses.

None.

LONG TERM

Water Augmentation

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA
REQUEST FOR INFORMATION FOR LONG TERM WATER AUGMENTATION

November 15, 2023

November 15, 2023

Water Infrastructure Finance Authority of Arizona (WIFA)
LTWAF@azwifa.gov

Subject: Request for Information for Long Term Water Augmentation (LTWA)

Dear Water Infrastructure Finance Authority of Arizona,

Future growth and economic development in the State of Arizona and the broader Sonoran Desert mega-region depend on how the State, WIFA and private and public sector partners collaborate inclusively and strategically to implement water augmentation initiatives in an affordable, energy conscious, an environmentally responsible way. Recognizing the level of antiquated water infrastructure and water scarcity issues faced by the State, a group of like-minded public and private partners—brought together by the Canada Arizona Business Council (CABC) over a year ago—began openly exploring ways to help our wider community achieve short, medium, and long-term water augmentation solutions to improve our water supply portfolio for the coming years. Since then, additional partners have engaged to provide unified, globa expertise in water engineering, financing and funding, geopolit cal consultation, construction and operations, and social and community engagement. Together, these partners—**CABC and its members EPCOR, Freeport McMoRan, PCL, and Stantec; significantly bolstered by Aqualia, the University of Arizona's Water Resources Research Center (WRRC), and Montgomery & Associates**—provide WIFA a uniquely qualified and diverse set of expertise and delivery capacity th ough which to assess what is possible when the best of public and private enterprises across the US/Mexico/Canada geopolitical landscape come together to achieve the water supply augmentation goals outlined in WIFA's 5-Year Strategic Framework.

There is no question that the Sonoran Desert mega-region, Arizona and California, and other Colorado River Basin States are uniquely linked and set for rapid growth over the next 25 years. A combination of in-state and bilateral infrastructure is needed on both sides of the border requiring exceptional technical solutions, institutional-grade financing, binational political ngagement, alliances with water users/buyers, and community engagement. Public-private partnerships (P3) are needed to deliver the billions of dollars of water augmentation solutions of this scale and timeline.

Our group of partners submits the following RFI response that contains thoughtful discussion on the qualities needed to make a partnership successful, commentary on potential "win-win" solutions, insights into delivery methods, and approaches to mitigate risks related to market conditions and overall delivery.

Our response is the result of over a year's effort. Some approach details have been omitted to meet pag limits. Therefore, we request a one-on-one meeting with WIFA staff and interested board members to presen our proposed water augmentation opportunities and answer any questions you may have.

Stantec Consulting Services, Inc.

JOHN TAKE, PE, P.Eng.
Executive Vice President, Chief Growth & Innovation Offic
Tel: (520) 545-7450; Email: john.take@stantec.com

The long-term sustainability of our beloved Sonoran Desert is critical; as partners we are committed to redefining what is possible for water, food, and energy security in our community.

Respondent Name
Stantec

RFI Designation Name
Group of Partners

A. General Information and Experience

A1. Respondent and its Team Members

Respondent Stantec and its group of partners offer WI A a consortium of industry leaders in mega project development to identify solutions that can meet regional long-term water needs. Informed by over a year of consultation with industry leaders—as well as beginning open dialogues with local, regional and state governments, interested parties, and allies like the Tucson Water, Dr. José Luis Rubio Pino, Cities of Nogales, AZ, Central Arizona Project, Salt River Project, and others—our socially, politically, economically, and environmentally conscious group of partners includes:

AQUALIA

A globally renowned private water management firm specializing in design construction, O&M and water infrastructure concessions—particularly in Mexico—Aqualia can help Sonora solve, fix finance, and build sustainable solutions i Northern Mexico.

CABC

With Project HourGlass, CABC was the catalyst for starting conversations about the future of water in the Sonoran Desert Mega-region among multiple stakeholders and industry leaders who have a vested interest in advancing long-term water augmentation solutions, such as the Canadian Pension Plan Funds and others. They will be integral in helping maintain momentum for this initiative in an inclusive, transparent, and open way, especially related to potential cross border solutions.

EPCOR

A CABC member and water/wastewater services utility providing water services to 428,000 people in Arizona, EPCOR has a vested interest in collaborating to achieve sustainable, long-term water solutions.

FREEPORT MCMORAN

A major employer in Arizona and potential water buyer, Freeport McMoRan offer strength in examining options that better integrate Sonora's needs, including potentially selling water as an asset to Arizona, like is done in Mining and Agriculture products.

MONTGOMERY & ASSOCIATES

Arizona groundwater specialists, Montgomery & Associates, leverage local expertise to streamline technical and regulatory compliance components of potential projects.

PCL CONSTRUCTION

CABC member PCL offers constructio expertise and previous work for the IBWC and relevant water augmentation projects.

STANTEC

A CABC member, we offer expertis in groundwater, desalination, potable reuse, energy optimization, increased electrification, renewable energ generation, and storage. Our US Water Alliance Board of Directors role provides WIFA access to a network of leaders delivering sustainable One Water solutions. We also offer funding and publi engagement expertise for multi-billion-dollar water augmentation programs.

WRRC

Our partnership includes CABC member WRRC. Directed by Dr. Sharon B. Megdal, WRRC brings significant transboundar policy/binational engagement and transboundary aquifers experience that could help shape the region's water future.

Our partnership offers technica know-how and the financial and politica capabilities to foster inclusive, long-term solutions for the Sonoran Desert Mega-region. The following pages identify each member of the partnership along with long-term water augmentation experience related to our proposed concepts in Section B.

Stantec

Lead respondent, technical designer, water augmentation infrastructure design expertise

Ownership and Management Structures

Stantec is a publicly traded company with common shares traded on the NYSE and TSX under the symbol STN. Our nine-person board of directors sets the tone for our operations, fulfill their roles guiding management of the Company's business and affairs, and adhere to sound corporate governance practices. We provide services in five business operating units: Buildings, Energy & Resources, Environmental Services, Infrastructure, and Water. Stantec operates in three regional operating units (ROU)—Canada, the United States, and Global. Each ROU has a regional operating unit leader (ROUL) who reports to the chief operating officer (COO). In the Global ROU, the COO—Globa and ROUL—Global roles are combined. Each ROU contains a number of regions where Stantec has a presence. Each region is led by a regional leader (RL). Our global regions outside North America are led by country managers, who report to the COO—Global. Business Centers (BCs) are the base unit of the organization within Stantec.

Project Involvement and Experience

Stantec unites over 28,000 employees working in over 400 locations across 6 continents, including 182 US offices. e have nearly 5,000 water engineers and experts proficient in the design of major water supply and wastewater treatment systems including indirect potable re-use for municipal, agricultural replacement, and industrial; direct potable re-use; brackish groundwater desalination (with brine management) for municipal use; brackish groundwater desalination (with brine management) for industrial use; major pipeline projects; major dam raises; aquifer/groundwater development projects; and industrial and agricultural water conservation initiatives.

Stantec's ENR Rankings

#1 International Wastewater Firm

#2 International Water Firm

28K
Employees worldwide

400
Locations across 6 continents

182
US offic

5K
Water engineers and experts

Stantec Projects

Pure Water San Diego Program Phase 1, City of San Diego, Public Utilities Department, San Diego, CA
Stantec is providing program management services for the first phase of the San Diego Pure Water potable reuse Program to produce a safe, reliable, and cost-effective water supply for the City and reduce the City's water import needs amongst limited resources. Relevant infrastructure includes a reclamation plant expansion, new pure water facility, a pump stations, and pipelines. As part of this project, our team helped the City achieve regulatory permitting requirements, resulting in the first NPDES permit for reservoir augmentation in California.

Jackie A. Meck Water Campus, City of Buckeye, AZ
The City of Buckeye's escalating growth has created an unsatisfied demand for more potable water. As part of a progressive design team, Stantec designed raw water infrastructure, treatment infrastructure at the water campus, and finished water supply infrastructure. Other than the tailored approach to flexible project delivery which resulted in significant schedule savings, Stantec also led the City in optimizing reverse osmosis treatment options to consider advanced and emerging technologies to improve recovery and mitigate brine management issues.

Victorian Desalination Project, Department of Sustainability and Environment and AquaSure Pty Ltd, Melbourne, Victoria, Australia
The Victorian Desalination Plant (VDP) is one of the Victorian Government's five key strategies that will help secure Victoria's water supply against the effects of climate change, population growth and drought. The desalination plant can provide up to 150 billion liters of water per year regardless of rainfall, which is more than a third of Melbourne's yearly needs. As part of our services, Stantec provided review of over 1,700 design document packages, including 485 Approved-for-Construction packages.

Pure Water Southern California (PWSC) Program – AWT Planning Studies, Metropolitan Water District of Southern California (Metropolitan), Carson, CA
Our team has helped Metropolitan define the current configuration of PWSC and its major program elements including the design of the Advanced Purification Center demonstration facility. PWSC aims to produce up to 150 MGD, providing a resilient local supply of purified water.

Program Management Services – Pure Water Antelope Valley, Palmdale Water District, Palmdale, CA
Stantec assessed groundwater replenishment via direct injection and/or surface water augmentation indirect potable reuse at Palmdale Lake. Stantec developed conceptual design, cost estimates, and is providing program management services for a 4.8-MGD advanced water purification facility and associated conveyance and injection infrastructure.

Groundwater Reclamation Water Services Program (GWRS) and Advanced Water Purification Facility (AWPF), Orange County Water District, Fountain Valley, CA
This $492 million project involves purifying highly treated effluent water and using it as a groundwater replenishment source and a seawater intrusion barrier. Stantec provided CM and project administration for a 70-MGD AWPF with pumping stations and 14 miles of pipeline.

Aquifer Storage and Recovery (ASR) Well Program, South Florida Water Management District, Okeechobee, FL
With a planned total capacity of 275 MGD, this is currently one of the largest ASR projects in the world. It involves the construction of 55 ASR wells at eight sites throughout the Lake Okeechobee watershed. Stantec provided permitting support, hydrogeological assessment, groundwater modeling, well and treatment plant design, and CM.

Canada Arizona Business Council (CABC)

Geopolitical consultation, conduit to financiers and contractors

Ownership and Management Structures

The CABC is a non-profit, 501(c)(6) Arizona business league with diverse membership (92 members, limited to 100) and connections to politicians, local municipalities, and financial institutions. Glenn Williamson, Founder and CEO, brings 35 years of experience in leadership, diplomacy, entrepreneurship, and mentorship, enabling effective navigation of international business relationships and partnerships. CABC's structure facilitates collaboration, trade, and investment opportunities between Canada and Arizona.

Project Involvement and Experience

The CABC is an exclusive, peer-to-peer network of executives who operate at the highest levels of the private and public sectors. The CABC believes in inclusion and diversity and strives to exemplify best practices and lead by example. We are a transaction-oriented group where results are valued and members help each other obtain their business goals. This philosophy assures each member of one degree of separation with decision makers in any field on either side of the borde . Membership lists are not published or sold to anyone.

92 CABC members

35 years

Glenn's experience in leadership, diplomacy, entrepreneurship, and mentorship enables effective navigation o international business relationships and partnerships

Project Hourglass Meeting with Pension Fund Office, Arizona, Canada, and Mexico

The CABC has created initiatives to foster business and enable a planned growth strategy for Arizona, Canada, and Northern Mexico, including the water augmentation initiative: Project Hourglass. This initiative drives cooperation, encouragement, and support for decision makers in the water conservation/augmentation arena in public and private sectors. The top of the hourglass is full of solutions waiting to trickle down to obtain the goal of "new water resources." It consists of three phases: (1) how to create better efficiency, conservation and water reuse, (2) updating infrastructure and technologies for groundwater, agriculture, capture and storage, and (3) finding new water and moving it through interstate and international augmentation. CABC is most concerned with Phase 3, the movement of water into the state, creation of new water inside the state, and helping Mexico improve water security in a joint fashion via the viable concepts proposed in this RFI response.

Montgomery & Associates (M&A)

Groundwater/hydrogeological specialists, Arizona groundwater policy and regulatory specialists

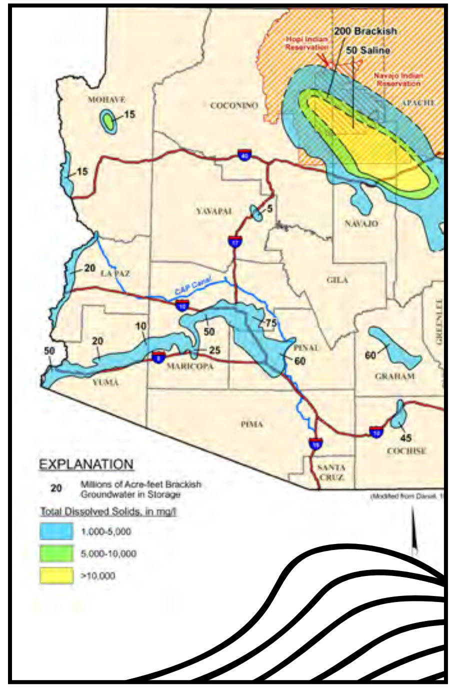
Ownership and Management Structures

M&A is governed by a five-member board of directors that guides the company's management and financial practices. Headquartered in Tucson, M&A operates offices in Phoenix Reno, Salt Lake City, four offices in California, and subsidiarie in Argentina and Chile. Each office is led by an operation manager who oversees project management and staff. Operations managers report to and collaborate with the executive leadership team consisting of a president, two vice presidents, and a chief financial offi .

Project Involvement and Experience

M&A is a leading groundwater development and management firm owned by a group of employee shareholders and operated by practicing scientists who oversee 100 hydrologists, geologists, and other scientists providing technical services in water resource planning, environmental hydrogeology, groundwater modeling, surface water, water supply and recharge, mining hydrogeology, and data management.

100+ Hydrologists, geologists, and other scientists providing technical services



Statewide Brackish Groundwater Inventory, Central Arizona Water Conservation District, Various Locations, Arizona

M&A was hired to assist Central Arizona Water Conservation District in its 2008 brackish groundwater study. M&A's work involved creating an inventory of resources, developing a comprehensive database, and preparing maps and a matrix of anticipated well yields and estimated volume of brackish groundwater in storage. In 2023-2024, M&A is updating the 2008 Statewide Brackish Groundwater Inventory under a contract with ADWR. Five potentially favorable areas have been identified for developing brackish groundwater supplies. M&A projected the impacts to residents and businesses using groundwater in these areas and recommended the next steps.

M&A Projects

Arizona Long-Term Water Augmentation Study, ADWR, Various Locations, Arizona

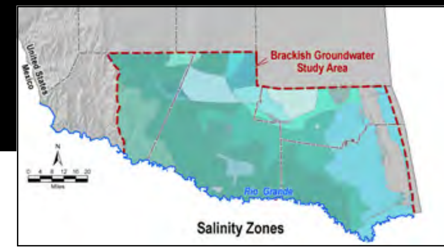
M&A supported the preparation of a long-term water augmentation study, identifying statewide water demand and potential water supplies to fill data gaps. Our work included developing specific criteria for evaluation factors; evaluating options for each planning area; and identifying and evaluating water augmentation projects. We evaluated regulatory and legal opportunities and barriers to augmenting water supplies statewide. Such barriers include ongoing water rights adjudications that impede planning for future water needs and long-term reliability; unresolved tribal water rights claims; and lack of statewide groundwater management planning.

Pure Water Antelope Valley Water Augmentation Project, Palmdale Water District (subconsultant to Stantec) Palmdale, California

On a team with Stantec, M&A developed a hydrogeologic conceptual model (HCM) for this regional water augmentation program, and the HCM supported development of a numerical groundwater flow model. The model was calibrated to local hydraulic gradients and used to estimate underground retention times of treated water.

High Desert Water Bank, Antelope Valley-East Kern Water Agency (subconsultant to Stantec), Palmdale, California

M&A has been integral in the development of the High Desert Water Bank (HDWB) that aims to improve water supply reliability and generate revenues to offset costs to its customers. In 2019, M&A was part of a team with Stantec to assist in design and construction. Work included developing recovery well technical specifications; conducting a hydrogeologic testing program; designing and managing construction and testing of deep monitoring wells, vadose zone piezometers, and grouted piezometers; overseeing drilling, design, construction, and testing of high-capacity recovery wells; preparing Watermaster Storage Agreement application; and assessing and adapting USGS groundwater model.



Brackish Groundwater Assessment, Texas Water Development Board, Austin, Texas

M&A assisted with the Lower Rio Grande Valley brackish groundwater assessment for the Texas Water Development Board (TWDB). The work included updating TWDB's Brackish Resources Assessment Characterization System database and developing databases and a 3D geologic model. Data from the conceptual model were incorporated into a numerical groundwater flow model and used to calibrate to groundwater and surface water conditions.

Aqualia

Water user, infrastructure builder, O&M expert, water cycle operator & management expert

aqualia

Ownership and Management Structures

Aqualia is a water management company owned by citizen services group FCC (51%) and IFM Investors (49%). FCC's core business is water, infrastructure and environmental services, with a broad presence across Europe, North Africa, Middle East and America (Mr. Carlos Slim is majority shareholder of FCC). The Australian ethical fund IFM Investors is a leading global provider of investment services across infrastructure, debt investments, listed equities and private equity. Aqualia serves 43.7 million people in 18 countries providing safe clean water and sanitation with a focus on sustainability, efficien , and affordabilit . The Board is the most senior body responsible for representing and managing the company, delegating its duties to the CEO. In collaboration with the Managing Committee, the CEO manages corporate activities via different committees. Aqualia's experience covers each stage of project development: design, procurement, construction, commissioning, operations and maintenance, and financing for all drinking wate , water reuse, desalination, and wastewater facilities.

Project Involvement and Experience

Aqualia operates 867 wastewater treatment plants, 259 drinking water treatment plants, and 28 desalination plants, applying all kinds of treatments and processes, and covering all sizes. The firm has been involved in over 1,000 projects related to water augmentation including desalination, water reuse, stormwater capture, and reduction of water leakages and non-revenue water, mainly with public entities, but also with the private industry.

43M+ People served in 18 countries providing safe clean water and proper sanitation

Guaymas Sea Water R.O. Desalination Plant, CEA- Comisión Estatal del Agua de Sonora (Sonora State Water Commission), State of Sonora, México

Aqualia designed, built, operates, and partially funded the Guaymas-Empalme desalination plant in Sonora to provide relief from serious drought in Mexico and supply drinking water to over 155,000 people. The desalination plant—which treats water using RO and contains an open water intake, brine management, and energy recovery using pressure exchangers—was developed as a P3 project and required an investment of $49 million, financed by Aqualia (54%) and by FONADIN-BANOBRAS, Mexico's National Bank for Public Works and Services.

Aqualia Projects

aqualia

Aqueduct II Water Supply System, Querétaro-Comisión Estatal de Aguas y Saneamiento de Querétaro ("CEAQ") State Water Commission of Queretaro, Querétaro, Mexico

Queretaro Aqueduct II water supply system satisfies the challenges of water availability by guaranteeing supplies to one million people. The project was designed and built by FCC and Aqualia through a JV and is currently being operated and maintained by Aqualia. The 62-mile aqueduct system includes a diversion dam, two pumping stations, 15 miles of pressure pipelines and 62 miles of gravity pipelines, one drinking water treatment plant and four drinking water storage tanks.

Mostaganem Sea Water Reverse Osmosis Desalination Plant, Wilaya de Mostaganem, Algeria

This project included the design, financing, construction, ownership, operation, maintenance, and transfer over a period of 27 years for a 52.8 MGD RO desalination plant. Aqualia was responsible for the design, construction and commissioning of the plant and is currently responsible for managing the O&M in conjunction with client staff. This plant provides a drought-proof, sustainable water supply to over one million people in one of the regions of the world with the biggest water scarcity problems and in a challenging political environment.

Sea Water RO Desalination Plant of Reference Project Alamein, Egypt Government Ministry of Defense, Egypt

Aqualia designed and built the 33 MGD El Alamein desalination plant and has been operating and maintaining it since 2019 to provide drinking water to over a million people. The project included a two-step RO system and environmentally conscious brine disposal system that blends brine with cleaning water, and a 1-mile submerged discharge outlet to achieve better dispersion of salts. El Alamein received the ENR Global Best Projects 2020—Award of Merit for bringing Egypt's largest desalinization plant from concept to commissioning in just 30 months.

Storm Tank Butarque, Ayuntamiento de Madrid (Madrid City Council), Madrid, Spain

Aqualia was the company in charge of the engineering, procurement, construction, commissioning and operation and maintenance of the Storm Water Reservoir of Butarque with a surface area of 52,320 cubic yards, dimensions 790 x 590 linear feet, and an interior height of 46 linear feet, equipped with electromechanical equipment with an installed power of 5,200 kW.

Abu Rawash WWTP. Ministry of Housing, Utilities and Urban Communities, The Construction Authority for Potable Water and Wastewater (CAPW), Giza, Egypt

The 423-MGD Abu Rawash wastewater treatment plant preserves biodiversity, provides clean water to farmers for agricultural purposes, and supports the Egyptian government's wastewater reuse strategy to secure the country's water resources, irrigate arboriculture and provide water for industrial needs. The project was executed by Aqualia in JV with a local partner under a DBO contract for the design, construction and 3-year operation and maintenance of the plant.

Freeport-McMoRan

Potential water user

Ownership and Management Structures

Freeport-McMoRan is a multinational natural resources company. It primarily operates in the mining industry, with a focus on copper, gold, and molybdenum mining. The company is publicly traded on the NYSE under the symbol FCX. The firm s Board of Directors is comprised of twelve members including ten independent directors who possess a diverse range of perspectives, skill sets and experience. The Board leverages Freeport-McMoRan's Corporate Governance Guidelines to assist the Board and its committees in the exercise of its corporate governance responsibilities. Freeport McMoRan has five executive officers and a senior leadership team compris of operations and administrative focused management.

Project Involvement and Experience

Freeport-McMoRan is a major employer in Arizona involved in mining operations as well as the extraction and processing of valuable minerals. It also plays a significant role as a water user to support its mining interests.

Cerro Verde Wastewater Treatment Plant, Arequipa, Peru

Freeport McMoRan retained Stantec to design and manage construction of new collection networks and a new wastewater treatment plant which was a cooperative arrangement between a global copper mining company operating the Cerro Verde Copper Mine and the City. The agreement called for the mining company to construct the new plant which resulted in widespread improvements to the local river environment and allowed the mining company to utilize the plant effluent for its mining operations.

Deep Mill Level Zone Dewatering System Engineering Detail Design, Tembagapura, Papua, Indonesia

Freeport McMoRan retained Stantec to develop concepts to meet dewatering goals. We realized these concepts and recommendations by providing design services. The system is designed to pump a nominal 5,000 usgpm with an upset design limit of 10,000 usgpm. The natural climate, averaging up to 6 meters of rainfall annually, makes this system vital to maintaining DMLZ underground mining operations, especially considering the logistics of the underground infrastructure.

Grasberg Block Cave – Main Pump Stations, Tembagapura, Papua, Indonesia

Freeport McMoRan retained Stantec to execute a trade-off study evaluating three conceptual options to meet the pumping requirements of GBC. We considered a single-lift slurry pumping system, a dual-lift slurry pumping system, and a surface clear water pumping system. Stantec then designed layouts for a dual-lift slurry pumping system that is capable of delivering 20,000 gpm of process water to the concentrator. A drainage channel arrangement was also designed to capture mine water and deliver it to the pumping system, that included 20 centrifugal pumps.

University of Arizona Water Research Resources Center (WRRC), Dr. Sharon B. Megdal

THE UNIVERSITY OF ARIZONA COOPERATIVE EXTENSION
WATER RESOURCES RESEARCH CENTER

Transboundary policy and binational engagement expert

Ownership and Management Structures

The University of Arizona is a public research university governed by the Arizona Board of Regents (ABOR). The WRRC operates as part of a Cooperative Extension and the College of Agriculture, Life and Environmental Sciences at the University of Arizona. It is the designated state water resources research center established under the 1964 Federal Water Resources Research Act.

Project Involvement and Experience

Dr. Sharon B. Megdal is director of the WRRC and is a well-respected Arizona water leader/research team lead. She is principal investigator for the Transboundary Aquifer Assessment Program efforts (Arizona/Sonora). She is also an expert in managing aquifer recharge (MAR) having completed considerable work including many publications on MAR.

Transboundary Aquifer Assessment Program (TAAP)

Dr. Sharon B. Megdal has significant experience in transboundary aquifers. She is the lead principal investigator for the University of Arizona TAAP efforts—a collaboration in binational research and engagement on shared aquifers. The program has focused its efforts for years on the transboundary aquifer between Arizona and Sonora, Mexico. The scope includes transboundary aquifer reconnaissance work, characterization of selected border communities, stakeholder engagement, collaborative efforts identified through the TAAP Cooperative Framework. TAAP has involved water balance modeling tools to characterize the effects of system changes, particularly related climate uncertainties and changes in groundwater demand. In addition, the program participates in binational technical working meetings, publication of journal articles and reports, presentations at regional, national, and international conferences, organization of forums and seminars for improving knowledge on transboundary aquifers. Key objectives TAAP encompass: development of binational information and shared databases on groundwater quantity and quality; identification and delineation of transboundary aquifers of importance; development of binational criteria for determination of priority transboundary aquifers; assessment of the extent, availability, and movement of water in transboundary aquifers and the interaction with surface water; development and improvement of groundwater-flow information for binational aquifers to facilitate water-resource assessment and planning; analyses of trends in groundwater quality, including salinity and nutrients; and application of new data, models, and information to evaluate strategies to protect water quality and enhance supplies.

PCL Construction

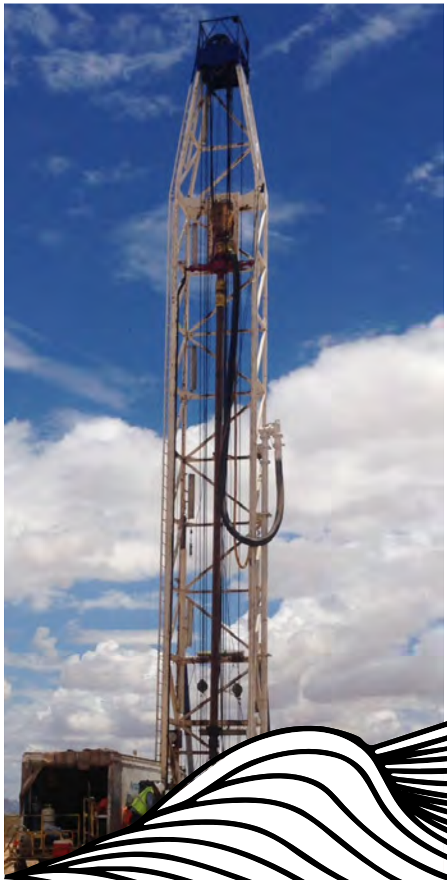
Lead contractor/construction manager, water infrastructure experts, specialists in water augmentation, treatment and supply, design-build/alternative delivery methods

Ownership and Management Structures

PCL is a group of independent construction companies that operates throughout the United States, Canada, the Caribbean, and Australia. As one of the largest contracting organizations in North America, PCL completes more than $6 billion in work annually, building projects that shape communities. The company's 100% employee ownership model fuels a culture of commitment for clients in the buildings, civil infrastructure, heavy industrial and solar markets. With a strategic presence in more than 30 major centers, PCL's leadership teams consistently drive innovation and set new benchmarks for excellence, bringing unparalleled skill to every project.

Project Involvement and Experience

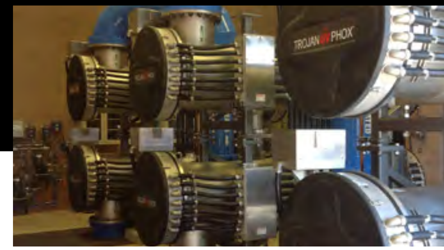
Whether you are in the buildings, civil, industrial or special projects markets, partnering with PCL means you're gaining a proven, reliable and trusted full-service partner with a mobile network of more than 4,900 experts and professionals across Canada, the United States, Australia and the Caribbean. From advanced digital construction technologies to innovative off site modular manufacturing, to the cutting edge of sustainable construction, we lead the industry as we have for more than 100 years. We leverage the expertise from this vast experience to help our clients and partners build lasting legacies.



Harquahala Water Supply Project, City of Scottsdale, La Paz County, AZ

This Construction Manager at Risk (CMAR) project included site assessments, cost estimating for a remote site, water transmission pipelines, and well drilling for three production wells with 1,500-foot-deep pilot holes and 1,000-foot-deep wells for the City of Scottsdale in Harquahala Valley. PCL supervised onsite drilling, well construction, and well testing operations. It included water augmentation infrastructure with testing water that will be transferred to the Central Arizona Project.

PCL Construction Projects



El Paso Advanced Water Purification Facility, EP Water, El Paso, TX

PCL is leading this water augmentation construction project via CMAR to build a first direct-to-distribution potable reuse,10 MGD Advanced Water Purification Facility. Involving border states/ Mexican stakeholders, the project includes microfiltration low-pressure membranes, RO high-pressure membranes, UV/advanced oxidation, granular activated carbon (GAC), finished water stabilization, chemical storage and feed, finished water storage, Greensand filters, AWPF building, electrical and I&C.

Nogales International Wastewater Treatment Plant, City of Nogales, Rio Rico, AZ

PCL self-performed most of this award-winning DB project in the Sonoran Desert Region. They worked with Stantec to design a new 14-MGD biological nutrient removal treatment facility that discharges to the Santa Cruz River. The plant receives 70% of its flow/load from Nogales, Sonora (Mexico) and Nogales and Rio Rico in Arizona, which required consultation with the City of Nogales, IBWC, US EPA, the Arizona Department of Environmental Quality, and NAD Bank. Funded by the EPA and SEMARNAT, the plant was upgraded to a MLE biological nutrient removal system to better remove nitrogen compounds in discharged effluent and improve water quality in Santa Cruz River. The project won multiple awards including Public Works Project of the Year for Environment $25 to $75 million—APWA.

Tucson TARP AOP Improvements, City of Tucson, Tucson, AZ

PCL constructed a first-of-its-kind UV/AOP plant via CMAR to treat 1-4 Dioxane in the Sonoran Desert Region using UV, hydrogen peroxide storage and feed, a GAC quenching system, an influent booster pump station, cartridge filters, backwash tank, backwash pumps and cartridge filters, raw water blending station, and civil and plant works. PCL worked with Tucson Water, EPA sponsored Unified Community Advisory Board, Airport Authority, and the Air Force. This project allowed the previous system of blending TARP well field water with other system water to reduce concentrations of 1-4 Dioxane sent to the potable water system. Done in 13 months, the project won multiple awards including the Water Treatment Project of the Year—AWWA—Arizona Chapter.

South Bay International WWTP (SBIWWTP), Secondary Treatment; International Boundary and Water Commission, International Boundary & Water Commission, San Diego, CA

SBIWWTP is near the US–Mexico border on a 100-acre site south of San Diego. The United States Section of the IBWC owns and operates the 25 MGD SBIWWTP, and advanced primary treatment plant capable of handling 100 MGD in future. PCL also installed 24- to 84-inch-diameter yard piping and performed ground dewatering.

EPCOR

Potential water user and project proponent, utility operator

Ownership and Management Structures

EPCOR Utilities Inc. (EUI), through its wholly owned subsidiaries, builds, owns and operates electrical, natural gas and water transmission and distribution networks, water and wastewater treatment facilities, sanitary and stormwater systems in Canada and the United States. EUI's Board of Directors includes business professionals with deep experience in the private sector, which operates independently of the company's sole shareholder, City of Edmonton. The EUI Board has the full authority to make strategic business decisions, and no City of Edmonton employee or elected official sit on EU s Board, nor does the city nominate its directors. EPCOR USA Inc. is a wholly owned subsidiary of EUI.

Project Involvement and Experience

EPCOR is the largest private water provider in the southwestern United States, owning and operating over 3,384 miles of water distribution pipeline and almost 250 groundwater production wells. Headquartered in Phoenix, Arizona, EPCOR USA Inc. delivers the highest quality water and wastewater service to more than 288,000 customer connections across 41 communities in Arizona, New Mexico, and Texas. EPCOR's assets provide both retail and wholesale water supply and wastewater treatment services.

3,384 miles of water distribution pipeline and almost 250 groundwater production wells

Sandow and Blue Sky, Samsung, Williamson County, TX

In 2023, EPCOR and Stantec were selected to provide industrial water supply and water reclamation services for one of the largest foreign economic development projects in American history—Samsung's $17 billion advanced semiconductor fabrication facility under construction in Texas. The Sandow Water Project will be capable of treating EPCOR-sourced groundwater supply and delivering high-quality purified water, and the Blue Sky Water Reclamation Facility will receive and purify water from the fabrication facility using the most advanced and proven treatment technologies and processes available in the market. The target is to reclaim or reuse 75% of the process water within the fabrication facility to reduce the plant's regional water footprint.

Vista Ridge Pipeline, San Antonio Water System, San Antonio, TX

EPCOR co-owns and operates the largest public-private partnership water project in North America, the Vista Ridge Pipeline located in Central Texas. Commissioned in 2020, Vista Ridge provides critical new water supplies for the seventh largest city in the US while protecting local environmentally sensitive aquifers, diversifies supply sources as protections against drought, and supports future economic prosperity. Requiring a total investment of $927 million, the Vista Ridge wellfield and 142-mile pipeline provide 50,000 acre-feet per year of sustainable, potable water supply.

B. Potential Augmentation Opportunities

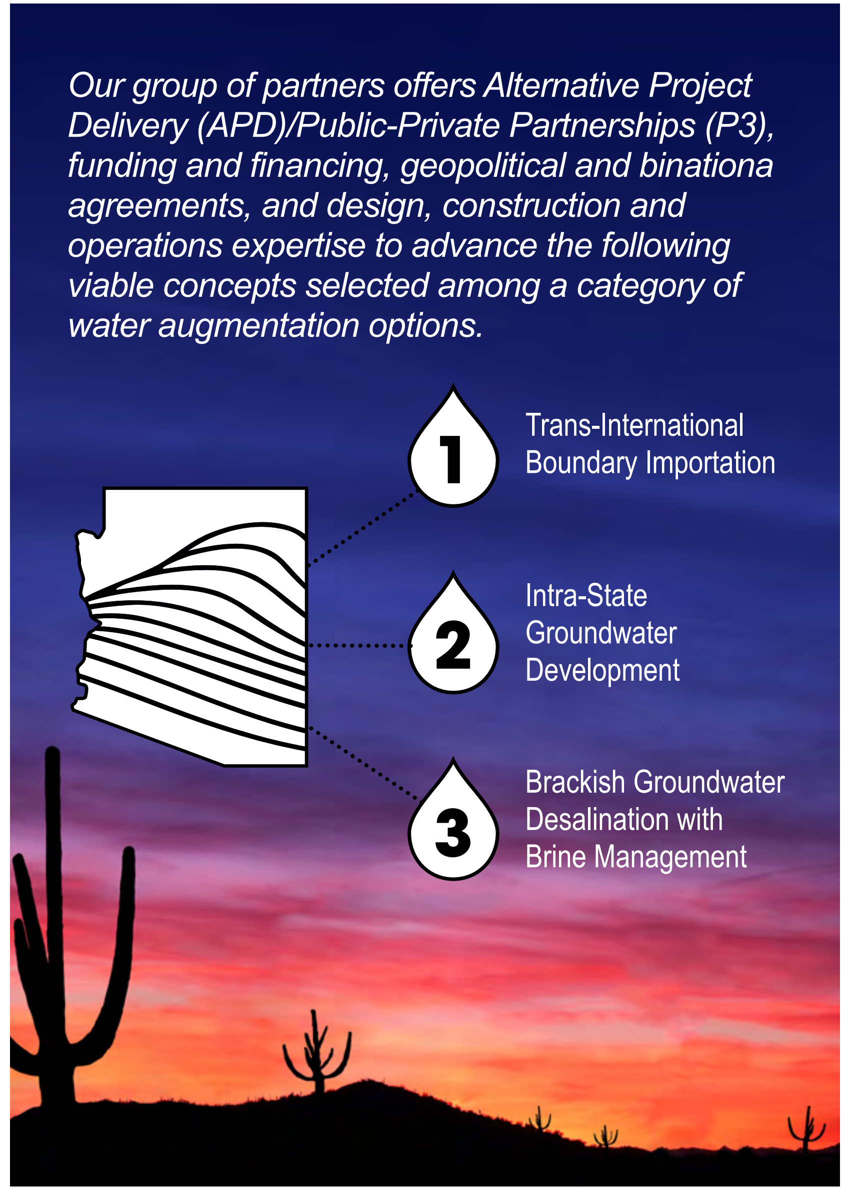
B.1 List of Potential Water Augmentation Opportunities and General Description

In consultation with WIFA, our group of partners believes a portfolio of projects developed from the following categories (in no order of preference) is required to meet the region's long-term water supply:

- Interstate or international water supply development and transport
- Intrastate groundwater development and transport
- Brackish groundwater desalination (with brine management)
- Programmatic reuse of treated municipal wastewater and stormwater
- Major dam raises (with operational enhancements)
- Industrial and/or agricultural conservation and/or efficiency improvemen
- Large-scale sea water desalination

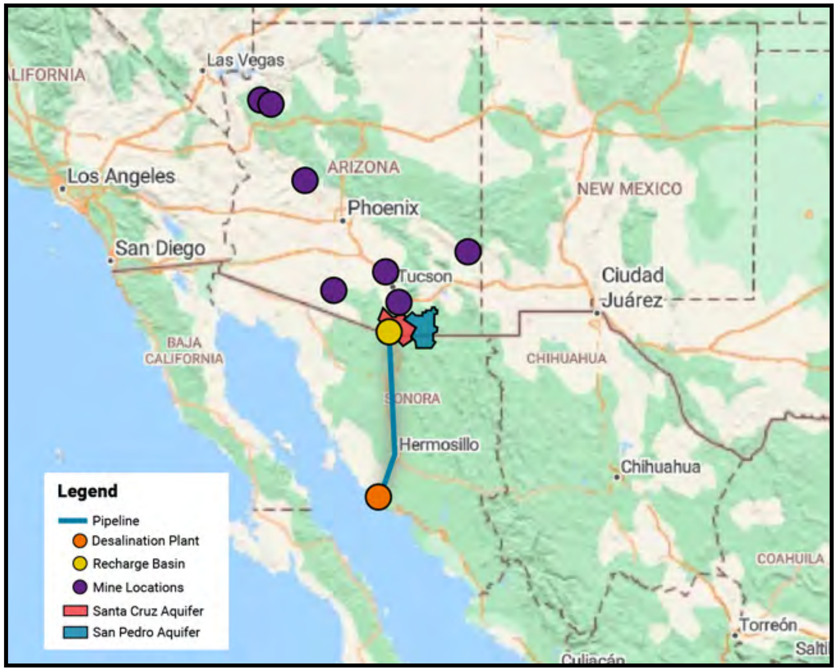
A portfolio of projects from these categories should provide the region with a robust set of feasible, practical, and timely options for securing net new water. While many opportunities could stand alone, optimal results will likely come from implementing two or more options (for example, linking programmatic wastewater reuse with groundwater banking and exchange or industrial/agricultural conservation programs).

Our group of partners is familiar with and offers insights into the following opportunities that are geographically well-distributed and could provide sufficient water quanti , quality, reliability, and sustainability for municipal, agricultural, or industrial uses dependent upon user preferences and affordability/ability-to-pa .



Opportunity 1

Trans-International Boundary Importation



At least 75% of WIFA's LTWAF is allocated to water imports from outside the state. Importation is socially, environmentally, and politically complex, costing many billions of dollars with long implementation times—often 10 to 20 years or more. These projects must create a "win-win" for the importer and importee, and a phased approach makes them feasible. We have evaluated several phased importation options including phased water importation from the Mexican state of Sonora to the state of Arizona through sister cities of Nogales, Sonora and Nogales, Arizona, discussed as follows.

General Explanation of Augmentation Supply and Delivery Strategy

Trans-international boundary projects include construction/operation of a seawater desalination facility drawing Gulf of California seawater and distributing desalinated seawater to Hermosillo and north toward Nogales, Sonora. Another includes leveraging water storage and conveyance through the transboundary Santa Cruz and San Pedro groundwater aquifers to immediately benefit Sonora and Arizona.

Nogales, Sonora sends roughly 60% of its wastewater across the Sonora/Arizona border to the Stantec designed Nogales International WWTP in Nogales, Arizona. Stormwater makes up a substantial proportion of wastewater flow from Mexico due to the undeveloped stormwater management system in Nogales, Sonora. There is a significant opportunity to develop a stormwater management and capture system in Nogales, Sonora that could maximize groundwater recharge of the Santa Cruz Aquifer on the Mexican side of the border. This would free up wastewater treatment capacity at the 14 MGD Nogales WWTP and support additional development in Nogales, Sonora. Increased groundwater recharge should also increase groundwater supply and reduce infiltration inflow into the international wastewater collector that conveys wastewater from Nogales, Sonora to Nogales, Arizona and would support increased development. Furthermore, Nogales WWTP discharges highly treated wastewater to the Santa Cruz River that flows north from the international border past Tumacacori National Historical Park, Tubac, Green Valley, Sahuarita, San Xavier del Bac, Tucson, Marana, and Picacho Peak State Park to the Santa

Cruz Flats south of Casa Grande and Gila River. Increasing the capacity of Nogales WWTP would support increased growth in the Nogales, Arizona area, provide more effluent for groundwater recharg through the Santa Cruz riverbed into the Santa Cruz Aquifer, enhance aquatic and terrestrial habitat along the river, and provide a recreational and aesthetic amenity for the surrounding communities.

WIFA is clear that identifying water users willing to pay for new water supplies is critical to long-term water augmentation success. Our group of partners has held preliminary discussions with Freeport McMoRan, Tucson Water, EPCOR, and Nogales, Arizona. Members of our team have also had general discussions with IBWC. Freeport McMoRan has also expressed interest in purchasing treated wastewater/effluent from th Nogales WWTP. We understand that Nogales (Arizona and Sonora) are also interested in developing stormwater capture and water re-use opportunities. We also intend to speak to Nogales, Sonora, US/Mexican sections of the IBWC, the Comisión Internacional de Límites y Aguas (CILA), and Comisión Nacional del Agua (CONAGUA) in Mexico. Tucson Water is interested in discussing new water supplies.

Estimated Annual Availability, Reliability, Variability, and Sustainability

Freeport McMoRan has completed an initial study determining that with sewerage improvements the Nogales WWTP could be expanded from 14 to 32 MGD, supplying up to 36,000 acre-feet per year of new supply. Freeport McMoRan is interested in taking up to 10 MGD/11,000 acre-feet/year of treated effluent as an industrial water supply for their nearb mine. Tucson Water is interested in taking up to 13.4 MGD/15,000 acre-feet/year to replace some of their Central Arizona Project water supply. This leaves 8.6 MGD/10,000 acre-feet/year for discharge to Santa Cruz River and potential aquifer recharge. Bringing desalinated water from the Gulf of California to Sonora for Santa Cruz aquifer recharge increases potential supply significantl . Both wastewater effluent reuse and seawater desalinatio would be a reliable and sustainable water supply.

Estimated Capital/Operational Costs and Financial Considerations

The ultimate capital and operating expenditures will be determined by the projects selected; however, Freeport has funding for an initial plant expansion project and is looking for partners to make this regional development project a reality. This opportunity is also supported by private equity interests (Canadian Pension Funds and banking interests) and Aqualia, who have significant Mexican operations, operating one seawater desalination facility in the state of Sonora. The approach would involve parallel development of the Nogales WWTP expansion with a seawater desalination facility in Sonora including a treated water pipeline through Hermosillo to Nogales, Sonora. The initial goal would be to use desalinated water to supply key water customers in Sonora and use some water to recharge the transboundary Santa Cruz aquifer. Users on the US side could develop partnerships to pay for water to be banked in the aquifer for later withdrawal.

We envision the following implementation phases:

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Develop a stormwater capture and Santa Cruz Aquifer recharge project in Sonora benefiting Sonora and Arizona. This phase includes hydrogeological modeling in conjunction with our partners at the University of Arizona and Montgomery & Associates.	Work with IBWC and CILA to develop an expansion plan for Nogales WWTP to increase economic development in Nogales, Sonora and Nogales, Arizona, while providing industrial water supply for Freeport McMoRan and potential future municipal water supply for Tucson Water.	Develop a multi-party development agreement between IBWC, CILA, State of Sonora, State of Arizona, and US and Mexican governments to establish the joint beneficial use of the Santa Cruz aquifer by Sonora and Arizona.	Work with Sonoran and Mexican governments, our Canadian funding partners, and Canadian Economic Development Corporation to develop a public-private partnership for a desalination facility to supply Hermosillo and recharge the two transboundary aquifers.	Develop aquifer recharge projects and design/construct desalinated water pipelines.

Environmental and Regulatory Permitting Considerations

This opportunity will be subjected to regulatory requirements on both sides of the border. Key environmental and regulatory considerations for a Mexican desalination facility will be associated with brine discharge. Groundwater recharge facilities in Sonora would require intergovernmental cooperation between the US and Mexican governments and associated regulatory agencies.

Legal, Jurisdictional, and Political Considerations

Politically, stakeholders on both sides each must feel they are mutually benefiting from the opportunity. An inter-governmental agreement outlining the responsibilities of each party, payment details, and groundwater banking rules will be required. We believe this can be achieved given the immediate and long-term benefits for the parties involved.

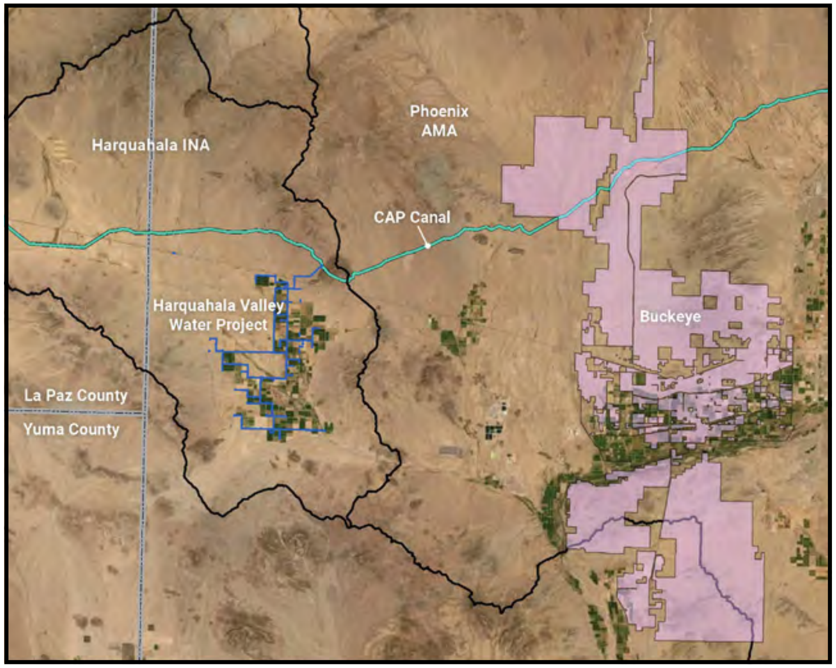
Benefits include

- Funding stormwater capture/groundwater recharge in Sonora makes more water available to Arizona and increases development potential in Nogales, Sonora.
- Increasing development in Nogales, Sonora supports “friend shoring” of advanced manufacturing and other industrial activities critical to US national interests on the Mexican side of the border.
- Increased wastewater flows from Mexico can be recovered at Nogales WWT to enhance flows in the Santa Cruz River and create an additional water supply on the Arizona side of the border.
- Increased water supplies for Freeport McMoRan support copper mining, critical to the energy transition and the Biden administration’s agenda to accelerate the development of electric vehicle production.
- Increased effluent discharged to the Santa Cruz River can be an additional water sourc for City of Tucson, helping them reduce their Central Arizona Project usage making it available for other cities such as Phoenix.
- The development of a new desalination facility to serve Sonora initially and solve Sonora’s water supply problems can help accelerate economic growth in the Sonora region, subsequently increasing the standard of living for residents.
- The ultimate use of desalinated seawater for groundwater recharge could set up a long-term groundwater banking and recovery system to benefit residents in Sonora and Arizona.

Opportunity 2

Intra-State Groundwater Development

Arizona has several untapped groundwater basins not fully developed in areas historically dedicated to agriculture. These aquifers could provide an available and inexpensive source of new supply as they contain large amounts of groundwater that could be extracted and exported to adjacent urban areas.



Land Areas Owned by Water Asset Management LLC and WHoldings in the Harquahala Groundwater INA. (Image Courtesy of Westland Resources and Water Asset Management LLC)

Exportation of groundwater is controversial, as it potentially reduces water availability and degrades water quality for current and future users those basins underlie. This can create social, legal, and political challenges and requires negotiating agreements and resolving potential conflicts amongst stakeholders to achieve long-term sustainability, as well as in some cases statutory changes. However, if developed properly, such projects can provide much needed water supplies while also supporting sustainable development for the exporter and importer. One such opportunity is described as follows.

General Explanation of Augmentation Supply and Delivery Strategy

Harquahala Groundwater Basin in west-central Arizona covers 766 square miles and is bordered by Harquahala, Big Horn, and Belmont mountain ranges. Harquahala Basin is designated an Irrigation Non-Expansion Area (INA) and the state limits and regulates groundwater use for irrigation.

The Harquahala Basin/City of Buckeye Water Treatment Plant opportunity is a project that aims to provide a new source of water for one of the fastest-growing cities in Arizona. Buckeye plans to triple its population in the coming decades, but faces water supply challenges due to changing weather patterns and declining deliveries from Colorado River through Central Arizona Project. As such, the City needs alternative water sources to support growth and development. One potential source is Harquahala Basin that can have its groundwater extracted and exported.

Estimated Annual Availability, Reliability, Variability, and Sustainability

In January 2023, Buckeye City Council approved an agreement to buy a one-acre parcel of property in the Harquahala Basin for $80 million from Harquahala Valley Landowners LLC, a company representing farmers and investors who own land in the area. The purchase gives Buckeye the right to extract 5,926 acre-feet of groundwater per year for 100 years (enough to supply water about 20,000 homes). The purchase requires landowners to retire their current agricultural water use once Buckeye begins to pump (to maintain the sustainability of the basin). The City lies within an AMA and is eligible to receive exported groundwater. However, to use this supply the City must construct facilities to extract, transport, and treat water for delivery to their service area.

The project involves the planning, design, permitting, construction, and operation of a groundwater well field, a pumping station and pipeline system to transport the water from the Harquahala Basin to the Central Arizona Project canal, and a water treatment plant.

The project will provide the City with a high-quality and drought-resistant source of water that will supplement its existing supplies from the Central Arizona Project, the Salt River Project, and local groundwater. The project will also help the City meet its water management and conservation goals, such as achieving safe yield in its groundwater basin and reducing its reliance on the Colorado River, which is facing increasing shortages. The objective is to have the project operational by the year 2025.

Environmental, Regulatory, Legal, Jurisdictional, and Political Considerations

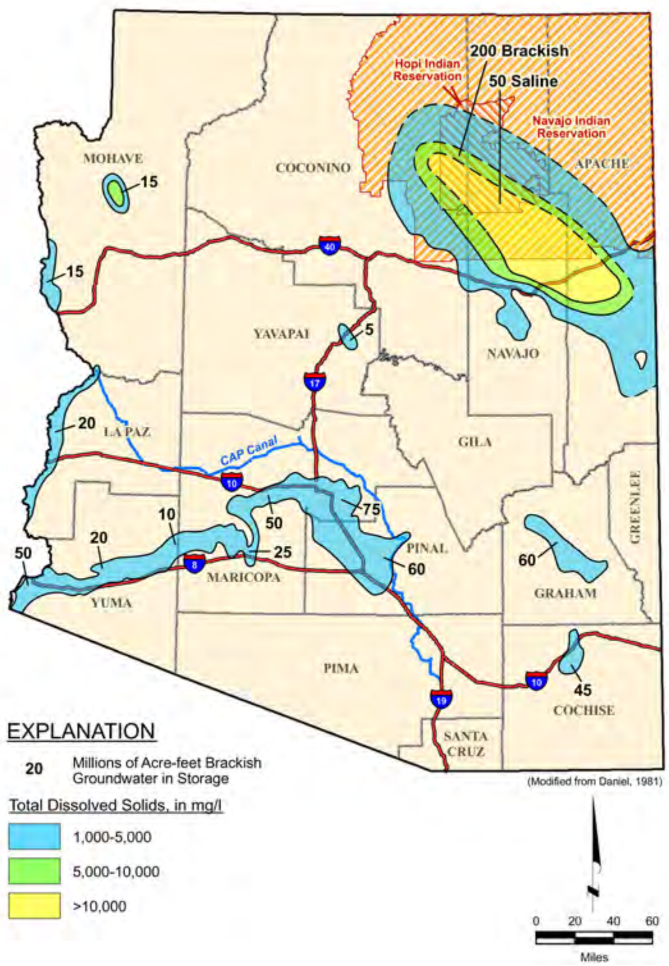
Harquahala Basin is designated an Irrigation Non-Expansion Area (INA) and the state limits and regulates groundwater use for irrigation. The state allows groundwater from the Harquahala Basin to be exported to Active Management Areas (AMAs). Such actions need approval from the State of Arizona and federal authorities. The Gila River Indian Community, which has senior water rights in the region, may not need to approve this groundwater transfer unless the pumping is within their safe harbor zone, in which case it may not be allowed. The Arizona Department of Water Resources (ADWR) and Arizona Department of Environmental Quality (ADEQ) are the main agencies responsible for overseeing and regulating groundwater use and quality, respectively, in the basin.

Estimated Capital/Operational Costs and Financial Considerations

The estimated capital and operational costs for this opportunity are detailed in the City of Buckeye 2020 Water Resources Plan. The lifecycle cost of importing groundwater from the Harquahala groundwater basin is estimated at $1,400/acre-feet in 2020 dollars.

Opportunity 3

Brackish Groundwater Desalination with Brine Management



In 2016, M&A completed an investigation for the Central Arizona Water Conservation District concluding the state of Arizona has over one dozen areas with brackish groundwater that could sustain large-scale withdrawals (10,000 acre-feet per year). These range from the shallow alluvial aquifer in Yuma County to regulated groundwater basins in the Pinal and Phoenix AMA to the vast Coconino Aquifer System on the Colorado Plateau (see map). Studies have identified vast volumes of brackish groundwater in the state.

At that time, the study partners concluded that prospects for desalinating deposits of brackish groundwater water for potable and non-potable uses are most favorable in three areas: the **Yuma Brackish Groundwater Mound, the West Salt River Valley, and the Winslow-Leupp Area** in northeastern Arizona. Unlocking this potential source of supply would be significant

Treatment of brackish groundwater and brine disposal after treatment pose unique challenges. Both require bespoke infrastructure and are energy intensive. Brine disposal done improperly can adversely impact the environment. Disposal options are typically limited to surface water discharge, sewer discharge, evaporation ponds, deep injection wells, land application, and evaporators/crystallizers. These options can be environmentally unsustainable and hindered by land availability, permitting hurdles, and high capital costs beyond economic feasibility for most municipalities acting on their own. Solving the problem of brine disposal would be a significant step forward in unlocking brackish groundwater as a potable water supply alternative. One solution could involve the regionalization of brine disposal facilities for use by multiple agencies.

General Explanation of Augmentation Supply and Delivery Strategy

Stantec has developed a concept for a regional merchant brine facility utilizing a P3 model. The P3 entity would be a special purpose project company set up to interface and provide general and administrative oversight to the merchant brine facility design and construction and long-term operation. Initial discussions have been held with potential stakeholders including:

- Cities and industry providing brine waste streams to the brine facility—Cities of Buckeye and Goodyear, the Arizona Public Service (APS), and others.
- Investors and banks interested in providing long-term financing for the project
- Engineering, procurement, and construction partners and suppliers to design, provide treatment technologies/equipment, and construct the brine facility.
- O&M suppliers to commission and operate the facility long term.
- Water users for clean water produced (including both municipalities and industry), as well as brine produced (for salt and metals recovery)

The regional brine merchant facility must have an optimal size to take advantage of economies of scale while maximizing produced water and brine material recovery to minimize financial impact to rate payers.

Estimated Annual Availability, Reliability, Variability, and Sustainability

Studies have identified vast volumes of brackish groundwater in the state. Practically speaking, if not mined to exhaustion, this supply is limited only by cost, ability-to-pay, and efficacy of brine disposa

Environmental and Regulatory Permitting Considerations

It may be appropriate to reconsider regulatory or statute changes to permit use of this resource, increase use of brackish groundwater, and preserve increasingly limited quantities of fresh water. One approach is to address barriers posed by the regulation of brackish groundwater as groundwater and permitting for disposal of brine streams through deep well injection. Some potential concepts are in Arizona's Groundwater Management Code (Code), which refers to "poor-quality" groundwater and enables some special uses of brackish groundwater beyond groundwater in AMAs. Specific exemptions to the prohibition on inter-basin transfer of groundwater are also in the Code. In terms of disposal, no suitable locations for deep brine injection have been identified under federal la . However, Arizona is seeking primacy of EPA's underground injection control (UIC) program. This future, state-regulated program may provide a way for deep brine injection under conditions that protect actual drinking water sources.

Augmenting water supplies with brackish groundwater resources in the state is an attractive, short-term bridge between current reliance on diminishing freshwater supplies and future development of distant, logistically challenging, expensive renewables like seawater desalination. Potential adverse impacts from increased groundwater production and brackish groundwater treatment would be minimal. Furthermore, the short-term nature of a brackish groundwater solution may make regulatory changes to enhance implementation more favorable.

Legal, Jurisdictional, and Political Considerations

In 2021, the Desalination Committee of the Governor's Water Augmentation, Innovation, and Conservation Council, determined there are no legal or regulatory constraints specific to the use of brackish groundwater in Arizona law. Brackish groundwater is subject to statutory restrictions on use and transportation of groundwater. Any proposal to reclassify brackish groundwater must be considered in view of the primary objectives of the protections offered in the Code. Since brackish groundwater can be pumped pursuant to an existing groundwater right—and some areas are already pumping water supplies that exceed 1,000 ppm TDS and are considered brackish—the committee recommended no changes to the current laws and regulations at that time.

Estimated Capital/Operational Costs and Financial Considerations

Our recent work documenting the landscape of future additional water supply options for Arizona indicates that brackish groundwater desalination is an effective and prudent medium-term option. The treatment costs for brackish groundwater (not including brine disposal costs) are approximately $1,000/acre-feet.

B.2 Potential Delivery/Ownership Models

Our group of partners includes engineering, construction, operations, and financing experts with global experience delivering complex, large-scale water supply projects for the express purpose of developing and delivering projects under a P3 environment (although our we have the ability to deliver under any contractual model). Given the importance of this decision; however, consideration should be given to the entire range of potential project delivery models from traditional design-bid-build to all forms of alternative delivery.

In some ways, the most straightforward decision for parties to make will be the delivery model. Broadly speaking, this decision will be defined by risk allocation and an appetite for asset ownership versus concession agreements and the ability to secure financing and the ability-to-pay of the end users. Our team can form a special project vehicle (SPV) under various debt/equity models and has significant experience designing, constructing, and operating water supply facilities in both the southwest US and Mexico.

The more difficult decisions will entail legal and contractual arrangement between project proponents regarding cost and benefit allocation, and ultimate control of key facilities.

Lastly, potential projects of the scale and complexity will not proceed in a vacuum. Permitting and regulatory agencies, political interest groups, and public/community members can significantly impact how projects proceed and are implemented. Therefore, it will be important for any group or partners or consortium to have exceptional skills in multi-stakeholder engagement to proactively manage communication and stakeholder outreach during project development and maintain consistent messaging.

B.3 Financing Considerations and Payment Options

Securing funding is a critical component of executing projects. Our team knows the level of effort involved in applying for grants and loans–the frameworks, policies, time frames, terms, and agency preferences that drive project selection and funding obligations. Numerous federal, state, local, private, and philanthropic sources have funding programs and objectives that align with long term water augmentation objectives. The Bureau of Reclamation Desalination and Water Purification Research Program, the U.S. Department of Energy National Alliance for Water Innovation Pilot Program, the U.S. Department of Agriculture Water and Waste Disposal Loan & Grant Program, and other Bureau of Reclamation Title XVI programs are some of the available federal funding programs for this project. The State of Arizona may have funding as well as State-administered federal funding from the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA) that may be used to address a project funding gap.

B.4 Potential Supply Chain Constraints

We foresee some incremental supply chain constraints for potential work conducted in Arizona beyond the normal competition for labor and materials experienced by the contracting community, namely:

- Shortages of skilled trade labor.
- Long lead times for some specialty electrical equipment.
- Uncertainty around future regulation of Per- and Polyfluorinated Substances (PFAS) that could impact certain membrane and pipe material availability.

The above may be further exacerbated by the Infrastructure Investment and Jobs Act (IIJA) when/if appropriations reach the market. Potential work conducted in Mexico may present additional challenges. However, our partner, Aqualia, is well-established throughout Sonora.

B.5 Other Considerations

We typically use the PESTLE approach when evaluating complex water supply projects such as those contemplated above. Each project will have its own unique political, technical, and environmental issues. However, there are some overarching considerations that could impact each of the opportunities presented above including:

Political – There are many practical and financially viable projects that could provide reliable, sustainable water supplies for the state. Selection of any portfolio of projects necessarily forecloses selection of other projects. Providing communication and stakeholder engagement support to those who must "make the call" as they work to persuade the ultimate end-users (that is, those who will pay for the water) will be paramount.

Economic – The next increment of water supply for the state will not be cheap. However, in some ways the state is left with no choice if it wants to move away from mining groundwater and depending on dwindling stream flows: it must either implement projects or suffer the impacts to economic development and quality of life.

Social – Stakeholder outreach and communication around construction of new infrastructure and increases in cost must be precise and timely.

Technological – The technology exists to implement these projects. However, certain technologies may need to be scaled up and there will be a need to embrace potential new, more advanced technologies as they advance.

Legal – Existing law supports water supply project development. It will "simply" be a matter of working through the process.

Environmental – All impacts can be mitigated.

We have assembled a creative team that has the experience and expertise to assist WIFA and project proponents as they navigate these issues.

aqualia

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THE UNIVERSITY OF ARIZONA COOPERATIVE EXTENSION
WATER RESOURCES RESEARCH CENTER

Response to the Request For Information
Issued By The
Arizona Water Infrastructure Authority
Seeking to Identify and Understand Water Augmentation Opportunities
To Support Growing Arizona Communities and State Water Needs

Submitted By
Sun Fresh Water, LLC
In Partnership With
The Center for Advanced Engineering Design and Development
Of
The City College of New York

Sun Fresh Water, LLC, in partnership with the Center for Advanced Engineering Design and Development of The City College of New York have developed three systems to meet the global challenge of securing a sustainable system of potable water. Each of these systems is based on Nature's methodology of fresh water production - distillation. Each of these systems are summarized below along with an introduction to their application to the State of Arizona.

In Nature the Sun heats the surface of the world's oceans causing the freshwater component to be segregated, vaporize, evaporate, and rise up into the atmosphere where it condenses into clouds and is then returned to Earth via precipitous.

The Sun Fresh Water systems mimic this process but replace the Earth's atmosphere with enclosed containers. They have developed three systems of desalination via distillation to provide a cost-effective sustainable source of unlimited fresh, potable water. Each of these three systems only require two components - a source of contaminated water (Salt, brackish, or otherwise contaminated) and an energy source - either solar or thermal energy from existing power plants.

Sustainable Sources of Contaminated Water for Arizona

There are two sustainable sources of contaminated water available to Arizona that can be converted to fresh potable water.

1. Brackish Aquifers
2. The Gulf of California

Brackish Aquifers

Brackish groundwater offers one significant advantage over any other source in Arizona and the Southwest: it is extremely abundant. In Arizona alone, more than 600 million acre-feet (MAF) of recoverable brackish groundwater are stored underground. *This equates to almost 100 times the current total water use in Arizona.* Furthermore, the impediments associated with utilizing this water source for drinking have diminished rapidly as desalination technologies have become economical for most water types, especially those discussed herein.

The Gulf of California

The Gulf of California is located along the east coast of Mexico, the head of which is approximately 60 miles from the southern border of Arizona. While utilizing this resource would require a binational agreement between Mexico and the United States, and also require the construction of a pipeline into Arizona, it would provide a virtually unlimited source of available contaminated water for conversion to fresh potable water.

System # 1 - Solar Distillation/Desalination

Salt, or otherwise contaminated water is introduced into a clear glass tube containing a stainless steel tray which is heated by concentrated solar energy. The fresh water component is segregated from the salt, rises within the tube, condenses along the top, and then runs down the sides into channels that direct the freshwater to egress from the tube into an exterior reservoir as fresh, potable water.

Benefits of Solar Distillation/Desalination

- Inexpensive, easy to use, ideal for smaller communities
- Purifies salt, brackish, or otherwise contaminated water
- Produces significant quantities of fresh, potable water
- Easy to use, and maintain
- Portable and scalable
- Sustainable with zero carbon omissions

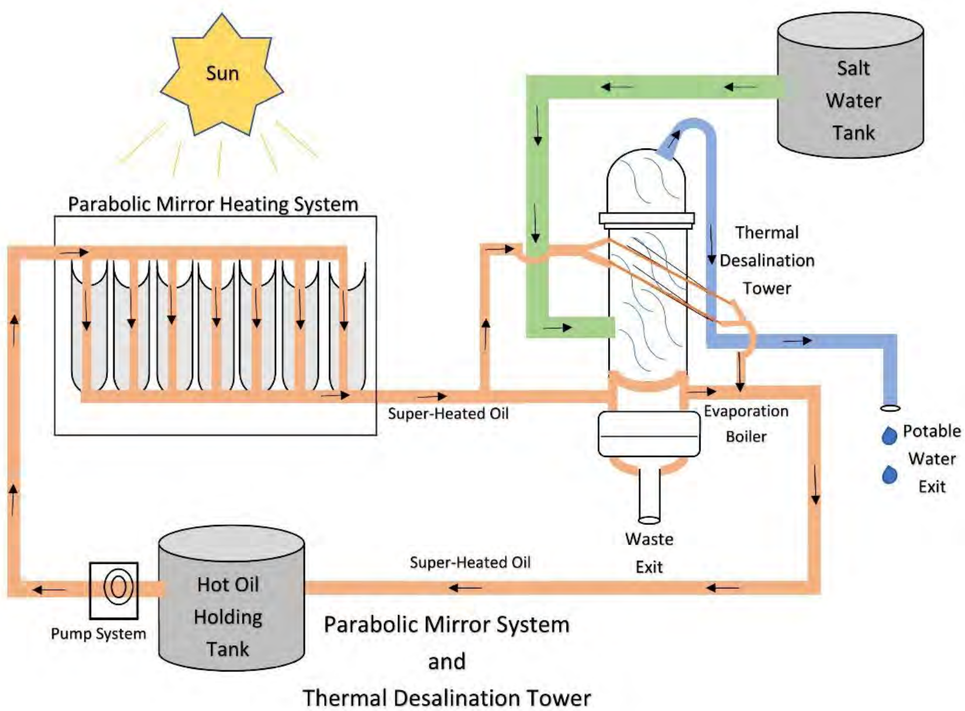
Application to Arizona

The Solar Distillation/Desalination System is applicable to individual residential or small communal use, especially those that are isolated. It is inexpensive, easy to use and maintain, of significant production, portable, scalable via incorporation into water farms, sustainable, and produces zero carbon admissions.

System #2 - Solar/Thermal Distillation/Desalination

Linear Parabolic troughs concentrate solar energy and direct it to a pipeline containing oil causing the pipeline to be heated. This pipeline then wraps around the base of a condensation tower into which saltwater is introduced and heated. The freshwater component of the salt or otherwise contaminated water is segregated, evaporates, and rises to the top portion of the tower where it condenses and egresses the tower as fresh, potable water**.**

Solar/Thermal Distillation/Desalination Schematic

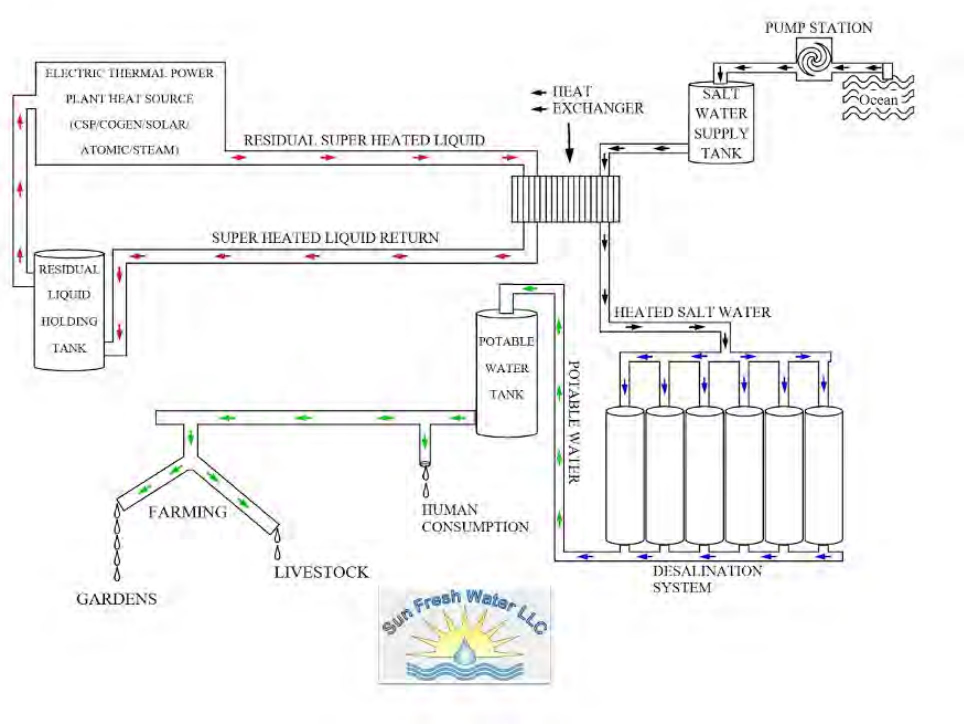


Benefits of Solar/Thermal Distillation/Desalination

- High production that meets or exceeds reverse osmosis
- Minimal maintenance
- Scalable, sustainable, with zero carbon emissions

The Solar/Thermal Distillation/Desalination System, relative to the huge infrastructure, energy, and maintenance expenses of Reverse Osmosis, is extremely inexpensive. Utilizing concentrated solar energy, and recognizing the extreme amount of which is available throughout Arizona, along with the fact that it is readily scalable, of virtually unlimited production capability, sustainable, and produces zero carbon admissions, makes it ideal for Arizona.

System #3 - Thermal Distillation



This system functions in the same manner, and provides the identical benefits of the Solar/Thermal Distillation/Desalination System, with one major difference: Instead of using solar energy as the heat source, it uses the residual thermal energy from existing oil, gas, coal, or nuclear powered thermal power plants.

Benefits of Thermal Distillation/Desalination

- Provides for the conversion of existing power plants
- Applicable to oil, gas, coal, or nuclear power plants
- Ideal for large regional application

Application to Arizona

The Thermal Distillation/Desalination System provides the ability to produce a huge amount of potable water via the Palo Verde Nuclear Generating Station along with the existing three dozen thermal energy power plants within Arizona. None of these facilities will require additional expense for the production of the necessary thermal energy generation; no additional energy is required; and zero additional carbon emissions will result. Likewise, there is a significant reduction in maintenance expenses. Each of these facilities will utilize the available brackish water aquifers available in each location. Moreover, the construction of a pipeline and power generation station is unnecessary thereby eliminating the environment damage presented by the construction of a pipeline and additional power generating facility.

Conclusion

The three systems described herein afford Arizona the ability to provide virtually the entire State of Arizona a cost-effective, sustainable, and environmentally friendly unlimited source of potable water.

By Email to: LTWAF@azwifa.gov

November 15, 2023

RE: Request for Information

Dear Sir:/Madam:

The Superstition Vista Water Augmentation Group, a Public-Private Partnership formed by the Sonoran Water Group, LLC and the Arizona Geological Survey, is pleased to present the following regarding the Request for Information (RFI) issued by the Arizona Water Infrastructure Finance Authority (WIFA) and the Long-Term Water Augmentation Fund (LTWAF) on September 20, 2023.

The Superstition Vista Water Augmentation Group was created specifically to respond to the anticipated Request for Proposals for Projects that augment water supplies for the state of Arizona.

The Superstition Vista Water Augmentation Group is lead by Mr. Richard Carr, PE., an Arizona-based registered professional engineer who has assembled Teams for the purpose of developing needed infrastructure for numerous public and state agencies. The total value of which is approximately $1 Billion (US), and Mr. Brian Gootee, who holds a Master of Science (MS) Degree in Geology, . Mr.Gootee is the author of numerous technical documents regarding the geology of the state of Arizona and is considered as *an* expert in water sources throughout Arizona. Mr. Gootee was recently designated as the Arizona Geologist of the Year and as an individual with broad experience regarding water sources available to the State of Arizona.

The Superstition Vista Water Augmentation Group elects to respond to the Request for Information through the utilization of Paragraph C. Submission Documents specifically in accord with the second to the last sentence of that paragraph, which reads: I*t is not necessary for Respondents to respond as the consortia or partnership that may submit responses to future potential solicitations.*

The Superstition Vista Water Augmentation Group looks forward to working with the state of Arizona to augment water supplies throughout the state.

Superstition Vista Water Augmentation Group, LLC

Sincerely,

Richard L. Carr PE
Managing Member

COVER PAGE

Deliver by email: LTWAF@azwifa.gov
Subject Line: RFI for LTWAF Submitted by: UmidaAg, Joseph Gallegos
Submission by: Umida Agriculture
Contact: Joseph Gallegos,
Email: Joseph@UmidaAg.com

Title: Transpiration Only Irrigation – For long term augmentation 12.3 Million Acre Feet

The core of this solution is to use agricultural water resources in the upper Colorado River basin more efficient, thus allowing more flow into Arizonia. The technology can be described as extreme water conservation on the farm without retirement of farmland. In many cases the solution provides multiple benefit, such as recharge groundwaters during high flow periods, reduce need of agricultural chemical reduce agricultural power consumption, and increases flow mitigates the challenge of hydropower generation risk. Thus the solution is better described as **multi-benefit agricultural water infrastructure retrofit.** This solution is designed to provide water security for Arizona multiple stakeholder groups now and into perpetuity. The solution solves water security by working with nature in holistic approach the benefits all stakeholders.

Table of Content

RFI-General Information and Experience

1. Please briefly provide the following descriptive information to aid WIFA in understanding the identity, business and authorities of the Respondent and its team members.

a. Name of Respondent, team members, and anticipated roles and responsibilities related to this opportunity.

In the proposed project Umida Agriculture acts as the project technical guide across the Colorado River watershed, and as the general installation company in some regions, Due to the size and scope much of the on farm installation work will be manage by local pipe installation specialist and financing by local banks.

b. For privately held and investor-owned entities, describe your ownership and management structures.

Umida Agriculture is a dba of Drought Diet Products, a private C corporation register in the state of California. We are the Intellectual Property (IP) holder of the Aquifer Pipe and software technology that supports the operation of the equipment "**multi-benefit agricultural water infrastructure"** proposed in the RFI.

c. For public agencies, describe your statutory authorities including any authorities to own and manage water rights and water supply facilities.

We are not a public agency.

d. Describe each member's involvement and experience with existing water augmentation projects, programs or initiatives, municipal and industrial provision, and non-consumptive provision.

Umida Agriculture is applying our technology across California water stress regions that have new state policies limiting groundwater withdraws. Without our technology over 1 million acres of productive farmland in the San Joaquin Valley would have to be retired. In Imperial Valley we are working with Alfalfa growers to reduce water consumption, through annual conservation rebates, allowing more Colorado River water to flow to downstream municipalities. The current size of our operation and installation partners is over 150 employees with a capacity to install 60,000 acre of the **multi-benefit agricultural water infrastructure** annually resulting in 180,000 in conservation flow to Arizona annually**.** This volume can scale to 600,000, increasing the annual flow to 1,800,000 annually.

Glossary

Transpiration Only Irrigation –is a method of irrigating, just like you have Evapotranspiration Irrigation volumes, and Deficit Irrigation volumes, Transpiration Only Irrigation focuses on delivering only the water a plant needs for transpiration needs.
Virtual Water Table Irrigation - is a new class of irrigation, just like drip and sprinklers are types/class of irrigation.
River basins: this proposal addresses river basins in a plural, since there are multiple rivers that flow into Arizona (out of state augmentation), not just the Colorado Rivers. Plus multiple rivers that feed into the Colorado River.
Evapotranspiration: This is the suggested amount a plant needs based on applied waters evaporation from surface and transpiration from the plants.
multi-benefit agricultural water infrastructure retrofit: A long term distributed agricultural base solution that address water used, crop flexibility, groundwater recharging, reduce power consumption, reduce agricultural chemical use, farm production climate resilience, and environmental benefits.

Challenge:
It is well known that agriculture uses 70% to 80% of all regional freshwater resources and that agriculture stakeholders have some of the most senior water rights. This water conservation project will reduce agriculture's regional percentage down to 14% to 16% annually, **without retirement of agricultural land**. When applied to only alfalfa and cotton agriculture acreage in the Colorado River watersheds, 9.9 Million Acre Feet (MAF) of additional river flow into Arizona with no centralized infrastructure (no single point of failure). When Arizona's alfalfa and cotton acreage are added to the acreage the total increases to 12.3 MAF. The proposed solution solves Arizona's water stress now and into perpetuity.

Technology Introduction:
The **multi-benefit agricultural water infrastructure retrofit** is known technically as "virtual water table irrigation". This significant water conservation benefits the farm operation with a long 100 year water climate resilience solution also known as "Climate Smart", thus mitigating agricultural operations' concern of water scarcity. Since the **multi-benefit agricultural water infrastructure** reduces water needs by 80%, there is an 80% reduction in power use. Since most of the retrofits will occur in the upper Colorado River watershed, this will increase rivers flows for hydropower generation.

Technology operation description:
This **multi-benefit agricultural water infrastructure retrofit** uses the specially designed Aquifer Pipe placed four feet below the surface to create a virtual water table below the crops. The areas in the pipe's "V" channel becomes fully saturated to a consistency of mud, from here the surrounding soil wicks up the moisture by capillary

movement into the root zone for the plants. The irrigation operation is like dipping the tip of a paper napkin in a full glass of water, the napkin is going to wick the moisture up. Pull the napkin away from the water and the napkin will eventually dry out, till the napkin is dip back in the water again. When a farm uses this infrastructure, the action is the same, the farm fills the pipe and lets the water wick up into the soil in a moisture plume and uptake by the crops roots in this moisture plume. The agricultural operational goal is to fill the soil profile with enough water for the crop and avoid surface evaporation losses. The technology is basically mimicking subterranean stream or subsurface furrow irrigation, it has also been described as field base hydroponic irrigation.

Added advantage of Subsurface Flood MAR

The same infrastructure pipe is used to allow excess storm flow to recharge the groundwater in what is known as Subsurface Flood Managed Aquifer Recharge (Flood MAR). Using the same napkin example above, but in this case allow the napkin to hang over the water glass edge, and the water in the glass will drain to the tabletop.

Information for none farm personnel:

Water pressure: In the city water distribution pipes are pressurized, but in a farm the water systems are all gravity flow, till the farm connects a pump to take standing water and create pressure by pushing more water in a pipe than can naturally fit. These pumps are called booster pumps and require significant power for each acre foot of water distributed under traditional irrigation at 35 to 60 pressure standard index (PSI)

Crop water requirements:

A typical crop in the Colorado River watershed (Southwest Desert) requires 4 to 5 acre feet of water per year, per acre. Most crops are water weekly between .5-to-2.5-acre inches. More in the summer and less in early spring/fall time. Farm crop needs are measured by evapotranspiration needs, and fundamentally are based on soil moisture available for the crop. The soil moisture profile is kept between a range of 2.5 to 5 acre inches, it is around 5 acre inches right after irrigation and is allowed to dry out to 2.5 before the crops starts to wilt. This **multi-benefit agricultural water infrastructure retrofit** is designed to keep the water profile at 5 acre inches daily with variations of .2 acre inches a day. The equipment is designed for 100 years of use, it should last a couple of hundred years since it is hard thick plastic and never under pressure.

Solution addresses multiple water conservation activity statutory criteria goals.

The **multi-benefit agricultural water infrastructure retrofit** will provide a 100 year term **reduction in water use** that also allows/encourages groundwater recharging and storage for **reliable** resources during drought years.

Long term reduction & Improvements in water use efficiency: The technology applies highly efficient water use in agriculture by eliminating evaporation water loss especially during the peak of summer and avoiding deep percolation loss from overwatering during the growing season. The technology has revealed the combined losses (evaporation & deep percolation) add up to 80% of environmental leakage in applied irrigation water. This 80% is **significant water use reduction** **<u>without retirement of agricultural lands.</u>** The multi-benefit agricultural water infrastructure retrofit hard thick plastic and depth of installation is designed to provide 100 years of use in reducing agricultural water needs.

Water Reliability: In the winter months and monsoon season when water runoff is abundant and not fully utilized, the same subsurface **multi-benefit agricultural water infrastructure retrofit** is used for subsurface Flood Manage Groundwater Recharge storage, by over saturating the agricultural fields subsurface with storm water flow, resulting in deep percolation into the aquifer below. The annual opportunity goal is to capture three-acre feet per acre from high storm water flows. This volume can increase dramatically with multiple atmospheric rivers, and since most of the agricultural land is in direct contact with river flow, small rain events are naturally funneled into the narrow river flow for recharge diversion and capture.

On a larger regional Colorado River watershed, the technology has improvements in water reliability, the **multi-benefit agricultural water infrastructure retrofit** technology provides water security for multiple communities/stakeholders downstream in the river basins. First by reducing upstream river withdrawals, especially during the critical high demand months of summer, and then by slowing of precipitation events when this upper basin's groundwater is being recharged to the point of overflowing back into the rivers months later as lateral ground seepage flow versus immediate rain surface runoff. Both examples provide benefits for habitat ecosystem, downstream infrastructure such as reducing the speed reservoirs are filled, thus less need for pre-storm reservoir flow discharges.

Watershed Collaboration and Natural Water Conveyance Infrastructure
This technology offers a path to a new collaborative model, whereby urban stakeholders could bank groundwater in upstream aquifers below farm sites for pump withdrawals when called upon, usually during long-term droughts. There are environmental benefits to this collaborative solution since the natural rivers are used as the **"water conveyance infrastructure" (not pipes)** from the farms to downstream urban centers. Plus the distributed aquifer storages acting as one large reservoir, creates an economic relationship with upper and lower Colorado River watershed stakeholders, reducing legal water allocation wars.

This technology mitigates a number of other undesirable outcomes in the Colorado River watershed:

Water Supply Shortages, the technology addresses the biggest freshwater user directly to reduce water demand permanently for agricultural crops by 80% of their evapotranspiration requirements. Reducing the amount applied from 4 or 5 acre feet per acre annually, a standardized crop evapotranspiration needs across the Colorado River basin, and reduces this to only (1) one acre foot per acre annually, a fixed amount across all crop types. The conserved water remains in the river or in the interaction groundwater zone, so more river water can flow downstream into Arizona communities who depend on it most.

Groundwater Depletion Reversal: The **multi-benefit agricultural water infrastructure retrofit** allows for groundwater recharge when there is excessive winter/monsoon flow, thereby improving the groundwater storage as resilient drought contingency **reservoirs** along the **river basins**.

Water Quality Issues: The **multi-benefit agricultural water infrastructure retrofit** eliminates surface water in crops, leading to a steep reduction in herbicide use and other chemicals such as fertilizer, pesticides and fungicides. Resulting in a cleaner aquifer and cleaner watershed flow.

Natural Disasters: All this is accomplished while building climate smart resilience into the agricultural industry against natural disasters such as droughts or atmospheric rivers. The **multi-benefit agricultural water infrastructure retrofit** is reducing water use permanently to drought volume allocations every year. In wet years the **multi-benefit agricultural water infrastructure retrofit is** groundwater storing extra river flow avoiding flood downstream while building water reservoirs for the unlikely event of extreme multi year drought. Due to the **multi-benefit agricultural water infrastructure retrofit** ability to soil moisture (water), it can be described as speeding up regenerative agriculture.

Reliance on non-renewable water supplies: This project will demonstrate a holistic collaboration between upper watershed users (farmers) and lower watershed users (cities and the environment), ensuring not only utilizing renewable water sources more efficiently for the project's direct stakeholders (farms) but many community stakeholders who access the river watersheds throughout the Colorado River basin. Ultimately, this project will act as a positive model of working together on renewable water security among all stakeholders along the Colorado Rivers watershed: agriculture, groundwater storage basins, environmental actors, urban dwellers along river watersheds, and multiple upper and lower basin states all without retiring agricultural land. The holistic approach of managing river water resources has a direct impact on reduction on reliance of non-renewable water supplies across the same regions, bringing water resources back into balance.

Expected water savings in acre-feet per year?

The overall objective of this or any other extreme agricultural water reduction is to limit water use down to one acre foot (12 acre inches), without retiring land and recharge up to 3 acre feet on a wet year. Chemical use reduction is a added benefit.

Our Calculations:

<u>Calculation #1 (direct water conservation):</u> Current water demand per acre is close to five-acre feet annually in the Colorado River watershed basin, some crops require up to 5 acre feet (alfalfa), and with the new infrastructure the water demand drops to one acre foot per acre. If addressing only alfalfa and cotton grown outside of Arizona, the water savings add up to 9.9 Million Acre Feet, when including alfalfa and cotton acreage in Arizona the annual water savings (flow) increase to 12.3 MAF annually. Across a distributed on farm infrastructure.

State	Acerage	Applied acre inches ET	Current acre feet use	**20%** Conservation in acre feet	**50%** conservation in acre feet	**80%** conservation in acre feet
Arizona [1]	549,000	66	3,019,500	603,900	1,509,750	2,415,600
California [2]	251,544	54	1,131,948	226,390	565,974	905,558
Colorado	1,530,000	34.5	4,398,750	879,750	2,199,375	3,519,000
Nevada	351,000	40.5	1,184,625	236,925	592,313	947,700
New Mexico [1]	278,500	54.9	1,274,138	254,828	637,069	1,019,310
Utah	715,000	31.1	1,853,042	370,608	926,521	1,482,433
Wyoming	970,000	31.8	2,570,500	514,100	1,285,250	2,056,400
Total Irrigation use (acre feet)	4,645,044		15,432,502	3,086,500	7,716,251	12,346,002
All out of state water conservation				**2,482,600**	**6,206,501**	**9,930,402**
Amount of reduction in acre feet (including Arizona)				3,086,500	7,716,251	12,346,002

<u>Calculation #2: (groundwater recharge):</u> Take the same acreage calculated above, and time by 3 to get the water reserves added every 5th wet year. This can be adjusted to a defined “wet” year cycle and/or volume. Regional atmospheric rivers can add significant volumes as they become the norm in a warmer climate with no snow. The alfalfa /cotton acreage the concept is target equals 4.6 million, time 3 acre feet every fifth wet year we are looking at 13.8 MAF of groundwater storage

<u>Calculation #3: (aquifer quality Improvement at each site):</u> Take the acreage in calculation number #1 and reduce the industry average for the following chemical pounds: 100% herbicide use, 25% reduction in fertilizer, pesticides, and fungicides all leading to less chemical contamination pressures on the aquifer reservoirs.

Note: The above three calculations are across only alfalfa and cotton grown in the Colorado River basin, the technology could be expanded to other crops and acreage thus increasing the river flows.

Funding the retrofitting across the watershed:
This is a distributed solution, with an emphasis in scaling by subsidizing farm conversion in three financial tranche methods that benefit society as a whole.

Financial Tranche #1 - Short term (1–3 years): Early government subsidized funding for on farm demonstration plots of 5 five acres to 10 acres to encourage early adopters to try the technology, this is similar to solar generation adoption. To five-acre plots, demonstrate agricultural input savings across water, energy, labor, chemical inputs and demonstrate yield improvements. Plus allows the farm operators to gather financial operation data, that can be shared with banks and capital markets interested in project financial long term climate technologies. The end goal is to equip early adopters with the financial and economic benefits that will help them finance the remaining farm acreage on their own without government subsidize funding. During this phase the ability of a farm to "sell" or "lease" the water conservation volumes to downstream user as a revenue source to pay for the retrofit. This stage will cost $500,000,000 to cover 25,000 agricultural acres and deliver 75,000 acre feet a year for 100 years at a cost of $66.66 per acre foot. No additional costs are needed for maintenance and operations, monitoring can be performed by automation satellite gathering.

Financial Tranche #2 – Mid term (3–5 years): Additional government subsidizing in the form of low interest / zero interest loans and or financing supported by aggregating farm loans in a syndicate municipal green bond. This stage will cost $500,000,000 in revolving funding to cover an estimated 200,000 agricultural acres and deliver an additional 600,000 acre feet a year for 100 years at an administration cost of 1 million per year or $01.66 per acre foot. No additional costs are needed for maintenance and operations, monitoring can be performed by automation satellite gathering.

Financial Tranche #3 - Long term (5–10 years): Funding sources move from government subsidized and bank financing to longer term project debt financing including private green bonds. At this stage no additional government subsidizing funding will be required to deploy the remaining 4 million acres. After one million acres have been retrofitted the total additional water flow to Arizona will be 3 MAF for 100 years at a cost of just the initial 500 million, bring the cost per acre foot down to $01.66 per acre foot.

In summary, the government subsidizes funding supports early agricultural adopters and de-risk the financial unknow variables. With investable financial models, the capital markets have the ability to finance the complete Colorado River watershed. Thus, any government subsidies are used to drive the larger capital financial market to support Colorado River watershed retrofits.

Conclusion:
This technology fundamentally fixes several issues in the Colorado River watershed, making the whole watershed more resilient across multiple stakeholders. The technology solution is also distributed across multiple sites, with no one spot of failure. This distributed approach enables a wider financial funding model, across the whole watershed. The technology enables agricultural stakeholders to be long term sustainable industry, while at the same time assisting the whole watershed in being water sustainable and ecologically sound. The solution does not require any additional power demand and cuts the current demand and improves hydro generation capacity. There are no long-term maintenance and operational cost. The solution can be described as a multi win-win-win-win for multiple stakeholders.

B. Potential Augmentation Opportunities
1. WIFA is seeking to develop a list of potential water augmentation opportunities that result in new water supplies for the state of Arizona. Augmentation opportunities that include new or augmented supplies within the state and from outside the state will be considered. Please provide a general description of potential water augmentation opportunities that you have identified or believe may be valuable for WIFA to consider. For each opportunity, please include:
a. General explanation of the augmentation supply and delivery strategy.
See information above
b. Estimated annually available water supply, if estimates exist. Also provide any information available on the reliability and sustainability of the supply along with any information on annual or seasonal variation of the supply, if available.
The end goal is to increase total flow of 12.3 MAF to Arizona within 10 years. See section title "***Funding the retrofitting across the watershed"*** above for more details. The project improves seasonal variation with winter and monsoon groundwater storage and diagonal seepage during "non-precipitation periods".

Long Term Water Augmentation
c. Duration of resource availability if there is the potential that the supply may not be available in the long-term or in perpetuity.
The plan accounts for extreme climate change variability with both a water conservation during dry periods and a recharge/storage structure during wet periods and wet years. This project is a holistic bio-mimicry solution

d. Environmental and/or regulatory considerations and/or limitations.
Yes, this plan has positive environmental and regulatory consideration across multiple areas, especially for endanger species environmental benefits, tribal waters improvements, hydropower improvements and greenhouse gas reductions.

e. Jurisdictional/political considerations and/or limitations.
The project is design to build collaborative approaches to water stress in the Colorado River basin, that reverses the Jurisdictional/Political adversarial approach.

f. Capital investment, repayment or other financial considerations and/or limitations. Details are defined above under section "**Funding the retrofitting across the watershed"** with government subsidize supporting the first 3% of the project and capital markets supporting the remaining 97%.

g. Approaches to enhance the sustainability, security and resilience of the water supply. Details above demonstrate a holistic approach addressing not only sustainability, security, and resilience of the water, but many of the other stakeholders such as environmental and hydro power generation. The solution is a decentralized solution, with no one point of failure and no long term maintenance and operational cost.

Move information on the technology can be found at: www.UmidaAG.com and https://youtu.be/MCEf46tAx1A

Joseph Gallegos
Founder/CEO
Joseph@UmidaAG.com
562-301-5598

RFI for LTWAF
Water Infrastructure Finance Authority of Arizona
100 N. 7th Ave. Suite 130
Phoenix, AZ 85007

11/09/2023

Dear Water Infrastructure Finance Authority of Arizona,

We are writing this letter to introduce a research study supporting the development of in-state water augmentation projects, the Arizona Tri-University Recharge and Water Reliability Project (ATUR-WRP). A collaboration involving Arizona State University, Northern Arizona University, and the University of Arizona, the ATUR-WRP seeks to support the identification and prioritization of potential locations for enhanced recharge projects. The research is being conducted at the request of the Arizona Department of Water Resources and is funded by the Arizona Board of Regents.

The project is led by Katharine Jacobs at the Center for Climate Adaptation Science and Solutions and Neha Gupta at the Arizona Institute for Resilience at the University of Arizona. All three universities are playing a major role in the research; the ASU team is led by Giuseppe Mascaro and NAU's is led by Abe Springer. The project's researchers are experienced in modeling, remote sensing analyses, and landscape-scale treatment evaluation. Combining these tools and expertise, the study will develop a prioritization framework to support the identification of locations where water that would otherwise be lost to the atmosphere can be captured and recharged or directly used for community or environmental needs. The project is analyzing potential options for both rural and developed/developing communities.

This research targets water that would otherwise not reach a natural or artificial channel. This is considered “new water” that is not part of Arizona's existing sources. The project also considers future climate projections in analyses, thereby filling a knowledge gap in existing research.

Results will not include implementation recommendations, but the prioritization framework considers physical availability, proximity to users, and feasibility of recharge or direct use. Results will be made publicly available, supporting stakeholder activities to enhance water supply reliability through the development of in-state water augmentation projects.

Arizona's universities are uniquely equipped to undertake research necessary to develop in-state infrastructure projects supporting community and environmental water needs. The results of the ATUR-WRP project will serve as powerful tools to aid WIFA and other decision-makers in developing in-state augmentation projects.

Sincerely,

Kathy Jacobs

Katharine Jacobs
Director, Center for Climate Adaptation Science and Solutions
University of Arizona

Arizona Tri-University Recharge and Water Reliability Project

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University of Arizona
Address: N 426, ENR2
1064 East Lowell Street, Tucson, AZ 85719
Email Address: jacobsk@arizona.edu
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Manager: Neha Gupta, Assistant Research Professor, Arizona Institute for Resilience,
University of Arizona
Project Manager Address: N 423, ENR2
1064 East Lowell Street, Tucson, AZ 85719
Email Address: nehagupta@arizona.edu
Phone Number: 520-626-4525

Date: 11/09/2023

A. General Information and Experience

1. Please briefly provide the following descriptive information to aid WIFA in understanding the identity, business and authorities of the Respondent and its team members.

a. Name of Respondent, team members, and anticipated roles and responsibilities related to this opportunity.

Respondent: Arizona Tri-University Recharge and Water Reliability Project

Team Members

Arizona State University

- Dr. Giuseppe Mascaro, Associate Professor, School of Sustainable Engineering & the Built Environment: Lead, Hydroclimate subteam
- Dr. Tianfang Xu, Assistant Professor, School of Sustainable Engineering & the Built Environment: Urban recharge modeling & analyses
- Dr. Abdul Moiz, Postdoctoral Scholar, School of Sustainable Engineering & the Built Environment: Hydroclimate modeling & analyses
- Dr. Xin Su, Postdoctoral Associate Researcher, School of Sustainable Engineering & the Built Environment: Urban recharge modeling & analyses

Northern Arizona University

- Dr. Temuulen Sankey, Associate Professor, School of Information, Computing, & Cyber Systems: Forest & natural environments management modeling & analyses; Wildfire effects
- Dr. Abe Springer, Professor, School of Earth & Sustainability: Lead, Recharge Enhancement/Alteration subteam; Karst recharge & discharge; Forest & natural environments management modeling & analyses
- Dr. Ryan Lima, Postdoctoral Scholar, School of Earth & Sustainability; School of Informatics, Computing & Cyber Systems: Forest & natural environments management modeling & analyses; Wildfire effects

Resilient Rivers LLC

- Dr. Holly Richter, Principal Consultant: Recharge & riparian ecosystem analyses

University of Arizona

- Professor Katharine Jacobs, Director, Center for Climate Adaptation Science & Solutions, Arizona Institute for Resilience; Professor, Department of Environmental Sciences: Project PI

- Dr. Neha Gupta, Assistant Research Professor, Arizona Institute for Resilience: Project Manager; Co-lead, Urban Recharge subteam; Stakeholder engagement

- Dr. Ali Behrangi, Distinguished Professor, Hydrology & Atmospheric Sciences: Hydroclimate modeling & analyses

- Dr. Patrick Broxton, Assistant Research Professor, School of Natural Resources & the Environment: Forest & natural environments management modeling & analyses; Snow hydrology

- Dr. Ty Ferré, Distinguished Professor, Hydrology & Atmospheric Sciences: Urban & natural landscapes recharge modeling & analyses

- Dr. Jia Hu, Assistant Professor, School of Natural Resources & the Environment; Assistant Dean of Graduate Education, College of Agricultural, Life, & Environmental Sciences; Director, Southwest Climate Adaptation Science Center: Lead, Forests & Natural Landscapes subteam

- Dr. Yoga Korgaonkar, Assistant Professor of Practice, School of Geography, Development & Environment: Co-lead, Urban Recharge subteam

- Dr. Willem van Leeuwen, Professor, School of Natural Resources & the Environment; Professor, School of Geography, Development & Environment; Director, Remote Sensing Center: Forest & natural landscapes analyses; Snow hydrology

- Dr. Guo-Yue Niu, Associate Professor, Hydrology & Atmospheric Sciences: Hydroclimate modeling & analyses

- Dr. Aniket Gupta, Postdoctoral Associate, Hydrology & Atmospheric Sciences: Hydroclimate modeling & analyses

- Dr. Yuan Qiu, Postdoctoral Research Associate III, Hydrology & Atmospheric Sciences: Hydroclimate modeling & analyses

b. For privately held and investor-owned entities, describe your ownership and management structures

n/a

c. For public agencies, describe your statutory authorities including any authorities to own and manage water rights and water supply facilities

The ATUR-WRP is a scientific study, with no regulatory or water management authority.

d. Describe each member's involvement and experience with existing water augmentation projects, programs or initiatives, municipal and industrial provision, and non-consumptive provision.

The faculty listed have scientific expertise related to hydrology, recharge and recovery, groundwater, geographic information systems, climate modeling and projections, etc. Kathy Jacobs has a long history in water management in Arizona, including developing municipal, agricultural, and industrial water conservation regulations; studies related to developing recharge and recovery projects; lead the development of the assured water supply rules; water reuse, etc. She was the director of the Tucson Active Management Area for 15 years and worked for ADWR for 23 years. Holly Richter has been a leader in the development of augmentation projects in the San Pedro River watershed.

B. Potential Augmentation Opportunities

1. WIFA is seeking to develop a list of potential water augmentation opportunities that result in new water supplies for the state of Arizona. Augmentation opportunities that include new or augmented supplies within the state and from outside the state will be considered. Please provide a general description of potential water augmentation opportunities that you have identified or believe may be valuable for WIFA to consider. For each opportunity, please include:

a. General explanation of the augmentation supply and delivery strategy.

The Arizona Tri-University Recharge and Water Reliability Project (ATUR-WRP) is a research study funded by the Arizona Board of Regents at the request of the Arizona Department of Water Resources (ADWR) to investigate opportunities to enhance water supplies through capture and recharge of precipitation that would otherwise be lost to atmospheric processes (evaporation, evapotranspiration, sublimation) before reaching a natural or constructed channel or increased runoff generated as a result of urban development (where appropriate). The project is a collaboration between the University of Arizona, Arizona State University, and Northern Arizona University led by Professor Kathy Jacobs, Director of the Center for Climate Adaptation Science and Solutions, and Professor Neha Gupta, Assistant Research Professor within the Arizona Institute for Resilience, both at the University of Arizona. ATUR-WRP is a 3.5-year project that began in January 2023 and will end in June 2026 when final project deliverables are transmitted to ADWR and made available to the public. We would be very willing to present an overview of the project and share preliminary findings with the Water Infrastructure Finance Authority.

The ATUR-WRP study will serve as a scientific foundation for in-state water augmentation projects that capture precipitation through constructed projects and changes in land management practices before it evaporates or is used by plants. By focusing on individual groundwater basins, we will identify the augmentation strategy most appropriate for the physical hydrological environment and the users who could benefit from project construction. ATUR-WRP also considers environmental water needs by focusing on projects that support water availability for important environmental features, such as riparian areas. Climate change projections developed by this project will guide the identification of locations suited for capture under future hydrologic conditions.

The objectives of ATUR-WRP are to identify locations in Arizona where precipitation can be captured to reduce atmospheric loss; identify areas where captured water can be recharged; identify areas where both conditions occur; develop a prioritization framework for locating capture and recharge projects; and identify potential future recharge project partners for ADWR. The research team will meet these objectives by describing runoff patterns in the state, using geologic maps and estimates of geologic units' hydraulic properties, and estimates of water table depth to identify suitable recharge locations. The study will combine the geologic and hydrologic analyses with information regarding proximity to users and environmental assets, focusing on water needs within each groundwater basin (Figure 1). In order to aid in future planning under climate change modified hydrologic conditions, the project will use computational models, simulations of recharge projections, land cover and management information to estimate future evapotranspiration, and future runoff in both urban and natural areas to estimate future water availability and identify management strategies to protect water resources. Project deliverables include maps and tools identifying future potential capture and recharge project locations, a final report that includes land treatment options to enhance runoff and recharge, a system for prioritizing project sites, an annotated literature review, and the identification of potential project partners with ADWR. The ATUR-WRP will develop a scientific framework to support in-state water augmentation projects by providing managers with decision-making tools.

Five subteams within the project focus on research areas pertaining to capture of water lost to atmospheric fluxes (including evaporation) in current and future climates. The teams are Forest and Natural Environments, Urban Environment, Hydroclimate, Recharge Enhancement/Alteration, and Stakeholder and Partner Engagement. The project team consists of 14 researchers, five post-doctoral scholars, and ten graduate students.

In addition, the ATUR-WRP study has a technical advisory committee that consists of nine representatives from sectors involved in water management and use, including groups such as the Salt River Project, U.S. Forest Service, Navajo Nation Department of Water Resources, hydrologic consulting firms, and The Nature Conservancy. By assembling a wide range of water interests and perspectives, the project is able to incorporate broad ideas regarding potential methods to capture water that would otherwise evaporate and land treatment options to increase water availability.

The Hydroclimate subteam will use modeling to develop and refine estimates of modern basin runoff efficiency to assess evaporative losses, and will evaluate the implications of climate change on runoff as a result of changes in precipitation and temperature. The Recharge subteam will use maps, models, and analyses to investigate how Arizona can increase recharge potential and use alternative recharge approaches to increase water supplies. They will identify locations within each groundwater sub-basin where enhanced recharge is most feasible, and how post-fire sediment and flood mitigation measures create opportunities for recharge. The Forest and Natural Environments subteam will investigate and summarize via maps, models, and analyses ways that forest and rangeland management practices can enhance runoff and recharge in the context of climate change. This subteam will address questions such as, how do disturbances such as wildfire and mechanical thinning alter the hydrologic cycle (evaporation, transpiration, and sublimation) and create opportunities to increase recharge? The Urban subteam will investigate and summarize ways that Arizona can alter urban land use management to enhance runoff and recharge in or next to urban and developing areas in the context of climate change.

The Stakeholder subteam will coordinate outreach to stakeholders in sectors that use water to ensure the project is responsive to their concerns. Sector representatives engaged with to date include water managers, Tribal authorities, flood control districts, federal and state land managers, agricultural representatives, consultants, and planners. Ongoing engagement will include environmental organizations and county and local governments. Project products will include maps, datasets, and recommended strategies that will be made publicly available and accessible to both researchers and managers following the conclusion of the project.

We will analyze methods currently employed to capture water, including dry wells and infiltration trenches, managed aquifer recharge techniques, intentional flooding, flood control structures with incidental recharge, qanats, and recharge through natural channels. In addition, we will consider direct-use options to support in-lieu recharge through water exchanges. The project will not provide recommendations regarding which projects to implement, but will establish criteria that should help with prioritization as well as identifying land and water management organizations as potential partners with ADWR in project development.

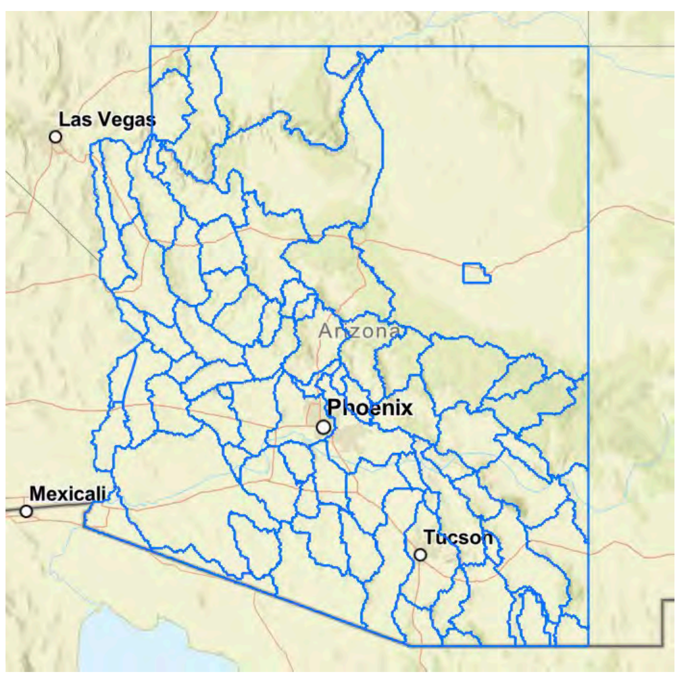


Figure 1. Map of Arizona with groundwater basins (delineated in blue) derived from Arizona Department of Water Resources (ADWR).

The ATUR-WRP project will provide valuable guidance to land and water managers, including ADWR, as a foundation for developing in-state water augmentation projects. The hydrologic, climatic, and geologic research conducted by this study can improve project efficiency, siting, and outcomes – while anticipating the effects of climate change, and supporting projects that focus on benefits to water users, communities and ecosystems.

b. Estimated annually available water supply, if estimates exist. Also provide any information available on the reliability and sustainability of the supply along with any information on annual or seasonal variation of the supply, if available.

Studies estimate as much as ~94.8% (e.g., Harshbarger *et al*., 1966; McMillan and Shroads, 2012) of precipitation evaporates from the land surface before reaching a natural or artificial channel. Capturing a small percentage of this water could constitute large increases in water supplies within specific watersheds.

c. Duration of resource availability if there is the potential that the supply may not be available in the long-term or in perpetuity.

n/a

d. Environmental and/or regulatory considerations and/or limitations.

Because this project can support existing or potential environmental uses of water, minimizing environmental impacts and maximizing opportunities is a core focus for our framework. The ATUR-WRP project does not directly address policy or legal regulations regarding water rights or environmental protection. This study does not include any project implementation. Any future project implementation pursued by ADWR or partner agencies would proceed through the necessary regulatory framework.

e. Jurisdictional/political considerations and/or limitations.

None

f. Capital investment, repayment or other financial considerations and/or limitations.

None

g. Approaches to enhance the sustainability, security and resilience of the water supply.

Our approach is focused on current and future water supply reliability and enhancement. By including climate projections in hydrologic analyses, the ATUR-WRP study can provide data that support projects that are appropriate over the long term.

2. WIFA may consider a variety of delivery and/or ownership models for augmentation opportunities, including long term purchase contracts, a variety of P3 agreements (ref A.R.S. § 49-1211), or other models. Please provide information on factors that will positively or negatively influence your consideration of various potential delivery models. Does an alternative delivery or P3 agreement make the identified water augmentation initiatives more or less attractive business opportunities?

   n/a

3. Given constraints on funds available for water augmentation projects, are there recommendations on how to best prioritize, finance and pay for proposed WIFA augmentation opportunities including those utilizing P3 agreements?

   Our work will be a good platform for evaluating the costs and benefits of augmentation projects across the state.

4. Are there any practical market capacity constraints to deploy water augmentation plans (e.g., physical construction limits, current water pipeline manufacturing and delivery capacity in a given year, other supply chain constraints, labor or any other constraints that may impact the capacity to deliver a total augmentation plan)?

   n/a

5. If Respondents have perspectives on challenges (financial, political, social, regulatory) that may not be project/program specific, they are invited to share opinions that may aid WIFA in analyzing potential responses.

   Unlike other approaches to augmentation, capturing precipitation that would otherwise not be available does not involve taking water from one area or sector to provide it to another. This water we are proposing to capture is essentially “free” water that is not part of the existing water balance in Arizona.

References

Arizona Legislature, Arizona Statute 45-141, Public nature of waters of the state; beneficial use; reversions to state; actions not constituting abandonment or forfeiture, https://www.azleg.gov/ars/45/00141.htm (Accessed October 2023).

Harshbarger, J.W., Lewis, D.D., Skibitzke, H.E., Heckler, W.L., and Kister, L.R. (1966), Arizona Water, *Geological Survey Water-Supply Paper 1648*, United States Department of the Interior, 85 p.

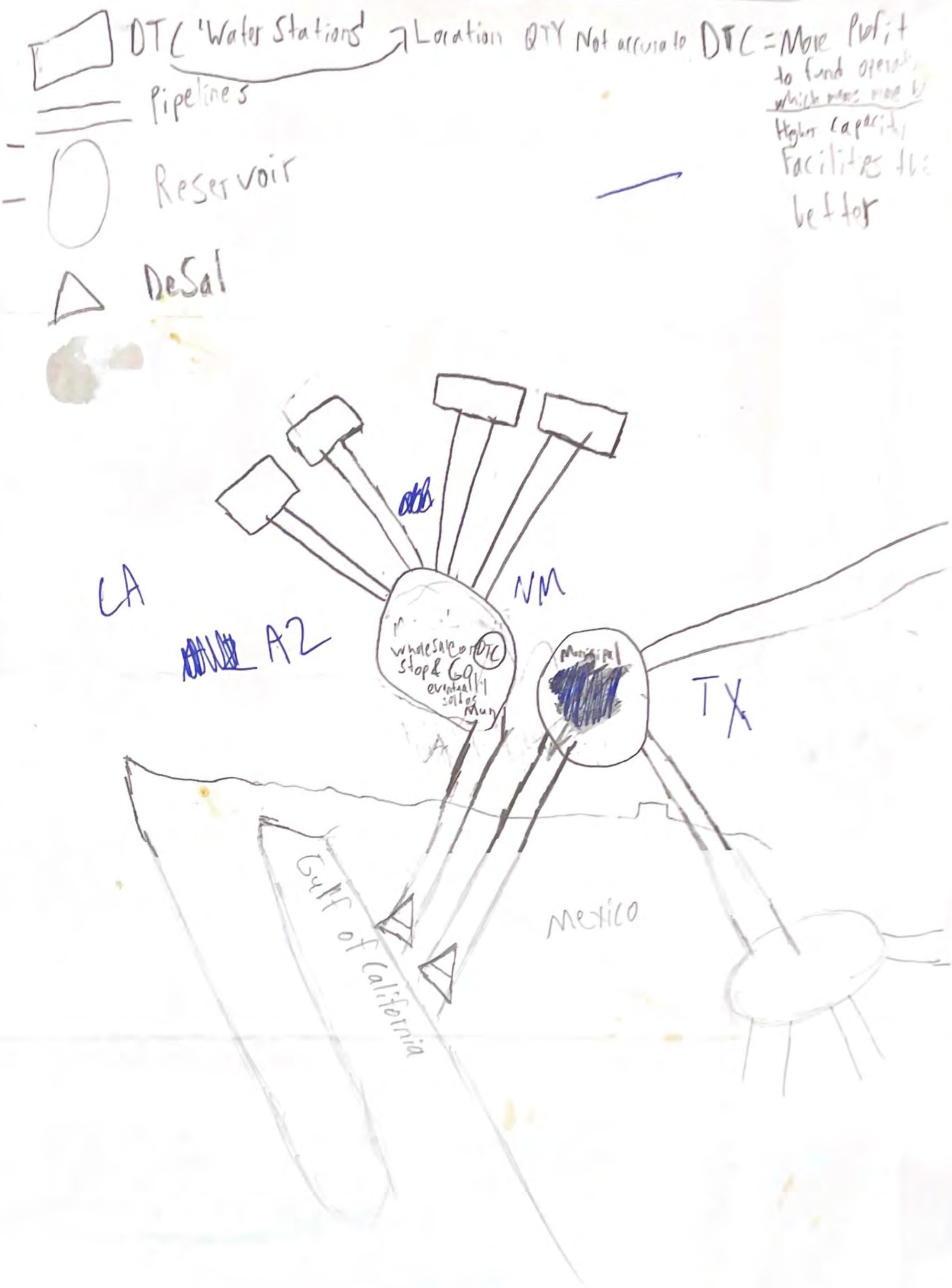
McMillan, D. & Shroads, R. (Civiltec Engineering) (2012), Macro-Rainwater Harvesting / Evaporation Interception, *Arizona Hydrological Society Symposium*, Phoenix, Arizona, September 19, 2012, https://www.yumpu.com/en/document/view/38349416/with-macro-rainwater-harvesting-arizona-hydrological-society.

From: Vincent Vahedi
To: Long Term Water Augmentation Fund
Subject: Re: RFI for LTWAF
Date: Sunday, October 1, 2023 1:27:12 PM

If you set aside 15 minutes of your time for a video call this week or as soon as possible I would appreciate it thank you.

On Fri, Sep 29, 2023 at 6:04 PM Vincent Vahedi <vvahedi.sfi@gmail.com> wrote:

> And Nevada. The emphasis here is water,revenue where it is needed, and improving the quality of life many.
>
> On Fri, Sep 29, 2023 at 1:00 PM Vincent Vahedi <vvahedi.sfi@gmail.com> wrote:
>
>> Hey my name is Vincent,
>> Though this RFI is no guarantee or formal contract of business, I want to share with you a model that I think could benefit the entire southwest, and one day our whole nation. It will get a little more complex as we go but to simplify things the aim is to sell water for any and every possible given purpose, based on geographical needs. The picture is far from precise measurements. However, the idea is to build 2or more maximum size desalination facilities bordering the Gulf of California in Mexico, towards the northeast side of it. Then to run water up to the mountains and create artificial reservoir(s) in the process. And from the reservoirs let gravity try and do as much as possible, then leading into aqueducts to deliver the water in all directions (Mexico,Texas, New Mexico, Arizona, southern Cali if needed). So that is the aim for the municipal water, and the first of good causes we want to be a part of. The second or perhaps first aspect of the business, which can ultimately fund the operations the whole way, is making one plant that is devoted to wholesaling water to beverage distributors or our own way of selling our own brand of bottled water in the same areas. To simplify this again we want to sell water in all ways and shapes and then acquire the industry as a whole and devote it to crucial spending areas in our federal government, such as Medicare/aid. There are more potential streams of revenue involved with water energy or water to be converted into energy. All with the intention of spreading nationally and internationally. We don't want to appear unethical in any way as if the whole thing is about money, because it will cost a lot of money that we will be willing to help raise. It is about bringing water to all of those regions in need, and understanding there is still a demand to be met, and then taking the business side and devoting it to people that need it. So again our goal would be creating a business alongside the municipal delivery of water, that will fund all operations. That can be used to bring power and clean water to Mexico and the southwest, strengthen our border but also benefit the immigration process, add value to property throughout the southwest, create jobs, create tens of billions of water inventory, and with the aim to take over this growing water industry that is +500 billion and get it to a trillion gradually. Again one day devote that entire business to where the spending is needed for the people of our country. We want to help bring what is needed out there, and create something bigger and better in the process. It sounds complex, but this is taking things that have been done by people no smarter than us, and amplifying the potential. Some see a desert while we see Fields of Gold. With your collaboration, Arizona can be the face of a revolution. If you could please make some time to discuss this further, and not focus on any obstacles ahead. Thank you!



DTC 'Water Stations'
Location QTY Not accurate
DTC = More Profit
to fund operations
Higher capacity
Facilities the better
Pipelines
Reservoir
DeSal
CA
AZ
NM
TX
wholesale or DTC
stop & Go
eventually
sold as
Mun
Municipal
Gulf of California
Mexico

To: Water Infrastructure Finance Authority
RE: Long Term Water Augmentation Fund - Request for Information

Water for Arizona contact: Morgan Ross, mross@edf.org

November 15th, 2023

General Information and Experience

The Water for Arizona Coalition is a community of Arizonans who support innovative practices and smart policies to ensure a reliable water supply to meet the state's needs. We strive to secure groundwater for rural communities, adapt Colorado River management to climate change, and protect groundwater in urban Arizona. Organizational support is provided by solutions-oriented groups like American Rivers, Business for Water Stewardship, Environmental Defense Fund, the National Audubon Society, and Western Resource Advocates—which collectively have over 60,000 Arizona members—as well as hundreds of hunters, anglers, and outdoor recreation enthusiasts across the state. Chris Kuzdas of the Environmental Defense Fund and Haley Paul of the National Audubon Society co-lead the Water for Arizona Coalition.

Our five member organizations are led by Arizona water professionals with a combined 90 years in the industry. Our collective knowledge includes: groundwater policy, urban water conservation, and business partnerships.

Todd Reeve, the CEO of Business for Water Stewardship has more than 20 years of working with companies to understand business risk and leverage growing opportunities to shape progressive water policy and advance water stewardship and conservation outcomes. Todd has worked collaboratively to develop corporate environmental water strategies and has led partnerships with Fortune 500 companies, universities, and NGOs to build a corporate-led water stewardship movement. Todd has overseen the development and funding of more than 350 corporate-funded environmental water stewardship projects and partnerships across 20+ U.S. states and internationally.

Chris Kuzdas, PhD, a senior manager in EDF's Water Program, is a political and social scientist with a diverse background in water management, the decision and policy sciences, and international development. Chris manages a large portfolio of projects, research, and investments for EDF's Water Program in the southwestern United States.

Project work includes balancing demands with supplies in the Colorado River Basin, keeping the Verde River flowing, and advancing sustainable groundwater management in rural regions. Prior to joining EDF, Chris worked in Central America for many years as a consultant, project lead, and researcher for universities and multilateral organizations.

Haley Paul is the Arizona Policy Director for Audubon Southwest. In this role, she distills complex natural resource policy and water management issues—via blogs, webinars, infographics, and more—to demonstrate why water policy is important and how it impacts people and birds. Haley seeks to influence water policy outcomes in Arizona and in the Colorado River Basin, pushing them to be more inclusive of environmental needs and the needs of those historically excluded from water management decision-making. Prior to Audubon, Haley worked in the Water Department, in both water resources and water conservation, for the Town of Gilbert.

Kim Mitchell is Senior Policy Advisor at Western Resource Advocates where she focuses on expanding and supporting conservation programs that help stabilize Lake Mead, protecting the state's surface water and groundwater resources, working with tribal communities, and increasing water management flexibility in Arizona. Kim was a hydrologist at the Arizona Department of Water Resources for over 20 years working in a variety of disciplines including basin-wide groundwater studies, recharge, and instream flow. Following ADWR, Kim served as the Executive Director of the Arizona Water Banking Authority for five years where she was responsible for all contracts and intergovernmental agreements for storing sufficient water to firm municipal and industrial supplies, to assist in Indian water rights settlements, and to fulfill interstate obligations with Nevada. She also worked as a consultant to the Central Arizona Project on water planning and management projects.

Sinjin Eberle is the Southwest Communications Director at American Rivers. Sinjin has 23 years of experience in communications as a writer, photographer, and Executive Producer of short films. Sinjin is versed in broad conservation issues across the Colorado Basin and the west, particularly water supply and protection of the Colorado River. Sinjin is an Environmental Representative on both the Glen Canyon Adaptive Management Program's Adaptive Management Work Group and the Technical Work Group.

Potential Augmentation Opportunities

Water in Arizona is critically important to communities, agriculture, the environment, and economic sustainability across the state. Arizona is currently experiencing declining groundwater supplies in rural areas and reduced Central Arizona Project deliveries from the Colorado River. We must strengthen and modernize our water management approach to ensure the long-term viability of a prosperous Arizona. It is critical that all water supplies in our portfolio across the state are well managed to ensure their reliability and sustainability for generations to come. In 2022, the Arizona Legislature increased the authorities and level of state funding for the Water Infrastructure Finance Authority (WIFA), providing Arizona with a once in a generation opportunity to make high-impact monetary investments in water security. This opportunity deserves thoughtful decision-making based on scientifically proven, sustainable, and economically feasible solutions that can provide long-lasting benefits to Arizona's water security. For a brief overview of the various considerations for augmentation and conservation options, see our report, Investing in Arizona's Water Future. This report includes estimates on water savings, costs, and timelines for water conservation, augmentation and management options.

Conservation/Near-term opportunities

The WIFA Water Conservation Grant Fund (WCGF) has demonstrated the need and opportunity for in-state conservation projects, with 199 applicants over seven months. As of October 18th, approved projects are projected to save 1,246,365 acre-feet to 1,870,553 acre-feet of water. WIFA is on track to allocate all $200 million from the WCGF to sustainable, conservation programs and projects that will contribute to Arizona's water security by contributing to the reduction of Arizona's overall water demand, and demonstrating a clear motivation from both rural and urban communities to invest in water conservation.

The WCGF provides a maximum award of $3 million and requires the money to be spent by 2026. The number of applicants and the project funding requested demonstrates the need for conservation projects, and should be factored into ongoing budgetary considerations so Arizona can continue to deliver high-impact funding to near-term projects that save water.

The WCGF has demonstrated a significant need for conservation projects and programs across Arizona. All counties have submitted at least one application and there are currently more applications than funding available. Proposed initiatives will contribute to water savings and sustainable water resource management. In-state projects that lead to a long-term reduction in water usage, or an increase in water supply, should be prioritized due to the immediate water crisis facing the Colorado River and our shrinking groundwater supplies. While the winter of 2023 increased reservoir levels in Lakes Mead and Powell, Arizona is still entering 2024 in a Tier 1 shortage condition. There is immediate need–and opportunity–to cost-effectively conserve water and bolster the resilience of our water supplies within the state. Pinning Arizona's water security strategy on a single importation project with uncertain timing and complex permitting and approval steps is a high risk strategy.

Medium/Long-term In-state Opportunities

We realize conservation measures are only one piece of securing Arizona's water future, and it is important to consider other in-state, medium to long-term projects. As we face a warming climate and declining Colorado River supplies, Arizona needs to be prepared to significantly conserve water and augment our in-state water sources in the near future. The Bureau of Reclamation has started the process for developing the Post-2026 Operating Guidelines for the Colorado River. It is highly likely that the new guidelines will implement increased shortages and reduced water deliveries through CAP as early as 2027.

It is critical to address the immediate need of prioritizing our in-state conservation and augmentation efforts alongside any efforts that may lead to importing water from out of state. Any long-term augmentation project involving importation will need to overcome substantial challenges such as permitting, high costs, power requirements, and complex multi-state (and, in some cases, international) negotiations. Furthermore, any importation of water into the Basin that benefits some states or water users over others, or that requires exchanges of water among States or between Basins, may require amending or defending the Colorado River Compact and other components of the "Law of the River."

There is significant opportunity to bolster Arizona's water supplies through medium to long-term projects including: direct potable reuse, groundwater recharge, alterations to the physical infrastructure and management of existing dams and reservoirs, and of course, improved water management policies (see our Arizona Water Security Plan for details). Many of these opportunities require a longer timeframe for implementation and a greater investment in planning and design than the WCGF allows for, yet these projects can contribute significantly to Arizona's water security.

While WCGF has primarily awarded grants to projects with demonstrated water savings, which is to be applauded, there also needs to be a holistic approach to water management. The Long Term Augmentation Fund should consider ideas that not only augment water supplies, but also advance innovative projects and management tools that have the potential to contribute to water savings or reduce pressure on existing water resources.

Aquifer Recharge
Aquifer recharge projects, when combined with existing water conveyance infrastructure, can provide a cost-effective water source for augmentation of existing water sources. Capturing stormwater and recharging aquifers could provide a significant amount of water for our growing cities and rural communities. These projects, however, require a longer timeline than the WCGF allows for. The Southeast Houghton Area Recharge Project (SHARP) project in the City of Tucson took roughly 10 years from planning through construction. It allows 4000 acre-ft of water per year to be recharged into the aquifer, raising water levels in the aquifer for future use and supporting and enhancing a nearby riparian area.

Natural Infrastructure Projects
Natural infrastructure projects are another example of aquifer recharge where the source water can include stormwater runoff and effluent. Retention basins that capture runoff can be constructed adjacent to a river with the outcome of an increase in water going into the ground to sustain streamflow. Or, if not located near a stream channel, these basins can still be beneficial in helping sustain groundwater levels in the aquifer (albeit on a seasonal basis if storm runoff, year-round if effluent). These types of projects are being implemented successfully in the San Pedro River valley.

Direct Potable Reuse (DPR)
The implementation of direct potable reuse presents a huge opportunity for Arizona to position itself as a leader in water conservation and recycling. The cities of Phoenix and Tucson have identified direct potable reuse as an important part of their future water portfolio. The Arizona Department of Environmental Quality (ADEQ) has started the process to formulate regulations and processes for potable reuse treatment plants. Once these regulations are in place, it will require a significant investment to either build new treatment plants or upgrade existing water treatment plants to meet DPR requirements.

Headwater Resilience
Investing in sustainable forest management provides a wide range of ecosystem services, including the potential to increase water yields, greater fire resilience, and increased wetland water retention. Fire resilience is critical to protecting against the impacts of catastrophic wildfires and the associated damage to water infrastructure–both natural and built.

Reservoir Expansion
The expansion of Bartlett Dam could help to bolster Arizona's water security by increasing storage capacity along the Verde River. Climate change may lead to increased precipitation events, along with shorter runoff periods for Arizona's in-state rivers. There is a significant need to retain and store floodwaters from wet winters for

periods of drought. If Bartlett dam were raised by 97 feet, that would increase its capacity to 628,000-acre feet from its current 178,186-acre feet (source). The proper environmental enhancements and mitigation for such a project must of course be considered.

Recommendations on how to best prioritize, finance and pay for proposed WIFA augmentation opportunities

The LTWAF currently has $522 million, and we understand that a successful water augmentation project will require a significant investment from the private sector. We encourage WIFA to maintain transparency and opportunity for public input on how the public funds will eventually be allocated. In addition to transparency on how the public funds will be spent, WIFA should provide transparency to water users on debt being assumed and by whom (for example: WIFA, the State of Arizona; municipalities) and provide clear projections on how this will impact the cost of water, and for which customers, in the future.

The cost of importing water should be analyzed against other methods of water savings, including conservation, aquifer recharge and recovery, and reusing and recycling water. Cost-effective projects and policies should be prioritized as steps to increase water security for all Arizonans.

Perspectives on Challenges and Important Considerations

Environmental Considerations
While environmental impacts need to be considered for all augmentation projects, out-of-state importation will have significantly greater environmental impacts, and the communities bearing those impacts are likely not the communities to benefit from the project. Any water source imported to Arizona needs to be fully evaluated for environmental and social impacts. Additionally, any water source used for importation should be fully evaluated for its sustainability and reliability.

Benefits of using existing infrastructure
Environmental and climate impacts need to be considered by any augmentation project. The benefit of in-state augmentation projects, such as recharge or expanding reservoir storage capacities, is that the conveyance infrastructure is often already in place, minimizing environmental impacts. In the case of a water recycling plant, a wastewater treatment plant can be modified to meet new ADEQ criteria for DPR.

Energy Use
Importation of out-of-state water will be an extremely energy intensive process. Most previous desalination proposals have included the construction of a new power plant.

WIFA must consider the energy sources and the associated costs for the project and its accompanying environmental impacts.

Environmental Impacts of a Desalination Plant in the Sea of Cortez
The Sea of Cortez is a UNESCO World Heritage Site that contains 39% of the world's total number of species of marine mammals and a third of the world's marine cetacean species (source). The brine disposal from desalination, along with the impacts from an intake and outfall pipeline, will undoubtedly negatively impact this unique marine habitat.

Social Impacts
The construction of a desalination plant and the necessary power supply will negatively impact local communities, who will likely not benefit from the construction of the project. Furthermore, local communities in Mexico may not have the same environmental regulations as in the United States, or the government structure to enforce these regulations. It is important that any importation project is held to the same environmental and social standards as we have in the United States.

National Environmental Policy Act (NEPA)
When there is a federal nexus, a NEPA process will be critical to any water augmentation project. WIFA, along with any partners, should be fully prepared to do a thorough NEPA process that fully evaluates all alternatives and examines all environmental impacts of any proposed project. We also encourage WIFA to continue its effort to maintain a transparent process and help inform the public of the various opportunities to provide public comment and input throughout the NEPA process.

Conclusion

Alongside any efforts to evaluate out-of-state water sources, it will be critical to consider all options within the state and ensure there are adequate funding mechanisms in place to drive an all-of-the-above approach that includes both short-term conservation programs and medium to long-term in-state water management and augmentation projects. There is an immediate need for projects that can save water and improve water reliability. These projects should remain a focus.

Water Infrastructure Finance Authority of Arizona
November 7, 2023
VIA EMAIL: LTWAF@azwifa.gov
RE: Request for Information

WIFA RFI DESIGNATION

COVER LETTER
Seven Pages Plus Cover

Respondent Name:
Water Train Inc.
2095 Avenue F
White City, OR 97503-3210

Respondent Point of Contact
David Rangel, President
Email:dave@watertrain.us
916-275-2869

WATER BY RAIL

WIFA Section 3
A-1 General Information
WATER BY RAIL
Water Train Process Synopsis

A 1 - Water Train is pleased to offer the State of Arizona a new source of fresh water that originates from 100% domestic sources, via existing rail networks. Our exclusive water delivery system can provide Arizona with as much as 30,000 AF a year or more of spring water from our locations in New York, Kentucky, and Tennessee. These are drought-proof sources with several offering a century history of production.

Water Train provides a dedicated 100-car water tanker trains using the existing national rail network, entering Arizona from three points to deliver fresh water. Water Train offers the ability to service other cities of Arizona such as Holbrook, Flagstaff and Williams in addition to the central I-10 corridor. This new water source will benefit more of Arizona.

BENEFITS OF WATER TRAIN SYSTEM
• Immediate availability with 6 - 24 month deployment
• Total 100% domestic project
• No permitting required – Governed by the State of Arizona
• No international agreements needed
• No international work force needed
• Only infrastructure needed is for local water unload terminals
• Expected cost savings of 60% over other international, augmented water plan
• Billions of dollars reallocated for augmented water rather than facilities
• Water by rail can be reduced during wet years
• No treated water pollution bi-products
• Fully predictable service startup and network service schedules

The Water Train infrastructure is already built, including loading terminals and rail loading yards, resulting in a smaller amount of funding for local water unloading facilities. Billions of dollars will be saved in water processing, buildings, pipeline construction and anticipated legal challenges.

Water Train is a low-tech system that moves water from areas of domestic excess to areas of water shortages. From our perspective, billions of dollars could be spent on other augmented systems before the first drop of water is ever produced. While in the meantime, Water Train could be flooding Arizona.

WIFA Section 3
A. GENERAL INFORMATION AND EXPERIENCE

A 1a - Name of respondent / Team members / Roles and responsibilities / Management structure

Water Train Inc.

David Rangel, President. Founder. Responsible for company service objectives, areas of water needed. Marketing. Board of Directors member.

Scott DeVries, Vice President, Co-founder. Responsible for water loading rail operations, locomotives ground equipment. Board of Directors member. Answers to President and Board of Directors.

Jessica Ringor, CFO. Board of Directors member. Answers to President and Board of Directors.

Gail Bledsoe, Executive Management Assistant. Board of Directors member. Answers to President and Board of Directors

H.C.Christy, Vice President - Legal. Board of Directors member. Answers to President and Board of Directors

Gary Hunter, Director railroad inter-connect relations. Railroad network operations director. Board of Directors member. Answers to President and Board of Directors.

James Ferguson, Director legal compliance. Board of Directors member. Answers to President and Board of Directors.

Mark Rangel, Director unload facilities, off network contractors. Answers to President and Board of Directors

Jin Scott, Railroad Operations Advisor. Answers to
President and Board of Directors

A 1 b - Ownership

W.R.H.E.S. Inc.	83% Non profit 501 (c) (3) Corp
Scott DeVries	7% Private investor
Jessica Ringor	1% Private investor
Gail Bledsoe	1% Private investor
H.C.Christy	3% Private investor
Gary Hunter	1% Private investor
James Ferguson	1% Private investor
Jim Scott	3% Private investor

WIFA SECTION 3
A 1 a / A 1 d
Each member's involvement and experience in existing water augmentation programs

David Rangel - Founder
Prior 25 years railroad owner. Identified potential North and Central American water shortage conditions. Determines logistics compatibility. Designed and developed water service for customers in Central America and western United States. Identifies domestic and international nondestructive water sources. Prior railroad owner for 25 years.

Scott DeVries – Co-Founder
Current railroad owner. Develops outbound water logistics, truck railroad capabilities, labor availability, motive power availability, equipment serviceability. Assisted design and development of water service for customers in Central America and western United States. Assists in railcar fleet management serviceability. Has worked with David Rangel for 22 years in augmented water project development and distribution.

Jessica Ringor
Multi Media Developer – Owner. Chief Fiscal Officer. Assisted design and development of water service for customers in Central America and western United States. Has worked for David Rangel for 20 years as a financial assistant, water distribution marketing and project development.

Gail Bledsoe
Strategic Business Development Director. Assists all staff members in data processing. Assisted design and development of water service for customers in Central America and western United States. Assists in data processing for railcar fleet management. Has worked for David Rangel for 15 years as financial assistant, water service project development, on site water delivery market development.

H.C.Christy
Licensed Attorney. Verifies company is operating in accordance with transportation regulations as established by Federal Railroad Administration and industry Code of Operating Rules. Has worked for David Rangel for 20 years as legal assistant, project development, on site domestic water market development.

Gary Hunter
35 YearTransportation Consultant. Leads development of railroad operations integrations, designs and updates traffic patterns for optimum network transit times. Works with customers for design, development and construction of customer water unload facilities. Assists in railcar fleet management. Has worked for David Rangel for 25 years as industry assistant, project development, on site water market development and product delivery.

James Ferguson
Licensed Attorney. Works to assure individual state compliance with private sub basin water withdraw and interstate transportation. Licensed water law attorney. Assisted development of water service for customers in Central America and western United States.

Mark Rangel
Certified Railroad Engineer. Works with customers to develop safe and injury free water unloading operations. Works with all transportation partners for optimum serviceability of railcar fleet. Developed railcar serviceability matrix for company railcar fleet usage.

WIFA SECTION 3
Parts B1 – B2 – B3 –B4 –B5
POTENTIAL AUGMENTATION OPPORTUNITIES

B 1 - New / augmented supplies from outside the State of Arizona
Since the founding of the company in 2005, one of the first objectives was to locate and identify suitable sources of sufficient, high quality underground water where extraction would not be a deterrent to the above ground populations. Fourteen domestic sites have been identified that meet company standards.

B1 a - General description of augmented supply and delivery strategy
Fourteen domestic locations have been selected for current and future development as augmented water sources. The points selected must be free of chemical and industrial contamination. Water sources must be clean with minimal treatment to become potable.

Augmented water sources must be of a specific output threshold to warrant railroad infrastructure investment in rail yards and terminals. To reduce cost, water supplies were selected based on existing rail network infrastructure.

B1 b - Estimated annual available water supply
Of the fourteen identified augmented water supply locations, Water Train has chosen four sites for initial use. The estimated yearly water output of these four sites is approximately 87 billion gallons per year. The estimated output of all current fourteen water locations is 294 billion gallons per year. Seasonal precipitation is not an issue at any site the company has identified.

B1 c - Reliability and sustainability of supply
In all augmented water supply locations selected, output history was a factor in consideration. All locations chosen were required to have a fifty year plus of uninterrupted water output. However, past performance does not guarantee future results.

B1 d - Environmental and/or regulatory considerations
State water trans basin diversions, extraction laws and regulations were discovered to more constraining in states west of the Mississippi River and less so in states east of the Mississippi River. Working with guidance of individual state Natural Resource Departments, Water Train only operates in states where sub-basin water withdraws are compatible with local and state laws.

B1 e - Jurisdictional / Political considerations. Limitations
None

B1 f - Capital investment, repayment or other financial considerations
Water Train is fully capitalized from resources of founders. The company receives frequent requests for investment or stock purchases. The company growth is currently organic and is expected to continue in that manner.

B1 g - Approaches to enhance sustainability, security and resilience of water supply
Water Train continues to examine and evaluate all future augmented water supply opportunities. On average, the company receives multiple solicitations every month for new water supplies. The company takes all reasonable steps for sustainability of the water supply by working to build up our water inventory with reliable and robust water that strengthens the resilience of our total water inventory. The company takes all reasonable steps to ensure the security and safety of the water while under our care and control.

B2 - Delivery and / or ownership models for augmented water opportunities
All water in the Water Train inventory is company owned or under long term multi-year contracts. Our company has identified many locations, both domestically and other areas where augmented water will soon be necessary.

Our company research shows that our network transportation capacity is finite. Our company consideration of seven delivery models will depend solely on when a potential customer turns into a contractual account

Alternative delivery or a P3 agreement is of no value, as Water Train will most likely provide service to a single customer.

Water Train water purchases due prior to state of transportation and are not financially front end loaded, rather a pay as you go system. Water is F.O.B. the moment it is loaded into railcars. Customer will enter into contract for delivery of anticipated number of railcar cars on seven-year contractual increments. All water sold is sold as clean but not potable and is sold with conditions that cleaning is required for human consumption.

B3 - Prioritize limited funding
It is the position of Water Train to maximize the amount of water purchased for the least amount of dollars. Our company has no opinion for financing or payment options taken by WIFA. Priority should be taken with Water Train to secure available water supplies.

B4 - Practical market capacity constraints
Developing demand for clean water, delivered to point of consumption is growing, both domestically and internationally. Regardless of cause, the national demand for water vs. supply is out of balance and widening everyday. A bulk provider of water such as Water Train or a desalination plant can only provide service to one client. The cost of water will soon become insignificant versus availability.

B5 - Respondent perspectives on challenges
From our company perspective, WIFA can select augmented water from an international nation currently at war for its national survival. An international company offering to build a water treatment plant inside a nation-growing hostile to the United States daily, in an area governed by powerful and lawless Cartels, in a position to hold Arizona's water hostage every day, does not lend itself as a pillar of security. A water project that could take over a decade or more resulting in billions of dollars spent with uncertain results. An international water plan with no legal protections for Arizona and no guarantees should not be the augmented water selection for the growth and stability of the state.

The WIFA can select a United States augmented water company, based in Medford, Oregon. A company that can provide guaranteed water supplies. Water that can be seen and held in your hand today. Water from a company with water resources to supply the needs of Arizona at an estimated 60% cost savings. Water Train offers immediate water for most major points in Arizona with water security, legal protection and cost savings. From our perspective, Arizona can start today to build up water security and build water stockpiles or wait and suffer for 10 or more years with a project that may or may not work and dehydrate the citizens in the mean time.

Water Train provides water consistently and reliably without human geo-political trauma and drama. Water Train provides water security, which Arizona can depend upon for future growth and development. Even Mother Nature cannot offer this.

WELLS FARGO

Municipal Finance Group
Public Finance
30 Hudson Yards, 15th Fl.
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333 South Grand Ave, 9th Fl.
Los Angeles, CA 90071

November 9, 2023

Mr. Chuck Podolak
Director
Water Infrastructure Finance Authority of Arizona
100 North 7th Avenues, Suite 130
Phoenix, AZ 85007

RE: RFI for Long Term Water Augmentation

Dear Mr. Podolak,

On behalf of Wells Fargo, we have included a response to the Water Infrastructure Finance Authority of Arizona's ("WIFA") Request for Information ("RFI") for its Long Term Augmentation Plan. Our response is focused on various funding and financing alternatives that may be available to WIFA and P3 project applicants for the development of any public or private imported State of Arizona water supply projects procured through a subsequent RFQ / RFP process. We would note that the financing and funding concepts included in this memorandum are preliminary and conceptual in nature. Their relevance will depend upon a number of project, credit, risk transfer, funding and financing (including debt and equity market) considerations.

In providing this submission, we would note that we are relying on WIFA's IRMA with Piper Sandler & Co. Our role on any project financing under this RFI would be as an underwriter either for WIFA or for a P3 project applicant. At this time, we would also note that we are not a part of any project concept that may be received by WIFA as part of this RFI process.

Wells Fargo is well qualified in serving in either capacity. Our team has longstanding experience on water financings in the State for WIFA (SRF program) as well as a number of water and wastewater utilities in the State (e.g. City of Phoenix, City of Tucson, City of Scottsdale, City of Glendale, etc.). We also have relevant experience working with the Texas Water Development Board on its SWIRFT financing program which leverages its SWIFT Fund for water development projects. In addition, team members have worked on a variety of water and wastewater P3 projects around the country including desalination, wastewater treatment, flood mitigation, and biosolids tax-exempt (subject to the alternative minimum tax) and taxable project financings. As a result, we have relationships with a number of potential P3 project service providers. We also have experience working on these transactions with the use of WIFIA funding to help lower overall funding costs and customer costs of service.

RFI Overview

The RFI provides interested parties the opportunity to present to WIFA water augmentation opportunities from imported water which can be the basis of potential future competitive solicitations. The long-term need for increased water supplies in the State is driving the need for potential future solicitations. For example, the Arizona Department of Water Resources' 2023 Lower Hassayampa Sub-basin Groundwater Model currently projects total unmet demand of 4.4 million acre-feet of groundwater over a 100-year period in the Hassayampa sub-basin. The sub-basin is located in the Phoenix Active Management Area and is subject to Arizona's Assured Water Supply program which provides home buyer customer protection. Other sub-basins in the State are projected to face future shortages and expected growth continues.

The Long-Term Water Augmentation Fund ("LTWAF") was established by the Arizona Legislature as part of Senate Bill 1740 (the "Bill") which was effective in September 2022. The bill appropriated $1 billion from the State's General Fund to the LTWAF, the Water Supply Development Revolving Fund, and WIFA. The predominant portion of these funds are being allocated to the LTWAF and are being funded in approximately equal installments over three years. The Bill requires that 75% of the initial deposits to the LTWAF be allocated for projects that import water into the State. The LTWAF can also be used to finance or refinance water-related facilities in the State to facilitate water importation. In addition to water importation-related projects, monies in the LTWAF can also be used to finance or refinance supply development projects within the State.

The Bill expands the powers and duties of the newly created WIFA board to develop or facilitate water conservation, reuse and augmentation projects. The Bill provides WIFA with significant funding and financing flexibility to utilize the funds deposited into the LTWAF. WIFA can provide LTWAF loans and grants and issue bonds. Any LTWAF loans are required to be repaid. It can purchase or refinance debt obligations of water providers at a below market rate if the debt obligation was issued for water supply development purposes. Financial assistance through the LTWAF can also include credit enhancements purchased for an eligible entity's bonds and other forms of indebtedness. It can negotiate and enter into intergovernmental agreements and agreements with private and public entities within and outside the State, including the United States and other nations. This includes entering into public private partnerships to fund water supply projects. It can contract for water storage and recovery well feasibility studies. It can procure services for the development, design, construction, acquisition, improvement or equipment of water-related facilities. The Bill also requires that WIFA notify Arizona water entities that have Colorado River water entitlements of any water supply development projects that import water. Written notice to these entities is required for any water supply development project to import water that is proposed to be funded by WIFA. The Bill prohibits WIFA from purchasing or providing loans or grants with LTWAF dollars to purchase any mainstream Colorado River water rights (other than water held by a tribe). The written consent of a city, town or private water company is required for any project where WIFA has entered into an agreement to convey or deliver water to a water user within the incorporated boundaries of the city or town or the boundaries of a certificate of convenience and necessity of a private water company. WIFA is also prohibited from selling or leasing imported water or long-term storage credits in its name for amounts greater than necessary for the repayment of LTWAF monies.

Project Considerations

There are a number of project development considerations that WIFA and its advisors will need to consider as they evaluate alternative project proposals from various developers to import water into the State. We have assumed that any in-State permitting requirements will be more limited since the water is imported. Interbasin water transfer issues (legal, technical and environmental) may need to be addressed here for any projects involving other states as they have been on other western water projects. Energy requirements may be significant to pump water from outside the State which could have a material impact on water costs. The involvement of Arizona Power Authority or other contractual counterparties will need to be factored into project development. WIFA may receive a variety of project proposals involving water supply, treatment, storage, pumping, and transmission facilities. Conceptually, proposals may involve a subset of these facilities. For example, WIFA may receive proposals involving supply, treatment, storage and transmission of water to the State line where there will be a master meter that is the point that WIFA or another public or private party would take possession of the water. WIFA or that other public or private party would then be responsible for developing transmission and interconnection facilities to deliver the water to wholesale customers. To the extent that it is technically, legally and contractually feasible, use of the Central Arizona Project for transmission and delivery could also be proposed.

It is expected that WIFA will also receive water project proposals for public private partnerships. WIFA and the local water entities that will benefit from these projects will need to take into account a number of considerations on the use of public private partnerships.

First, there will need to be a determination about how risk needs to be allocated between the public and private sectors in this arrangement. Risks associated with water supply development and the design / construction, financing, operation and maintenance of the project facilities will need to be evaluated and allocated between the parties. The risks may be allocated differently depending upon the type of facilities (e.g. water supply, treatment, storage, transmission and interconnection facilities) and whether this is an out-of-State or in-State project.

Second, there will also need to be a determination about whether the allocation of risks is constant or could change over the term of the agreement. For example, WIFA may elect to have a private developer design, build and construction finance various facilities with WIFA or a joint water agency acquiring the assets once the project has successfully achieved construction completion acceptance. The private developer could then operate and maintain the project under a long-term operating agreement with the public owner subject to the management contract rules. Alternatively, the project could be operated and maintained by the public sector. Another alternative would be for the project to be privately owned for the term of a water services agreement with WIFA or the joint water agency. Under this scenario, the private sector assumes all project risks and the public offtaker only pays for water that is delivered to it at the master meter. A third alternative would be for public sector ownership with a long-term concession agreement with the private developer under a design build finance operate and maintain (DBFOM) arrangement. Under this scenario, the public sector would own the project and the private developer would hand back the project to the public sector at the end of the concession lease term unless the term is extended. Under this alternative, risks are primarily allocated to the private sector. A chart outlining the wide spectrum of P3 delivery alternatives is included at the end of this memorandum.

Third is the consideration of cost. As more risks are assumed by the private sector, this will most likely result in higher capital costs to finance the project facilities. The capital markets will want a greater proportion of equity in the capital structure. For a project financing, debt investors will want to see delay and performance liquidated damages provisions in the engineering procurement construction contract as well as performance liquidated damages provisions in the operating agreement. As discussed later in this memorandum, the cost of funding generally will be higher for a privately financed project (assuming privately ownership or concession arrangements). Offsetting these additional costs are the private sector's ability to design build the project more quickly (project acceleration lowering inflationary impacts) and potentially operate the project more efficiently. WIFA's advisors will want to look at these factors in doing a value for money evaluation comparing the various business arrangements.

Credit Considerations

Another important consideration from a financing perspective will be how the project credit is structured. The credit of any project debt will depend upon a number of factors including (1) the obligor, (2) type of credit – system revenue, corporate-backed or non-recourse project, (3) water supply contract provisions, (4) availability of credit enhancement (e.g. bond insurance or LTWAF guarantee), (5) bond covenants, (6) pledged reserves and (7) collateral package for a non-recourse project credit, among others.

The form of the water supply contract(s) is an important credit consideration. The strongest type of contract would be a take or pay arrangement where the water purchasers would be obligated to take or pay for a minimum amount of water over the term of the debt at a price that covers fixed and variable operating expenses, debt service, reserve funding requirements and targeted equity returns. This is similar to the availability pay concessions in the P3 market. This obligation begins once the project is placed in service. The water purchasers take the risk of any change in water demand or supplies for their systems. The other format would be a take and pay arrangement which shifts some of the risk to the private sector. Under this alternative, the water purchasers take and pay for whatever water they need each year with no minimum purchase requirement. This type of credit would be difficult to finance as a non-recourse project financing so would most likely require a parent guarantee or external credit enhancement. Under either of these alternatives, however, payment obligations of the water purchasers would usually be considered an operating expense which is senior to their own debt service payments.

To facilitate the purchase of water from a water importation project to multiple cities, water agencies or companies, a joint water authority could be established, subject to State law, to act as a counterparty to the project developer under long-term water supply agreement(s). This could be one agreement with the joint water authority that would have allocations with multiple parties or a separate agreement with each party. To the extent that there is one agreement with the joint water authority, the debt will need to be enhanced to avoid a weak link credit assessment based upon the weakest credit in the pool of water purchasers that are represented by the joint water authority. Typical credit enhancements include step-up provisions (e.g. if one water purchaser defaults or fails to take its allocated water, the other remaining water purchasers subject to the agreement step up to take this allocation proportionately) and/or supplemental reserves. There are a number of western joint water authorities that have structured their credits using these provisions including the Trinity River Authority, the Guadalupe River Authority, the California Department of Water Resources, the Metropolitan Water District of Southern California, the San Diego County Water Authority, the Calleguas Metropolitan Water District, and the Kern County Water Authority.

Alternative Uses of the WIFA LTWAF

As discussed above, the Bill establishing the LTWAF provides WIFA with significant flexibility to utilize monies deposited into the Fund. The LTWAF enables WIFA to use these State appropriated funds to help lower the cost of water to wholesale water customers under any of the water supply agreement arrangements discussed above. The authorized uses of the monies under the Bill are not mutually exclusive with various combinations of uses potentially utilized. It is assumed that WIFA would invest unobligated LTWAF monies (both appropriated monies and any loan repayments not used to pay debt service) to help increase fund balances over time.

One strategy would be for WIFA to use the LTWAF funds to provide subsidized loans or debt guarantees to a joint water authority or individual local water utilities to finance publicly owned water facilities. For example, these funds could be used for in-State water transmission, pumping and storage facilities bringing water from the State line master meter to various communities. Another approach would be to provide subsidized loans or debt guarantees for these entities for them to purchase a portion of the capacity of any publicly or privately developed water facility (including a treatment plant).

A second strategy would be for WIFA to private direct loans or guarantees using LTWAF monies to private (P3) project developers if WIFA is willing to consider this. This would extend the use of LTWAF monies to both out-of-state and in-State water treatment, transmission, pumping and storage facilities. Any loans or guarantees could be limited to senior project debt pari passu with any other project debt (including capital markets and WIFIA loan debt). A loan could also be provided on a subordinate basis to the project developer to reduce equity requirements and lower the cost of water to wholesale water customers. To provide additional security for such loans, a project sponsor parental guarantee could be required. There is precedent for this structure on various waste-to-energy project financings.

WIFA could also go one step further and leverage the LTWAF to enhance how much funding it can provide for water importation projects. Long-term Water Augmentation Bonds are authorized under the Bill for issuance by WIFA through the Board. Bonds issued by WIFA for the LTWAF would be secured by loan repayments from a joint water authority or various water supply customers with executed water supply agreements. Proceeds from the sale of the bonds would be used by these entities to pay their allocable portion of any water supply facility capital costs. One variation on this would be for a private sector developer to provide construction financing which would be taken out following construction completion acceptance by a WIFA LTWAF debt issuance secured by joint water authority or water supply customer loan repayments (Note: this could also be structured as a purchase of bonds from each of these entities who would be obligated to pay debt service on these bonds to WIFA). As discussed above, to the extent that WIFA is willing to provide credit to private developers for water importation projects, leveraged LTWAF funds could also be provided to the developers as senior or subordinate loans.

Texas Water Development Board SWIRFT Program. The concept of leveraging a large water supply fund has been implemented since 2015 by the Texas Water Development Board ("TWDB") for its State Water Implementation Revenue Fund Texas ("SWIRFT") program. The purpose of this program is to lower the cost of authorized State Water Plan project debt service costs. Members of Wells Fargo's coverage team have worked on four transactions for this program since then including a $1.01 billion financing this year. This program was initially capitalized by $2 billion of Texas rainy day funds which were deposited into the State Water Implementation Fund for Texas ("SWIFT"). Monies in the SWIFT are invested by the Texas Treasury Safekeeping Trust Company in the name of the TWDB. Monies in the SWIFT are transferred up to two times a year to provide loan subsidies to the loans funded for each bond issue and may also be used to cover debt service shortfalls (although the SWIFT is not pledged to bondholders). On the basis of the credit strength of the borrowers and the availability of the SWIFT, all series of SWIRFT bonds since 2015 have been rated AAA / AAA by Fitch and Standard & Poor's. This program is flexible in that it can be used for various types of loans with varying subsidies although only Political Subdivisions (i.e. public entities) are eligible to participate in the program. The three types of assistance to Political Subdivisions currently offered by the TWDB through this program are (1) 20 to 30 year low interest (below market rate subsidized) loans, (2) 20 to 30 year deferred loans for developmental (planning and design) costs with principal payments deferred and interest not accruing until the earlier of the end of construction or eight years, and (3) 34 year Board Participation loans where the TWDB assumes temporary ownership interest in the facility until growth enables the local sponsor to repurchase the TWDB's interest in the facility under a repayment schedule that allows for the deferral of principal and interest. We would point out that WIFA appears to have more flexibility with how it utilizes the LTWAF including the ability to facilitate public private partnerships but some of the loan origination and investment strategies used by the TWDB may be of interest to WIFA.

USEPA WIFIA Loan Program

As WIFA is aware, based upon its administration of Arizona's drinking water and clean water SRF programs and its ongoing interaction with USEPA, the Water Infrastructure Finance and Innovation Act loan program is a potential source of low-cost funds which could be part of the funding strategy for any approved water importation projects. The original intent of the WIFIA program was to fund more complex and challenging water and wastewater projects, including P3 and lower rated credits. In fact, over the past year two investment grade projects have executed WIFIA loans with USEPA in conjunction with the issuance of other debt (the Carlsbad Desalination Project for the seawater intake retrofit and the Lake Oswego Project wastewater treatment plant). The proposed 1.8 million acre-feet Sites Reservoir Project in Colusa County California for drought mitigation is expected to cost $4.4 billion and receive a $2.2 billion WIFIA loan along with the remainder funded by the state and revenue bonds subject to an accelerated review process.

WIFIA loans are very long-term taxable loans which can be originated to public or private entities for water supply projects. There is a two-step competitive process for being selected for these loans. Given the State's critical need for water, any water supply project should fare well in the selection process. Any combination of the private P3 developer, WIFA, a joint water authority or individual local water utilities could be applicants for such loans. WIFIA loans have very flexible terms. Given the expected long-term life of the water importation facilities that will need to be financed, WIFIA loans could have a final maturity of 35 years after construction. These loans can have flexible amortization (including wrapping this debt around more expensive other debt), loan prepayment at par at any time, a taxable loan rate of SLGs plus one basis point based upon the average life of the loan, and permitted loan subordination. Restrictive conditions for WIFIA loans include Federal cross-cutting (e.g. Davis Bacon, Build America, Buy America, etc.) and reporting requirements. WIFIA loans can be used to replace a portion of any more expensive long-term public tax-exempt debt or a private (P3) taxable or tax-exempt private activity bond debt. The debt structure for any water importation project can be optimized for the various tranches of public (capital markets tax-exempt and taxable) and private (WIFIA loans and private placement) debt.

P3 Project Funding (Tax-exempt Private Activity Bonds, Taxable Debt and Equity)
P3 water projects are generally funded with some combination of tax-exempt private activity bonds (PABs), taxable public or privately placed (including WIFIA loans) debt, federal or state grants, and equity. Following are considerations on the issuance of PABs and availability of project equity for these projects.

Private Activity Bond Considerations. For a water importation project which is privately owned or publicly owned under a long-term concession agreement, the water facilities may be financed using PABs under the local furnishing of water exemption. The assumption here is that the water that is delivered is available to the general public (i.e. the water is ultimately delivered to a joint water authority or individual local water utilities for general use).

One complication that will need to be investigated by tax counsel is whether PABs may issued for any portion of the facilities located outside of the United States (such as the proposed desalination plant in Mexico). These facilities may qualify for tax-exempt financing as output facilities providing water to Arizona. It is assumed that any portion of the capacity of the plant used for non-United States consumption probably will not qualify. Another consideration is that since the bonds are PABs, a Tax Equity and Fiscal Responsibility Act ("TEFRA") hearing will be required prior to issuance. This is typically conducted by a governmental entity for the public in the community impacted by the project. Since there is no US governmental entity in this case, the IRS will need to be consulted about the possibility of an exception to the TEFRA requirement in this situation.

PABs are issued through a conduit state or local authority on behalf of a project that has some level of private involvement and are subject to the alternative minimum tax. In the case of Arizona, exempt facility PABs are typically issued at the State level through the Arizona Industrial Development Authority, a nonprofit corporation incorporated with the approval of the Arizona Finance Authority. The benefits of PABs financing structures compared to taxable transactions include (1) lower yields as interest income is exempt from US income tax, (2) longer tenors, (3) deferred amortization, and (4) economic ten-year par calls.

A second consideration for the use of PABs is the availability of volume cap for the project. The first issue that will need to be determined is whether Arizona volume cap can be applied to facilities located outside the State under the assumption that the facilities provide water to the general public in Arizona communities. If not, this may preclude the use of PABs for any non-United States facilities. Any facilities located in the United States outside of Arizona may require volume cap allocations from the states in which the facilities are located.

In Arizona, total volume cap allocated to the State in 2023 was over $883.1 million based upon the $120 per capita formula. Of this amount, 30% or over $264.9 million was allocated to projects at the Director's Discretion with the remainder primarily allocated to Mortgage Revenue Bonds and Credit Certificates (35%) and Residential Rental projects (15%). The Director's Discretion allocation is the portion of the State's volume cap that is most likely to be available for local furnishing of water PABs. Allocations from this pool are made on a first come, first served basis. Relevant statutes for volume cap procedures were modified on June 20, 2023. Starting in 2024, the Director's Allocation is reduced to 25%. In addition, the Residential Rental pool is no longer subject to reallocation to another pool if it is not allocated by March 31st. 60% of the reallocation from Mortgage Revenue Bonds and Credit Certificates pool are reserved for the Residential Rental and Mortgage Revenue Bonds and Credit Certificates pools until July 31st. After that point, any unallocated volume cap in these pools may be reallocated to any other pool. The impact of these changes is a general reduction in the availability of volume cap to the Director's Discretion pool including for local furnishing of water exempt facility PABs transactions. On December 16th, all unused volume cap is pooled and is awarded to projects that have applied for carryforward for use in one of the next three years (after which it expires if it is not used). For private local furnishing of water PAB borrowers, they will want to apply as soon as possible for volume cap and take advantage of any carryforward opportunities to accrue sufficient volume cap for the project (depending upon the amount of debt to be issued).

Equity Considerations. The level of equity for any privately owned or P3 concession will depend upon several considerations. Given the credit strength of public offtake water purchasers and the proven technologies for these projects, equity levels tend to be lower for water projects than other types of project financings. Debt issued for these projects tend to be investment grade with strong long-term contracted cashflows, reserves, and pledged collateral. Equity levels have generally ranged from 8% to 25% including the Carlsbad Desalination Project, the Lake Oswego Wastewater Treatment Facility Project, the Fort Lauderdale Prospect Lake Water Treatment Plant Project, the Vista Ridge Project (water supply project for the San Antonio Water System), and the Fargo-Moorhead Flood Risk Management Project. The level of equity required for P3 projects will depend to some extent on the amount of risk transfer that the public owner will want to assign to the concessionaire as well as market conditions. The public owner will generally want to see some level of "skin in the game" by the concessionaire, balanced by limiting the amount of higher cost equity in the capital structure. Risk transfer to the private entity can also be built into the liquidated damages and performance guarantees of construction contractor and operator.

Sources of equity for these types of projects are plentiful. The water and wastewater sector is viewed as an essential service and stable industry and historically has had limited opportunities for private sector investment. Potential equity investors are very interested in investing in this sector to diversify their portfolios. Infrastructure funds, private equity funds, water operators, construction contractors, and equipment suppliers are potential sources of equity. Infrastructure funds who are buy and hold investors of long-term contracted projects are attractive equity investors in these projects given their lower return requirements. Consortiums competing for these projects will generally have representatives from a combination of these industry participants in their proposals.

Conclusion
In conclusion, Wells Fargo looks forward to continuing to monitor the direction that WIFA takes following the RFI process with respect to the use of the LTWAF for water importation projects. Please reach out to any of us if you would like to meet with us or have any follow-up questions, comments, or need for additional information.

Sincerely,

Richard G. Weiss	Michael J. Engelbrecht	Tom Wynne
Richard Weiss	Michael Engelbrecht	Tom Wynne
Managing Director	Managing Director	Director
Public Private Partnerships	Co-Head Utilities Group	Arizona Coverage

Appendix

A Wide Spectrum of P3 Delivery Alternatives

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A Wide Spectrum of P3 Delivery Alternatives

Over the years, the P3 Market has continued to evolve as governmental units pursue alternative delivery methods and alternative asset types

	Design-Bid-Build	Design-Build	Design-Build-Finance	Design-Build-Operate-Maintain	Design-Build-Finance-Operate-Maintain (Availability Pmt)	Design-Build-Finance-Operate-Maintain (Demand Risk)	P_3 Concession
Overview / Goal	*Most traditional municipal delivery, each contract is piecemeal*	*Mitigates risk of cost-overruns by pricing fixed price, date certain contract*	*In addition to benefits of DB, developer also responsible for gap financing*	*Provides life-cycle cost benefits and delivery benefits, but no private financing*	*Most common form of P3 that bundles design, build, O&M, and financing*	*Bundles design, build, O&M, and financing risk, with user-fees repaying debt*	*Privatization or monetization of an existing asset for an upfront payment*
Contractor	▪ Traditional delivery ▪ Separate contracts for engineering, design and construction	▪ Single contract ▪ Fixed price to design and build ▪ May include operation and maintenance	▪ Single contract ▪ Fixed price to design and build ▪ Short-term financing	▪ Design ▪ Construction ▪ Operation and maintenance	▪ Design ▪ Construction ▪ Operation and maintenance ▪ Long-term financing	▪ Design ▪ Construction ▪ Operation and maintenance ▪ Financing ▪ Demand risk	▪ Long-term lease ▪ Operation and maintenance ▪ Long-term financing ▪ Rate setting
Public Agency	▪ Revenue or general obligation bonds ▪ Rate setting / cost recovery ▪ Operation and maintenance ▪ Demand risk	▪ Revenue or general obligation bonds ▪ Rate setting / cost recovery ▪ Operation and maintenance ▪ Demand risk	▪ Revenue or general obligation bonds ▪ Rate setting / cost recovery ▪ Operation and maintenance ▪ Demand risk	▪ Financing ▪ Rate setting / cost recovery ▪ Demand risk	▪ Rate setting ▪ Provide payment only upon availability ▪ Demand risk	▪ Take-out financing after construction ▪ Rate setting	▪ Receives upfront concession payment ▪ Concession Agmt. lays out risk allocation and roles/ responsibilities
Design	○	●	●	●	●	●	●
Construction	○	●	●	●	●	●	●
Financing	○	○	●	○	●	●	●
O&M	○	○	○	●	●	●	●
Revenue	○	○	○	○	○	●	●

● Private Sector Risk Transfer ○ Risk Retained by Public Sector

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WESTERN WATER PROJECT

Making The River Work For All

PO Box 30273 | Las Vegas, NV 89173 | doremus@WesternWaterProject.org WesternWaterProject.Org 702 630-2229

Wed, November 15, 2023

David Beckham, Chairman
Water Infrastructure Finance Authority of Arizona
Dbeckham@bg-ventures.com

Dear Chairman Beckham and Members of the WIFA Board:

The desire for Southwest water augmentation has been around for over sixty years. The issue surfaces and then recedes, surfaces and recedes. There have been many engineering solutions to bring water from where it is to where it isn't: from the Colorado River, the Columbia River, the Mississippi, the Pacific Ocean, the Sea of Cortez.

There's a Colorado River Compact where the affected states that rely on water from the Colorado River agree to share it. We ask, "Why don't the Northwest states and tribes, those in the Columbia River watershed, form a Water Trust or Compact and sell a portion of the Columbia River water to the Southwest states?"

The Columbia River water under consideration to divert is not being used for agriculture or urban areas, but is being discharged into the Pacific Ocean, unused, unnecessary, unwanted. Additionally, it's not necessary to divert all the discharged water to the Southwest states but rather a small percentage of the water, five to ten percent. (The Columbia River discharges 192 MAF into the Pacific Ocean annually according to a USGS report.).

With all these viable engineering solutions presented over the decades, why haven't any been adopted and executed? Politics, primarily. And money.

Certainly, Western Water Project's proposal, bringing 10 MAF of water from the mouth of the Columbia River to the Southwest in an undersea pipeline, has a huge price tag: Western Water Project estimates it will cost $125B to build. But, this project would supply California and Arizona with additional water and plans to eventually reach additional Southwest states: Nevada, Utah, New Mexico, and Utah. At current estimates, water can be delivered for $1,573 per AF: 4 MAF for Arizona, 3 MAF for San Joaquin Valley, 3 MAF for Imperial Valley.

WWP also believes that providing some of the water from the Columbia River to California will initially relieve California's present demand and entitlement on the Colorado River allowing the other six states access to more Colorado River water. Once a water supply line is established to California, pipelines are built to carry water directly to Arizona and other Southwest states.

The WWP proposal is noteworthy in a few ways:

1. Recognizes that the Columbia River discharge into the ocean is water that is unused, unnecessary, unwanted.
2. Seeks to use a small percentage of the annual Columbia River discharge into the ocean, 5% - 10%. (6% of Columbia River discharge provides 10 MAF of fresh water.)
3. The Columbia River watershed states and tribes can form a Water Trust to own and control the water and sell it to the Southwest.
4. The proposed pipeline from the Northwest to the Southwest is undersea, not overland, avoiding private property rights and imminent domain issues and other jurisdictional considerations. (The undersea portion is 1,100 miles, the overland portion is 530 miles.)
5. Though no study has been performed at this point in time, it is likely the environmental impact would be less with an undersea pipeline compared to an overland pipeline.

In response to Arizona's WIFA Long Term Water Augmentation RFI, this proposal provides a solution to Arizona's water needs that offers a long-term plan for a water supply opportunity that imports water from outside Arizona's state boundaries.

An initial funding of $25 million would allow this project to move forward. These funds, as described in detail in the RFI, would strategically prioritize and pay for the project's various components. We estimate the initial capital funding would be expended within 18 months.

We welcome the opportunity to engage in further discussions, feasibility studies, and the necessary steps to transform this proposal into a reality that impacts Arizona's water supply portfolio for anticipated customer needs. Together, we can unlock the potential of the Columbia River and address the pressing water resource challenges of our time.

Western Water Project appreciates the opportunity to present our RFI to WIFA for Long Term Water Augmentation for Arizona.

Sincerely,

David Doremus, Director
Western Water Project, LLC
doremus@westernwaterproject.org
702/630-2229

WESTERN WATER PROJECT

Making The River Work For All

PROPOSAL FOR SERVICES

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA: REQUEST FOR INFORMATION

SUBMITTED BY:

WESTERN WATER PROJECT, LLC

WESTERNWATERPROJECT.ORG

DAVID DOREMUS, DIRECTOR

702/630-2229

DOREMUS@WESTERNWATERPROJECT.ORG

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The Team

David Doremus, a distinguished figure in the realm of community development, mortgage banking and real estate, stands as the sole owner and current exclusive financial contributor to Western Water Project – a pioneering water diversion project. With a multifaceted career spanning various domains, David Doremus has left an indelible mark on the landscape of the United States, which he hopes will culminate in this project to advance sustainable water management.

In 1992, David Doremus embarked on a political journey by running for the US House of Representatives in Idaho's 1st Congressional District. His campaign was marked by a fervent determination to address the critical issue of the vast and underutilized Columbia River's outflow into the Pacific Ocean, amounting to an average annual volume of 192 million acre-feet. David passionately advocated for a more responsible approach to this precious resource, highlighting the waste inherent in avoiding such a diversion. However, his campaign faced a formidable opponent fueled by public sentiment against diverting water to the south, driven by concerns that any concession would lead to total loss of control over this vital resource.

Before entering the political arena, David Doremus enjoyed a successful career as a prominent residential and commercial developer in Southern California. His illustrious portfolio boasts the construction of over 8,500 homes for sale and the development of 3 million square feet of mid and high-rise commercial offices. In addition to his real estate endeavors, David Doremus presided over various other businesses, including chairing a Real Estate sales venture and a Mortgage banking company that specialized in originating commercial loans above 5 million dollars.

The tragic explosion of the Challenger space shuttle in 1986 profoundly impacted David Doremus's trajectory as a developer at the time of the explosion. He had 1,600 single-family homes in various stages of development in and around Santa Maria, California. However, a rushed launch decision led to the Challenger disaster, abruptly terminating President Reagan's bi-monthly launch mandate and dealing a severe blow to America's space initiatives. The subsequent decommissioning of Vandenburg launch complex and returning activities to Houston control resulted in an outflux of engineers back to Houston where David Doremus was actively delivering approximately 650 new houses every year serving the Santa Barbara and Vandenburg environs. This calamity had far-reaching economic repercussions for his companies and the nation as a whole.

Simultaneously, the country grappled with soaring long-term interest rates of up to 20%, a major recession in process, and a Japanese acquisition of his commercial bank, which spelled further challenges for his enterprises. The Japanese owners expressed their aversion to speculative developers and swiftly froze his unsecured commercial line, which had an availability of nearly 8 million dollars. Faced with this confluence of adversity, David made the decision to refocus on his family, recognizing that competing with the federal government's sale of America's Savings and Loans selling assets, primarily to foreign buyers, at pennies on the dollar costs, was an insurmountable task. Despite overseeing more than 30 active companies and an annual volume exceeding $600 million, the changing economic landscape necessitated a strategic withdrawal.

One of the distinctive aspects of David Doremus's lineage is his great-grandfather, Abraham Fairbanks Doremus, who served as the first state engineer for Utah. A pioneer in the field of water distribution systems, Abraham Doremus notably designed and received multistate compact approval to divert Eastern slope waters to the Salt Lake City valley. This Uinta Mountain diversion project, a design that he formulated 140 years ago, was only completed three decades ago. David Doremus's lifelong commitment to community development underscores his remarkable journey as a visionary leader, with his current vision being shared by others as he strives to help bring a solution to the water problem faced within the western states and provide a solution that is a win-win for all involved.

Pat Madea is the other member of the company as its administrator, researcher, and company manager. Madea is a seasoned professional with over 35 years of experience in the corporate training and documentation field, specifically within the railroad and mining sectors. Pat has played a pivotal role in steering organizations through the dynamic landscape of technological advancements.

During his extensive career, Pat has demonstrated a keen ability to introduce innovative training programs on an enterprise-wide scale, supporting the seamless integration of new and disruptive technologies. His expertise has been honed over eight years as a Global Training Manager, a role that allowed him to contribute significantly to the evolution of corporate training in parallel with the introduction of computer technology in both the railroad and mining industries.

Notably, at the railroad, Pat was a trailblazer in implementing the cutting-edge mainframe computer-based training system, IIAS (Interactive Instructional Authoring System) from IBM. This groundbreaking initiative facilitated the delivery of training across the Southern Pacific system, marking a significant leap forward in training methodologies. In his capacity as the Manager of Global Training Services at Modular Mining Systems for 8 years, Pat orchestrated the creation and management of a highly skilled seven-person department. Under his leadership, this team developed and delivered comprehensive training programs utilizing various learning and delivery media. Pat Madea's rich and diverse career is a testament to his commitment to advancing corporate training practices and his adaptability to the evolving landscapes of technology and innovation.

Katrina Wertheim-Willey serves as our marketing director. She brings nearly two decades of Integrated Marketing and Corporate Communication experience in the high-tech environment, with a focus on marketing strategy, communications and brand management. She specializes in helping innovation companies gain visibility with their optimization technologies and cutting-edge ideas, specializing in mining and space companies' industries. Katrina is passionate about empowering businesses to leave a legacy with their enabling innovations that transform the way humanity accesses resources in real-time.

Larissa Nelson serves as our head writer. She is an experienced consultant with a rich history in the nonprofit and political world, specializing in writing, research and fund development. For over 22 years, Larissa has successfully worked in these industries securing millions of dollars of private and public funding. Known for strategic thinking, attention to written detail, and a genuine passion for positive change, Larissa is dedicated to empowering organizations to achieve their missions and make lasting impacts. Armed with expertise in Nonprofit Organizations, Government relations, and Media Relations, Larissa navigates the complexities of private/public partnerships. She continues to leverage her skills and experience, contributing significantly to the advancement of nonprofits, private and public agencies, and ultimately, to the betterment of society.

Ownership

Western Water Project is an LLC based in Nevada that was incorporated on May 18, 2023, but has been in development for years with David Doremus researching and promoting this project for 30 years. David Doremus has demonstrated his unwavering dedication to a transformative mission by committing an initial sum of $300,000 to finance the crucial first stage of the proposal's exposure. This bold initiative is poised to address the pressing need for fresh water in the arid Southwest while simultaneously generating revenue for the Northwest through the utilization of surplus Columbia River water. David's visionary endeavor aims to gauge the level of traction and support that this proposal can amass on its journey toward implementation. While the diversion of a portion of the Columbia River is deemed an inevitability, the pivotal question remains one of timing. It is important to emphasize that David's commitment to this endeavor is not motivated by personal gain but rather by an unwavering commitment to the betterment of America and the well-being of future generations, firmly anchoring his mission in the service of a greater cause.

Experience

In addition to his real estate endeavors, David Doremus presided over various other businesses, including chairing a multi-office Real Estate Brokerage, a Mortgage banker and Property management company with interests in mining and ranching. Raised on a farm in Iowa, his intimate familiarity with water requirements became paramount. The acquisition of building permits for his Real Estate developments hinged on being able to secure “Can and Will Serve” letters guaranteeing water delivery. Consequently, a significant portion of his later career was dedicated to adeptly navigating the intricacies of water bureaucracy and working closely with multiple levels of government bureaucracy: state, county, and city.

Having spent formative years on his grandfather's farm in Iowa, David possesses a nuanced understanding of both urban and rural water needs. Towards the culmination of his building career, he found himself predominantly engaged in the intricate process of securing entitlements and permits, diverting attention from the actual building. This shift underscores his adeptness in negotiating the complexities of regulatory frameworks and bureaucratic channels.

This project is not complicated engineering, it is mostly bringing political consensus to a project that will absolutely someday be built. *Question is: 30 months or 30 years?*

OUR PROPOSAL: POTENTIAL WATER AUGMENTATION

Introduction

The Western United States, including the state of Arizona, face an ongoing challenge of securing sufficient water resources to support their growing populations, agriculture, and industries while dealing with more drought conditions and less fresh water supplies. As such, we appreciate the opportunity to respond to the Request for Information (RFI) for WIFA. We propose a thorough and specific project that provides a solution that promotes a water option that relieves the water shortage in the Southwest states with water from the Columbia River in the Northwest states.

Our Mission Statement: To introduce a bold initiative to supply fresh water to the Southwest and create revenue for the Northwest using surplus Columbia River water.

Our Main Goal: WWP will work with the public, the legislators, and tribal governments in 11 states to promote and adopt this bold initiative with legislation.

Augmentation Supply

Our innovative solution not only addresses Arizona's water demand by lessening other Western states' reliance on other water sources thereby providing more water for Arizona - but also has cascading positive effects for the entire Southwest region. This solution revolves around harnessing the abundant and underutilized water resources of the Columbia River, which discharges an astounding 192 million acre-feet of freshwater into the Pacific Ocean annually. This equates to 65,000 trillion gallons of clean, unused water needlessly discarded each year into the ocean. Our proposal calls for the 5 Northwestern states to create a Water Trust allowing for the fast-track construction of six 8' feet diameter pipes anchored 160 feet underwater along the continental shelf that would bring the unused fresh water to the Western states.

How we would implement the project:

1. Columbia watershed states form a Water Trust or Compact to claim and sell the water. They become a Northwest water-exporting states (NWES) entity and decide the equitable allocation of that income.

2. The water subject to export is at the mouth of the Columbia River unused and is being discharged into the Pacific Ocean. Currently, based on USGS numbers, the amount of discharge is approximately 192 MAF annual average. The water, at this point, is unused, unwanted, unnecessary for agriculture or urban areas.

3. Six percent of this water from the mouth of the Columbia River would be carried by a pipeline, largely undersea, along the Oregon and California coastline, bypassing individual and state property seizures and resultant litigation and delays.

4. Though no environmental study has been performed at this point in time, it is likely that the environmental impact would be less with an undersea pipeline than with a pipeline overland.

Arizona Benefit – As soon as water starts flowing from the Columbia River into California, it should immediately relieve a percentage of California's demand on the Colorado River thereby releasing Colorado River water to Arizona and other Southwest states. Concurrently, a pipeline would be under construction bringing 4 MAF to Arizona.

The WWP solution not only addresses the acquisition of water resources as part of the overall augmentation plan, but it also creates a holistic approach to meeting Arizona's water needs through conservation, reliability, and augmentation for the benefit of all. Water cannot be economically exported, but the beneficial use of that water does create profitable exports, i.e., 2,980 gallons of water equals 1 pound of beef.

A first priority should be to convene a multi-state engineering and water management symposium with hopefully hundreds of designated states representatives so that we can establish a consensus among the options and move forward. In prior history, the attitude of the NW states has been don't waste the postage stamp, it is a non-starter. Hopefully we can overcome that opposition and let the water FLOW.

Delivery Strategy - Pipeline Route and Key Components

WWP's proposal distinguishes itself from previous initiatives by advocating for an **underwater coastal pipeline as opposed to an overland route**, marking a pivotal and innovative departure in its approach. This novel strategy deliberately circumvents potential complications related to property rights, eminent domain, state borders, and other legal disputes. Furthermore, preliminary assessments suggest that this coastal pipeline may entail a comparatively lesser environmental impact than its overland counterparts, underscoring our commitment to sustainable and responsible infrastructure development. Development of approximately 1,100 miles of artificial reefs along the coastline and the *60,000* concrete ballast blocks will incorporate caves and crevices to further harbor and encourage marine life and further protect dam fish. We would also create rehab ponds to nurse hydro-turbine stunned and wounded fish back to health to be released into the river to survive. These details would be hashed out as we conduct more studies.

A second distinctive feature of the WWP proposal revolves around the establishment of a Water Trust, uniting the five Northwestern states within the Columbia River watershed. This consortium could broker water sales to the Southwestern states, presenting a pragmatic solution to the historically contentious issue of water allocation. While the Northwestern states have traditionally guarded their water resources, the proposed financial incentives offer a compelling rationale for reconsideration. By forming a Water Trust, these states can "claim and put to beneficial use" with control over the Columbia River water, enabling them to regulate its distribution and capitalize on its market value. And bear in mind, this proposal envisions using only 6 percent of the water that is currently discharged into the ocean.

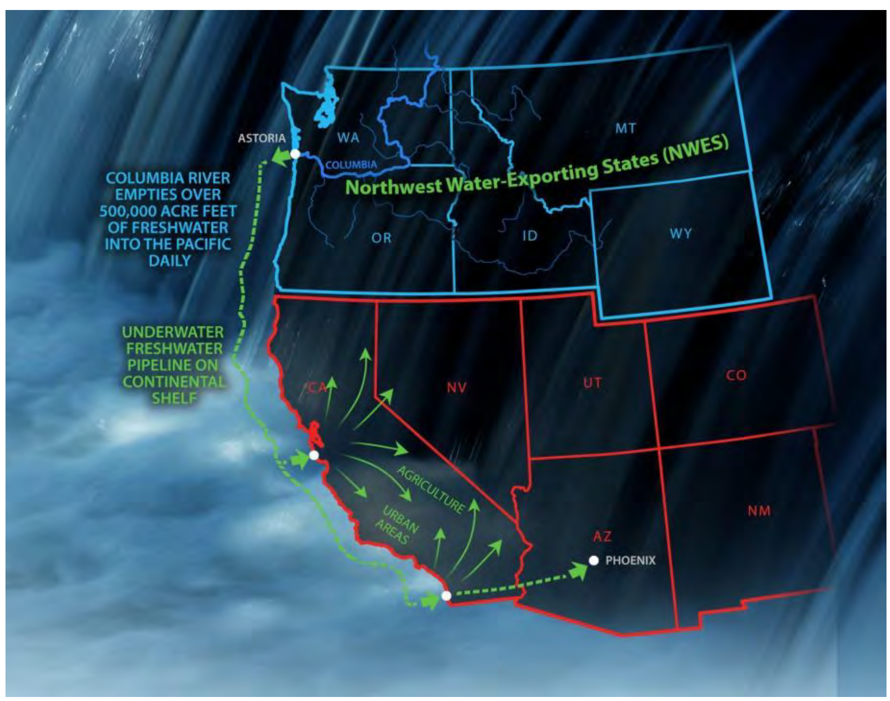
Notably, the envisioned water transfer primarily focuses on utilizing untapped resources — approximately 6% of the annually discharged 192 million acre-feet of water into the ocean, as per USGS data. This water currently remains unused, unwanted, and seemingly superfluous for the Northwestern states' urban, agricultural, and other essential needs. Crucially, the WWP proposal emphasizes a responsible approach by not laying claim to the entirety of the discharged water, but rather targeting a modest fraction, aligning with sustainable and equitable water resource management practices. Arizona is a very important part of this solution; Arizona can work with CA and other SW states to help establish land routes and easements and transportation systems.

Project Specifics

The proposed pipeline includes six 8’ pipes carrying 10 MAF annually of clean potable water. They commence at the Bonneville Dam, located east of Astoria, Washington, and extend overland for 105 miles to reach the Pacific Ocean near Garibaldi. From there, they traverse the continental shelf. Two pipes turning inland just north of Monterey Bay, with two pipes carrying 3 MAF of water into the Central Valley of California to interconnect with the California aqueduct system in the San Joaquin Valley.

For this distance, from the Bonneville Dam to the San Joaquin Valley, we would need four power and pump stations: a low pressure pump at the Bonneville dam; a high pressure pump and suction pump at Garibaldi; a high-pressure pump to lift water over 480 feet over coastal range into Watsonville (300 psi to lift over coastal range).

From the Monterey Bay juncture, four pipes continue along the coastline to somewhere in the vicinity of Chula Vista, south of San Diego, CA. These 4 pipes carry 7 MAF of water where they turn inland. Two pipes continue overland to Arizona delivering 4 MAF and two pipes deliver 3 MAF to the Imperial Valley.



The undersea pipes will float about 10'-15' above the seabed tethered to cement blocks to keep them submerged. Fresh water is lighter than seawater so the pipes will float. In addition, if we anchor them to the seabed, they would be prone to abrasion and leaks.

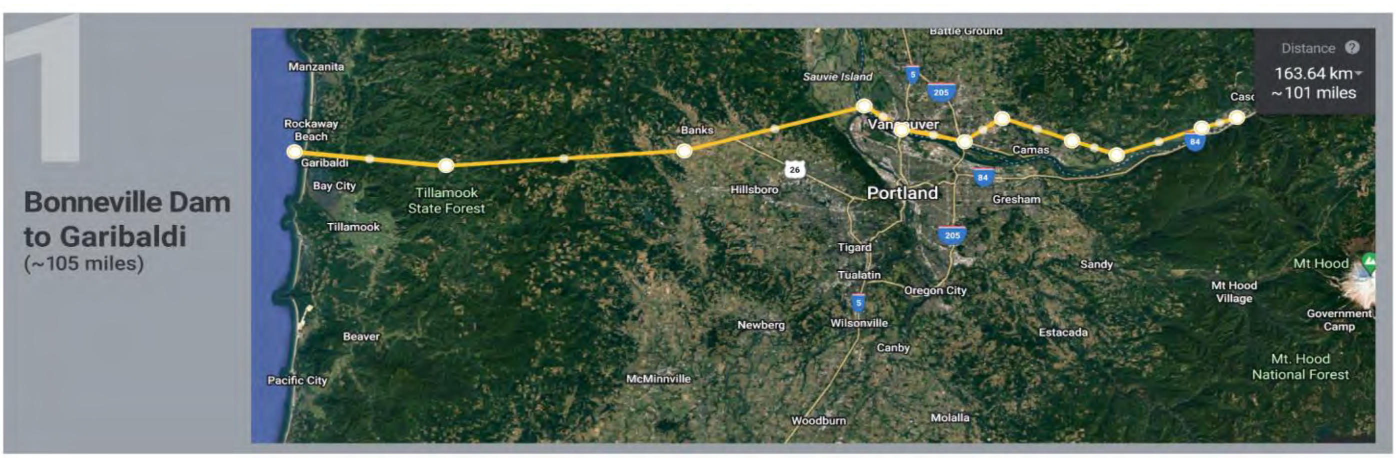
Our proposal advocates for the utilization of the continental shelf as the most feasible and cost-effective route for water transportation. By bypassing eminent domain challenges and working exclusively with the U.S. Corps of Engineers, we aim to streamline the regulatory process and expedite the implementation of this initiative.

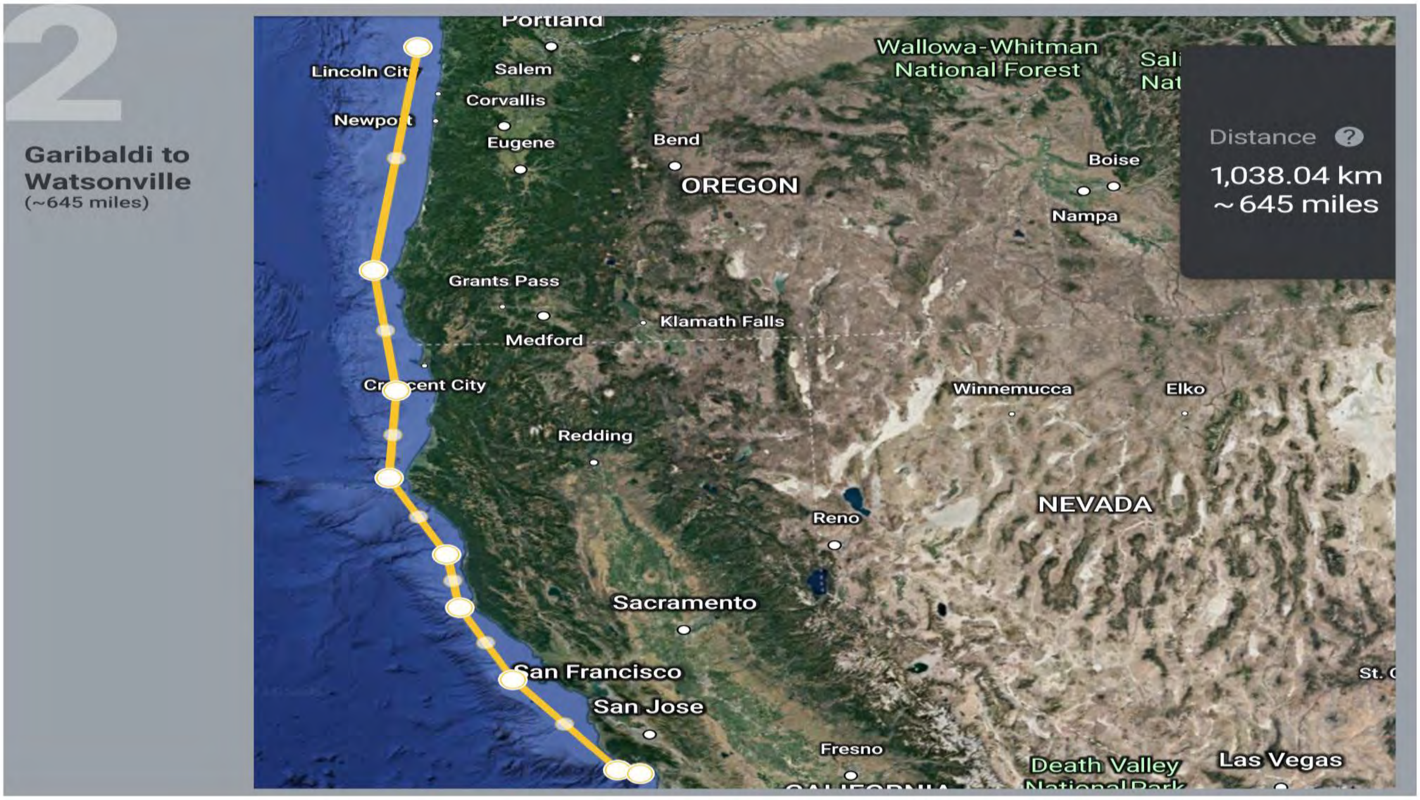
The pipeline's construction timeline could range from 18 months to 5 years based on the results on the EIS depending on various factors such as funding availability and permitting processes. This concept has been under consideration for six decades, with previous studies exploring overland routes. Now, we propose a new approach, leveraging advanced technologies and strategies to make this ambitious project a reality.

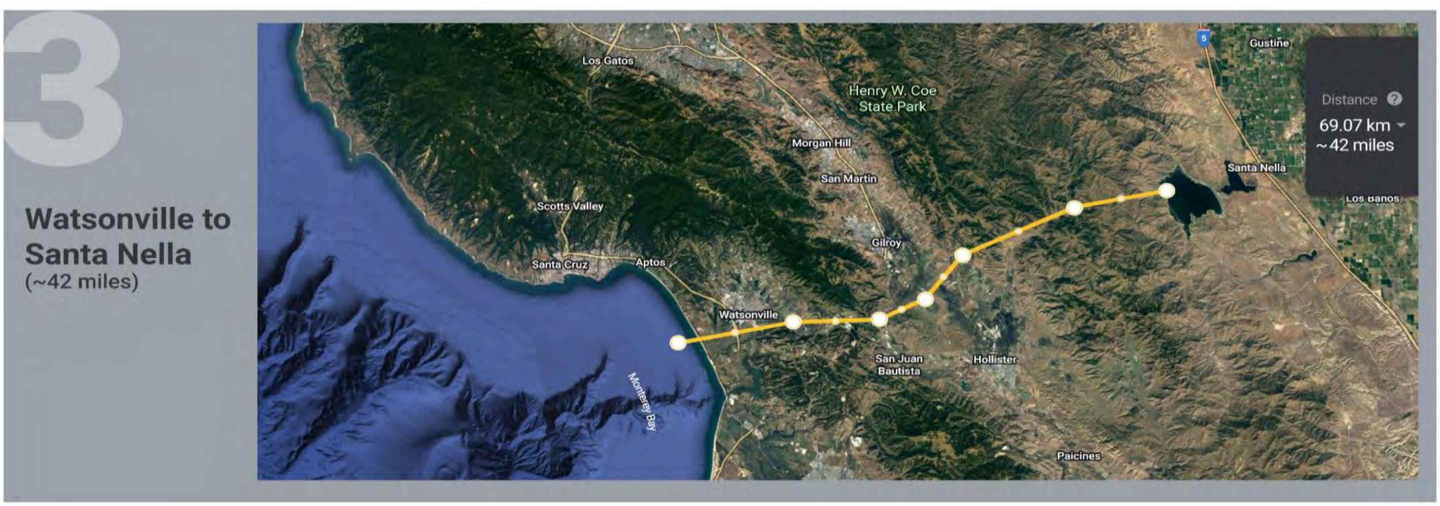
These maps show the route of the pipeline and water diversion that we propose. However, the exact onshore alignments will have to be determined by the individual states in accordance with their needs and economics. Arizona, for example, may wish the pipeline to tie into their existing water diversion from the Colorado River. We cannot dictate the interstate routes, that is up to the individual states, our goal is to make 10 MAF available to to destination points along the California coast and inland. This is our initial proposal.

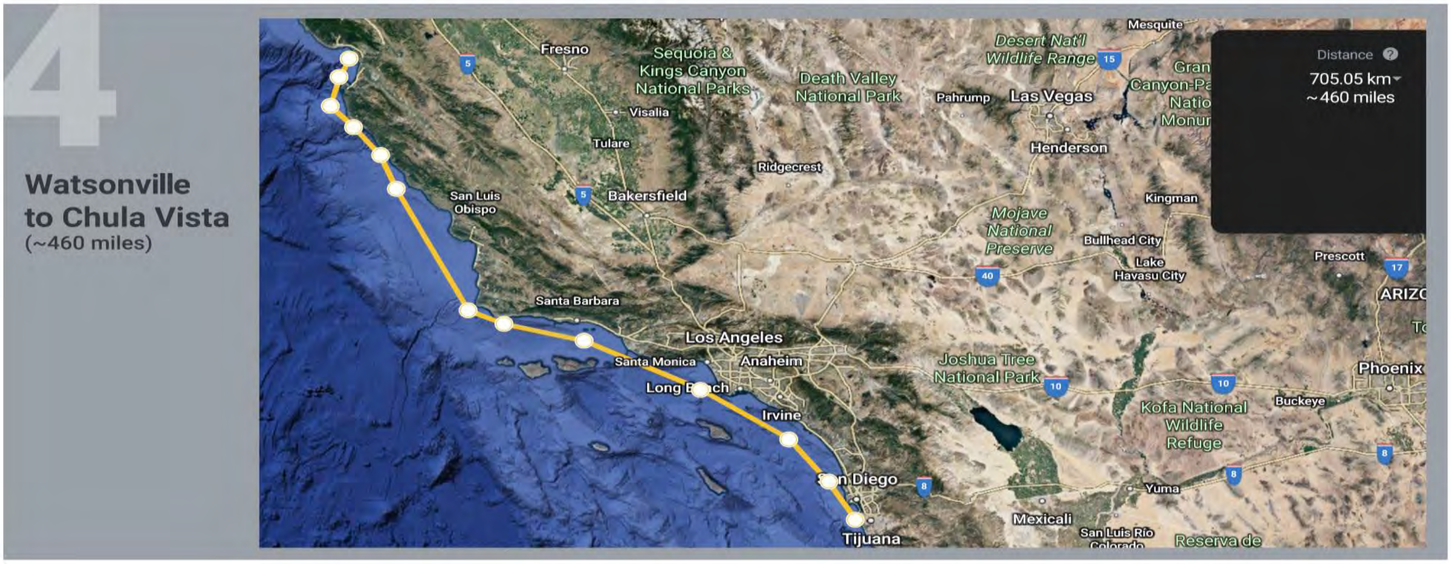
The following maps show the proposed pipeline locations:

- **BONNEVILLE DAM TO GARIBALDI - 105 miles**
- **GARIBALDI TO WATSONVILLE - 645 Miles**
- **WATSONVILLE TO SANTA NELLA - 42 miles**
- **WATSONVILLE TO CHULA VISTA - 460 miles**
- **CHULA VISTA TO PHOENIX - 315 Miles**




2
Garibaldi to Watsonville
(~645 miles)
Portland
Lincoln City
Salem
Corvallis
Newport
Eugene
Bend
OREGON
Wallowa-Whitman National Forest
Boise
Nampa
Distance
1,038.04 km
~645 miles
Grants Pass
Medford
Klamath Falls
Crescent City
Redding
Winnemucca
Elko
NEVADA
Reno
Sacramento
San Francisco
San Jose
Fresno
Death Valley
Las Vegas


3
Watsonville to Santa Nella
(~42 miles)
Los Gatos
Henry W. Coe State Park
Morgan Hill
San Martin
Gustine
Distance
69.07 km
~42 miles
Santa Nella
Los Banos
Scotts Valley
Gilroy
Santa Cruz
Aptos
Watsonville
San Juan Bautista
Hollister
Monterey Bay
Paicines



Expansion and Distribution

We envision a future expansion into multiple pipelines to deliver water to areas in high demand, including Arizona and other areas such as Los Angeles, San Diego, Nevada, and New Mexico lower Colorado and Utah. This multiphase expansion would enable us to inundate the southwestern regions with a replenished water supply while having a minimal impact on the Columbia River discharge, thereby preserving the region's environmental balance and the river's ecosystem. This would occur “Only with Permission” from the water trust regulators.

Benefits and Impact

This groundbreaking water augmentation opportunity offers several key advantages:

- Sustainability: Harnessing the underutilized Columbia River water resources reduces waste, ensures a reliable and sustainable source of freshwater, and addresses the water scarcity issues in the western states.
- Economic Growth: A secure water supply supports agricultural and industrial development, stimulates economic growth, and enhances the overall quality of life for residents in the region.
- Environmental Preservation: The underwater pipeline minimizes environmental disruption by reducing the need for most overland transportation and preserving the natural habitats surrounding the Columbia River. Continued over drafting of the existing aquifers is unstainable. A major issue in California is the settling of the land elevation from aquifer depletion and causing the existing state aquifers settlement significantly disturbing the flow gradient.
- Resilience: This project increases the region's resilience against droughts, climate change, and other water-related challenges, mitigating the impacts of water scarcity.
- Interstate Collaboration: Collaboration among the 11 western states promotes interstate cooperation and resource sharing, fostering unity in addressing shared challenges.

Costs

Entire project estimated costs

When complete, WWP estimates that the one-time infrastructure / construction costs for 10 MAF of water transmission lines to the south and EIS and litigation and financing at $125 billion dollars. The WP Project Estimated Cost Summary are estimated costs and detailed line-item breakdowns are available upon request.

WWP Project Estimated Cost Summary				
Item	Estimated Cost	Cost per route mile	Mileage	% of Total Cost
Land Acquisition	$ 162,500,000			0.13%
Land Development	$ 222,300,000			0.18%
Common Area Infrastructure	$ 204,525,000			0.16%
Bonneville to Garibaldi - 6 pipes	$ 3,859,746,000	$ 38,877,968	125	3.09%
Garibaldi to Watsonville - 6 pipes	$ 57,019,890,000	$ 85,744,195	665	45.62%
Watsonville to Santa Nella - 2 pipes	$ 2,244,990,000	$ 37,416,500	60	1.80%
Watsonville to Chula Vista - 4 pipes	$ 29,072,358,000	$ 63,200,778	460	23.26%
Chula Vista to Imperial Valley - 2 pipes	$ 1,686,838,000	$ 56,227,933	30	1.35%
Chula Vista to Phoenix - 2 pipes	$ 14,277,646,000	$ 45,325,860	315	11.42%
Indirect and General Considerations	$ 798,780,000			0.64%
Financing (includes bond underwriting of 4.5% on $125B)	$ 15,421,177,000			12.34%
Marketing	$ 13,250,000			0.01%
General & Administration	$ 16,000,000			0.01%
Totals	**$ 125,000,000,000**		**1,655**	**100.00%**
Total cost per route mile: $125,000,000,000 / 1,655 miles = $75,528,701				

Estimated Operational Costs: We estimate that the annual operating costs to the Southwestern states at $15,725,000,000 a year for financing, water purchase, and maintenance and administration. This comes to $1,573 per AF delivered. In comparison, desalination of seawater costs over $5k an AF and is not feasible into the foreseeable future.

Operational Expenses to Import 10 million Acre Feet (MAF) Per Year $125,000,000,000 Infrastructure/Construction Costs (one-time)	**Amount**
Water Purchase from Northwest Water-Exporting States (NWES)	$ 2,000,000,000
Bond P & I per year - Debt service at 7.5% cap rate on $125 Billion	$ 9,375,000,000
Electricity	$ 300,000,000
Maintenance and repairs	$ 1,000,000,000
Miscellaneous Operating Expenses	$ 750,000,000
General & Administrative	$ 1,000,000,000
Barge and Docs - Not included in Maintenance/Repairs	$ 83,600,000
Logistical and helicopter - Not included in Maintenance/Repairs	$ 18,000,000
Dry dock and land facilities	$ 48,400,000
Supervision	$ 100,000,000
Liability insurance	$ 50,000,000
Contingencies	$ 1,000,000,000
Estimated annual water import operating cost	**$ 15,725,000,000**
$15,725,000,000 /10 MAF = $1,573 per acre foot delivered	

Note: It is always difficult to forecast construction costs years if not decades into the future, but here are current estimates if built within 3 years. Estimates are subject to change if project specifications are changed or costs for outsourced services change before a contract is executed.

Water Supply Available

Estimated annual available water supply would be 10 MAF (just 6% of the unused fresh water running into the ocean from the Columbia River). Of this 10 MAF: 3 MAF goes to Central Valley of CA, 3 MAF goes to Imperial Valley of CA, 4 MAF goes to Arizona.

This resource is dependent upon the continual water flow of the Columbia River. There may be yearly variances in its flow but not enough to affect an annual 10 MAF diversion (6% of the Columbia River annual flow).

Environmental Considerations

There are several environmental factors we have to address. Fish already are being killed off by the dam and the federal government and many tribes have spent many years and millions of dollars to especially protect the Salmon.

We have a few solutions in mind that could actually REDUCE the current kill rate of 28% of fish passing through hydroelectric turbines (One in five fish dies from passing hydroelectric turbines (phys.org))

Turbine from Bonneville Dam

The impact on salmon and other fish populations can vary depending on factors such as fish passage facilities, environmental conditions, and management practices. We plan to contemporaneously build onshore transmission lines, collection attachment to the Bonneville turbine closest to the Washington shore and route a minimal lift pipeline ashore so we can capture all the damaged fish with our water collector, immediately return all healthy fish to river and ease the sick fish back to health before returning them to the river. We don't kill any fish and improve the survival rate for those passing through the turbines.

While it is expensive to run an extra 55 miles overland to Bonneville, it has several advantages. We don't have cofferdams and debris separation and other operating costs associated with water collection if we took water at Astoria nor would we damage any additional fish in the process.

Jurisdiction/Political Considerations

Political considerations are the biggest barrier to the WWP proposal of bringing fresh water from the Northwest to the Southwest.

It is NOT an engineering problem – it is a political problem. So…what are the political challenges we face?

PROBLEM:

- The Northwest water exporting states have been entrenched in a belief for the past six decades that allowing the southern states, particularly California, access to their northern water resources would result in the eventual loss of all such water. This political sentiment has rendered discussions on water allocation to the south virtually impossible for politicians in the Northwest, as it is perceived as political suicide – and was for WWP founder David Doremus in his run for office in Idaho, one of the five Northwest states.
- We cannot economically export water; it will not compress. But we can use that water to produce industrial and agricultural products which can be exported. A pound of beef has the equivalent of 2,980 gallons of water and it can readily be sold abroad. The rest of the world can help pay off our national debt for us, if we stop wasting our water.

SOLUTION:

- To overcome this political barrier, we must mobilize citizens across all states to exert pressure on their elected representatives. The equitable distribution of water throughout the Western United States is not just an economic imperative but also a responsible use of resources.
- The proposed solution involves all Western states adopting the well-established doctrine of "First is Use, First in Right." By allowing the Northwestern states to form a consortium to claim the Columbia River and sell the water to the Southwest, we ensure that they maintain perpetual control over the water supply, safeguarding it for both current and future needs. And it generates revenue for the Northwest states to share.
- This initiative is not only for the benefit of our current generation but is an investment in the future prosperity of America and our great, great grandchildren.

Financial Considerations

Capital investment, repayment or other financial considerations and/or limitations.
Repayment costs could come from the issuance of tax-exempt Industrial Development Bonds amortized over an extended period of years. $125 billion dollars is within the capacity of industrialists and publicly traded companies, such as large oil pipeline owners, but we hope the transmission lines and profit derived therefrom will be retained by the States and the individual stakeholders.

Sustainability of Water Supply

As per above, this resource is dependent upon the continual water flow of the Columbia River. For the past 10,000 years there has been an uninterrupted flow to the Pacific Ocean. The sustainability and resilience of the Columbia River's water supply might be marginally influenced by factors such as effective water management practices, ongoing conservation efforts, and collaboration among stakeholders to address environmental concerns. Additionally, monitoring and adapting to climate change impacts play a crucial role in ensuring the long-term viability of the river's water resources.

Timeline for Execution

The timeline could take anywhere from 5-10 years to complete based on projects of similar size.

OWNERSHIP MODELS

Delivery Model Options

We at WWP do NOT plan or desire to own this project.

It is always WWP's objective to coordinate the design and obtain approval and permitting. As for actual construction this project is too large for any one company and there will have to be numerous subcontractors for onshore transmission lines and aqueducts, undersea pipe laying, pumping stations, electric grid extensions, pipe extrusion, onshore maintenance structures, pipe fusion equipment, barge design and construction including dive support facilities, real estate acquisition, architectural and civil and structural engineering firms, full time permit processing, public relations and political consultants. Many, many professionals have to be employed and all focused upon the start of construction.

The project must fall under the supervision of an inter-state management team (US Army Corp of Engineers) to oversee the disbursement of construction funds and manage the repairs and maintenance and resolve issues which will surely arise during construction. Once commenced the project needs to rapidly progress toward final completion, hopefully within 30 months. The USACE is the expert with hundreds of billions of dollars of infrastructure under existing management. A private company such as Enterprise Products Partners, L.P, has the capacity and probably the willingness to build as a private, for-profit transmission line, but no one public company should be allowed to own the monopolistic distribution of America's water supply on such a large scale, in our opinion.

Rather than a public company owning such a project – we would suggest the creation of a Water Trust. Recognizing the interconnectivity of water systems, the many parties involved – including states, cities, tribal lands, watersheds, dams, water-boards and more, and the need for collaborative stewardship, we propose the establishment of a multi-state Watershed Trust as the strongest ownership model. This Trust would comprise representatives from all states within the watershed, ensuring that decisions related to water allocation and management are made collectively, with the best interests of all stakeholders in mind.

As the pipeline itself is the main delivery option, there are several factors that can influence the delivery pathways on land which need to be determined as well and a multi-state Water Trust would be the best option. We would have to consider what options there would be for alternative delivery, but any other delivery method would negate our project. Southwest states must agree to assist and provide for future access rights and current changes in allocative distributions of the Colorado river as water starts flowing.

If ownership is outside of a Water Trust, depending on the ownership model, the attractiveness of this initiative as a business opportunity may be influenced by various factors.

Here are some considerations:

1. Long-Term Purchase Contracts:

Advantages:

- Revenue Stability: Long-term purchase contracts provide stability to the project and can provide a stable revenue stream for public and private entities involved.
- Risk Mitigation: The long-term nature of contracts may allow for better risk management and planning, benefiting both public and private partners.

Considerations:

- Flexibility: Long-term contracts should be flexible enough to adapt to changing circumstances, such as technological advancements or shifts in water demand.
- Financial Implications: All parties need to carefully consider the financial implications of long-term commitments, including potential changes in water prices or availability.

2. Variety of P3 Agreements (Ref A.R.S. § 49-1211):

The Arizona Revised Statutes (A.R.S.) § 49-1211 outlines various types of P3 agreements for water-related projects, including:

- Design-Build-Operate (DBO): Private entities are responsible for designing, building, and operating the water augmentation facility.
- Design-Build-Own-Operate (DBOO): In addition to designing, building, and operating, the private entity owns the facility.
- Design-Build-Finance-Operate (DBFO): Private entities finance the project in addition to their responsibilities in design, construction, and operation.

Note: WWP would propose that the DBO option would fit this project best.

Advantages:

- Flexibility: A range of P3 models allows for flexibility in tailoring agreements to the specific needs and goals of the project.
- Risk Allocation: Different P3 models enable the allocation of risks in various ways, providing options for optimizing risk management.

Considerations:

- Legal and Regulatory Compliance: Ensure that the chosen P3 model aligns with relevant legal and regulatory frameworks.
- Transparent Governance: Clear governance structures and agreements are crucial to the success of P3 initiatives.

3. Collaborative Multi-State Water Trust (preferred in combination with DBO in Arizona for this project):

Model of Ownership: A collaborative multi-state water trust involves multiple states jointly owning and managing water resources for mutual benefit. The 11 proposed states, including Arizona, contribute resources and expertise, fostering a cooperative approach to provide a solution to address shared water challenges.

Advantages:

- Shared Resources: States can pool resources, both financial and technical, to help with the pipeline project.
- Risk Distribution: By spreading the risks and responsibilities, this model can enhance the resilience of the proposed initiative.

Considerations:

- Interstate Cooperation: Effective collaboration requires strong interstate cooperation, clear agreements, and mechanisms for dispute resolution. And much legal support is needed.
- Equitable Resource Allocation: Ensure that the benefits and burdens of the collaborative trust are distributed fairly among participating states.

There are many water ownership and management options available. It is premature at this time to consider them all.

A multi-state Water Trust is the most feasible for this project and would best align with the specific goals, risks, and resources of the involved parties, emphasizing the importance of careful planning, legal compliance, and transparent governance. However, an alternative P3 agreement could be considered and as our goal is not to own and operate the project – to just get it off the ground and construction started – it will not make it a less attractive business opportunity.

FUND CONSTRAINTS

We have identified the immediate capital needs and funding to get the first step of this project started to study the feasibility and costs associated with it. With the challenge of optimizing the constraints on funding, we recommend an initial grant allocation of $25 million. This $25 million would be allocated strategically to prioritize and pay for the project's various components across the following key areas crucial for the successful implementation of the project. We estimate we will expend the following initial capital funding within 18 months.

Legal and Lobbying - $4 million:

- Legal and lobbying efforts will be allocated a significant portion to garner necessary support from all the states and stakeholders and start to determine the barriers of compliance and regulations.
- Engage legal experts and lobbyists to navigate regulatory requirements, secure project approvals, and defend the legal battles that may ensue over ownership, environmental issues, and miscellaneous issues.

EIS Scoping - $4 million:

- The most important large capital needs will be for preliminary engineering sufficient to undertake an environmental impact (EIS) study, both onshore and undersea.
- The EIS scoping will identify stakeholders that might be affected, what studies or evaluations need be included and preliminary environmental considerations such as undersea disturbance, fishpond evaluation (how many fish are in 10 million AF of turbine discharge?) and what is the outright kill ratio and how many, if nursed, could recover?
- We need to evaluate the effect of 6% less freshwater release into the Pacific. Does that reduced amount of water somehow alter the taste of salinity and prevent the salmon and steelhead from finding their way back to spawn? These are issues that can be preliminarily addressed even before a full-blown EIS is started. It will also identify the cost associated with the EIS before release to the public for comment. There will always be opposition.
- Environmental Impact Statement (EIS) scoping is critical to determine project impact and to be able to move forward. Allocating funds to this phase ensures thorough examination of environmental considerations that need to be considered for this project – from the impact of the pipes in the water to the fish to the land entrances and more.
- Collaboration with environmental experts to conduct comprehensive scoping studies and assessments.

Proof of Concept and Preliminary Engineering - $3.5 million:

- Developing a solid proof of concept and preliminary engineering is essential for project viability.
- Engage engineering firms to conduct feasibility studies, create pipe prototypes, install undersea pilot pipe lay and provide preliminary engineering designs.

G&A, WWP Staffing - $1 million:

- General and Administrative (G&A) costs, including staffing, are vital for overall project management.
- Allocate funds for administrative and staffing needs within WWP to oversee day-to-day operations of getting the project off the ground.

Support Team - $6 million:

- Distribute funds across various disciplines within the support team to ensure a well-rounded project approach.
- Specialists, consultants and experts in areas such as hydrology, geology, civil engineering, and environmental sciences.

Master Project Administration - $2 million

- Engage project management experts, identify and coordinate subcontractors, and hire a Primary Engineering contractor, such as Fluor, to complete the final design and commence construction.
- Allocate funds for project administration, including scheduling, cost control, and quality assurance.

Contingency - $4.5 million

- Establish a contingency fund to address unforeseen challenges or additional expenses that may arise during this phase of project execution – such as changing electric cost, permits, legal battles.
- This serves as a buffer to accommodate changes in scope, unexpected expenses, or other unforeseen circumstances.

Financing and Payment:

1. First, we would love to have the support of WIFA with help from the Long-Term Water Augmentation Fund.
2. We plan to seek funding partnerships with governmental agencies, private investors, and potential P3 agreements to leverage private sector expertise and funding, but the high costs will most likely need to come from the public sector.
3. Another pragmatic and cost-effective approach could be the issuance of tax-exempt Industrial Development Bonds as the most logical and economical means to fund this crucial initiative. To initiate this process, it is imperative to introduce the idea to all the states involved and convene a collaborative discussion to address the myriad nuances associated with this ambitious project.
4. Selling the water - WWP will offer to purchase 10 MAF of water from the NWES Water Trust, or directly from Washington state, for an initial duration of 30 years at $2 billion a year. Said contract will be assigned to whatever final water transmission management entity will be.

After this initial $25M funding, with resulting feedback, we propose we prepare a final budget number and request additional funding to commence final alignments, design, and EIS.

In conclusion, this strategic plan aims to maximize the impact of the $25 million budget for the WWP Water Augmentation project. Through careful allocation and consideration of alternative financing options this would allow the first steps to be completed to LET THE WATER FLOW.

One market constraint would be the type of pipes we want to use for the project. Determining the optimal pipes for our water augmentation project is crucial and we're actively seeking a company to produce the specific pipeline we require.

Unfortunately, our pipe size options are limited to a 7.5-foot interior diameter due to manufacturing constraints with polypropylene. The malleable plastic nature of poly when hot, during production causes drooping and collapse, necessitating this size limitation. Despite this, the advantage of poly lies in its ability to adapt to the seabed contours. The challenge lies in predicting the output flow after the pipeline spans 650 miles, given the cumulative frictional drag caused by resistance at bends and coupling points. We lack comparable pipelines for throughput capacity extrapolation, emphasizing the need to manage the pipeline without intermediate pumping stations to boost pressure.

Starting with a consideration of using underwater fiber reinforced plastic or poly (FRP) at a depth of 160 feet with a pressure of 200 psi, we anticipate only 100 psi outward exerting pressure. The advantage of using a thin-walled pipe is that, in the event of a ship anchor snagging, it would tear easily rather than dragging a substantial length of pipe.

Even if the FRP or poly pipe ruptured, it's likely to support its own weight until repairs can be made. Additionally, the installation process may be expedited using poly pipe which can be extruded in hundreds of meters per day, FRP is wrapped in multiples of feet per day. Speed of construction and installation, ease of repairs, and cost are factors. The larger the pipe size the greater reduction of internal frictional drag, hence greater flow through the pipe. A single 20-foot diameter pipe would flow the entire 10 million Acre-feet annually but is currently beyond economic manufacturing and installation capabilities.

A QuakeWrap is one alternative pipeline material, polypropylene is another. Initial cost and ease of repairs will be the two drivers of which technology will be used to continuously extrude 1,100 miles of undersea pipeline. Another consideration is there will be chasms and debris fields that need to be bypassed or floated above. A floating pipe offers many practical solutions for pipeline routing and installation. We foresee the manufacturing of pipelines in one-half or full mile segments to be rafted by barges to the pipe laying locations up along the coast. The route will have previously been delineated and the approximate 60,000 ballast blocks previously positioned so the pipe could then be choked and winched into position with divers connecting the cable tether to permanently hold the pipe. Similar to overhead high voltage power lines, the pipes will sway in unison and prevent any chaffing.

PROJECT CHALLENGES

The environmental and political challenges are significant, but we can overcome them. Unlike a major oil pipeline or nuclear power plant, we are dealing with benign water. Hopefully the construction can commence and, without much delay, move forward. Any adversities can be overcome, and the worst-case scenario is there is a line breakage that would only allow fresh water into the ocean at some point other than Astoria Bay.

CONCLUSION

In light of the immense potential and the critical need for new water supplies in the Western states and Arizona, we propose an innovative, comprehensive solution to harness the untapped resources of the Columbia River. With the establishment of a compact and the development of six, 8-foot diameter underwater pipes, we can secure a long-term, sustainable water supply for the region.

Once ashore, the water transmission would be no different than the tens of thousands of existing miles of previously constructed water conveyance systems. The state can direct where that water goes and how it ties into their existing supply routes. This project is not merely a water augmentation opportunity; it is a visionary initiative that promotes collaboration, sustainability, and prosperity for generations to come.

In conclusion, as was stated in the WIFA LTWAF Program overview - WIFA's mission *will open the door to solutions that may, at first, seem Impossible*. We know – like you – that with the right partnerships, careful vetting of projects, and involvement of all stakeholders, WWP can help WIFA carry on Arizona's legacy of successful water projects. We eagerly anticipate the day when water begins flowing through the Columbia River Pipeline and creates new water sources for Arizona and the Southwest..

With the Trust owning the pipeline, all profits derived therefrom are returned to the stakeholders. That can be resolved at a future time. Individuals from Texas have asked us - when do they get their water pipeline? Answer has to be as soon as possible, but first the water has to start flowing into the San Joaquin valley and next and then next. It is a massive project and must be developed in a continuous and conscientious manner. NO DELAYS should be the motto of the project.

We welcome the opportunity to engage in further discussions, feasibility studies, and the necessary steps to transform this proposal into a reality that benefits Arizona and the other Southwestern states. Together, we can unlock the potential of the Columbia River and address the pressing water resource challenges of our time.

We look forward to hearing from WIFA regarding your thoughts. If you have questions on this proposal, feel free to contact David Doremus by phone (702/630-2229) or Email (doremus@westernwaterproject.org). You can also contact Patrick Madea by Email: madea@westernwaterproject.org.

Thank you for your consideration.

1. A. General Information and Experience

1. Please briefly provide the following descriptive information to aid WIFA in understanding the identity, business and authorities of the Respondent and its team members.

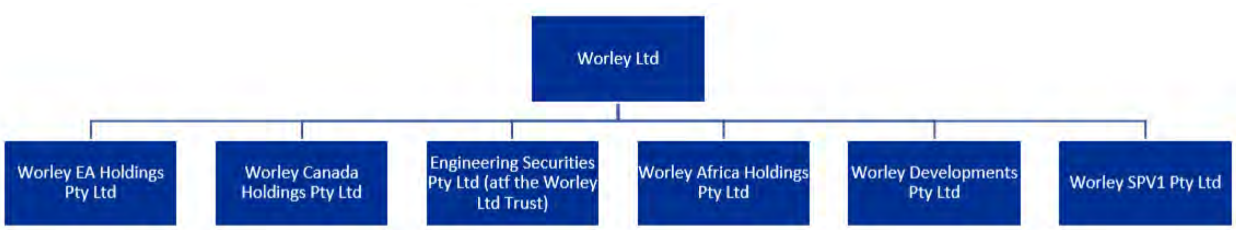
a. Name of Respondent, team members, and anticipated roles and responsibilities related to this opportunity.

The following Worley professionals contributed to this RFI Response.

Name	Position	Location
David Stanley, PE	Principal Consultant – Environment & Water	Phoenix, AZ
David Junco	Business Development Director – Worley Consulting	Los Angeles, CA
Jose Ruiz	Business Development Director – Worley Mexico	Mexico City, Mexico
Sohail Alyasin	USA Water Growth Director – Strategic Transformation	Houston, TX
Bruce Thomas-Benke	Principal Consultant – Water Treatment	St Louis, MO

b. For privately held and investor-owned entities, describe your ownership and management structures.

Worley Ltd is the ultimate parent company of all Worley entities and is publicly traded on the Australian Stock Exchange.

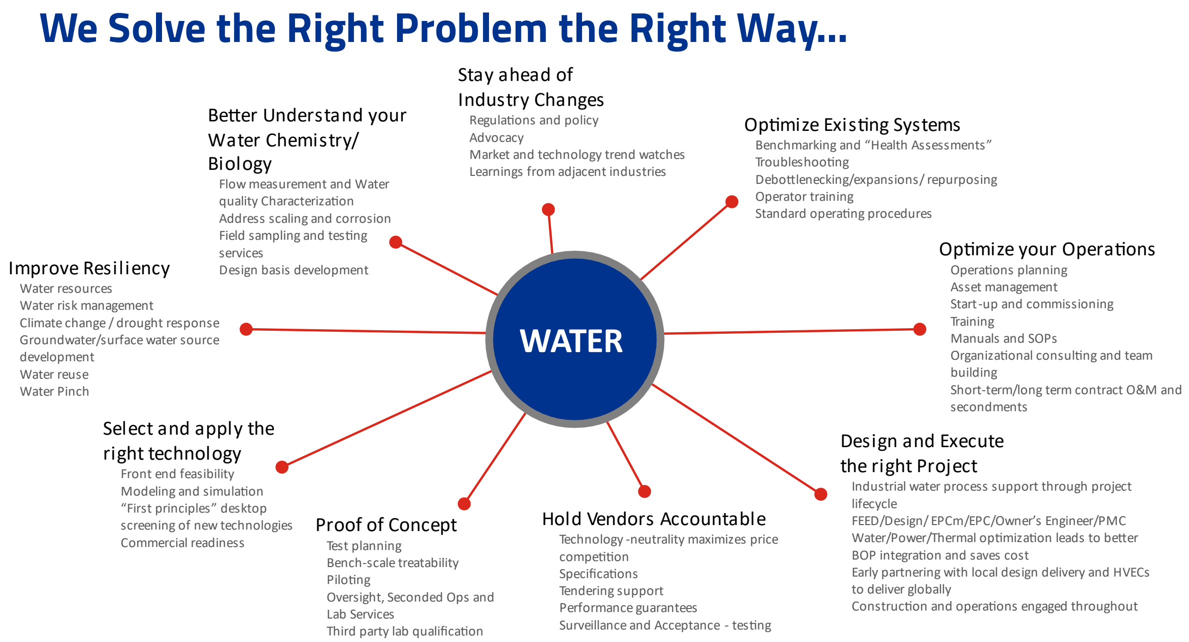


c. For public agencies, describe your statutory authorities including any authorities to own and manage water rights and water supply facilities.

Not applicable.

d. Describe each member's involvement and experience with existing water augmentation projects, programs or initiatives, municipal and industrial provision, and non-consumptive provision.

We have provided services to over 2000 water projects worldwide. Using our unique capabilities, we have successfully developed and delivered reliable, cost effective and environmentally sustainable water solutions for both onshore and offshore applications. Our adaptable capabilities ensure that we can meet the specific requirements of each project, as illustrated in the image below:



There is a list of our key projects in the Water industry:

- Oman - Water resources, sourcing & treatment, transmission, asset management: We provided flood risk assessment – rainfall assessment, rainfall-runoff modelling, 2D flood modelling, determination of flood risk and design of mitigation measures.
- Deep Tunnel Project: Worley with their Contractor Partner Archirodon, have undertaken the Concept; Detailed Design and Construction of the Deep Tunnel Stormwater System Terminal Pump Station.
- Shuqaiq 3 Independent Water Project: Advisian worked on behalf of consortium negotiate technical matters with the EPC and the O&M contractor, Develop Strategy of EPC and O&M Prepare the Sponsors’ functional requirement, provide inputs for the financial model, especially pertaining to contingency requirements, SPV cost during construction, O&M cost, etc., and Review CAPEX cost.
- BHP Spence: Worley was hired as owners engineer and project management consultant for 1,000 liter per second of desalinated water.
- Southern Seawater Desalination Plant Stage 1 and Stage 2 Expansion: Worley was retained to design and construct the original plant and second phase expansion of the Southern Seawater Desalination Plant. including the intake and outfall infrastructure.
- ADNOC Offshore - Debottlenecking of Zakum Central Complex Water Injection Facilities: Worley carried out evaluation studies on various debottlenecking options for Zakum Central Complex (ZCC) Water Injection

Plant to enhance UZ injection capacity to meet the Water Injection demand from 2022 till commissioning of the 1 MM STBOPD.

- Seawater Treatment Systems: We supported the client's critical decision-making regarding injection water quality for a new offshore development and compared options for development - new field, brownfield expansion, partner with existing operator.

Bellow you can find the Bios for our key personnel:

David Stanley

David Stanley has 30+ years of professional experience incorporating a vast range of project development responsibilities and roles. These have included business case and investment planning, natural resource and water planning and permitting, FEL study management, engineering management, and construction management. David is a resident of Mesa, Arizona.

Jose Fernando Ruiz Ramos

Jose Fernando Ruiz Ramos 30 years of professional experience, including: Mexico Operations Manager; Business Development Director/Manager, Site Manager, PM, PE. Managing projects/opportunities for hydrocarbons, chemical, pharmaceutical, consumer products and M&M markets, both private and public sectors for TIC from USD+$1 billion to USD$30 million.

David Junco

David Junco has 16 year of Mega Project execution, delivery and business development experience including roles in Construction Management, Project Controls, Contracts, Project Engineering and Project Management, primarily in the energy industry. David supports projects / proposals from Worley's Los Angeles offices.

Sohail Alyasin

Sohail Alyasin brings over 25 years of professional experience in project development, management consulting, and utility planning in both the power and water industries in the United States and internationally. Prior to joining Worley, Sohail was President of Velorum LLC, a business development advisory services company serving leading U.S. and global companies engaged in power and water project development, including Toyota Tsusho Corporation, trading arm of Japan's Toyota Motor Group, and SJW Group, parent company of San Jose Water, Connecticut Water, Maine Water, and SJWTX, Inc.

Previously, as Vice President, Development for Poseidon Water LLC, a Boston-based water infrastructure development company, Sohail established Poseidon's presence in Texas, and led the company's business development, project development, and marketing activities across the state. Before joining Poseidon, he was Executive Director at Lanco International Pte Ltd, a Singapore-based international power project development company, and established Lanco International's branch office in Dubai to focus on power project opportunities in the MENAT region. Prior to joining Lanco International, Sohail led power and water project development teams in the GCC countries and in China as Vice President, Development at Aqualyng Holding AS and Project Director at The AES Corporation.

Sohail holds bachelor’s and master’s degrees in Electrical Engineering from Purdue University, West Lafayette, Indiana.

Bruce Thomas-Benke

Bruce Thomas-Benke has over 30 years of diverse, international water/wastewater consulting, feasibility, design, construction, program management, business development and commercial management experience. He connects clients with our experts, technology, and solutions to address their most difficult water sourcing, conveyance, recycling, and disposal challenges. He is an experienced technical advisory leader for large scale (>$1 billion USD) complex water programs, helping to carry them from feasibility, planning and business case development through execution.

He has expertise in all manners of water/wastewater treatment technologies including seawater desalination, associated coastal infrastructure and brine management. Bruce enjoys bringing stakeholders together to create sustainable water stewardship solutions that bring value for owners, investors, and communities.

2. B. Potential Augmentation Opportunities

1. WIFA is seeking to develop a list of potential water augmentation opportunities that result in new water supplies for the state of Arizona. Augmentation opportunities that include new or augmented supplies within the state and from outside the state will be considered. Please provide a general description of potential water augmentation opportunities that you have identified or believe may be valuable for WIFA to consider.

In this response we present to WIFA some general principles for the development of a desalination project in the Sea of Cortez. We believe that enough work has been done over the years by various agencies and consultants to demonstrate that at some point in the future Arizona will need to access this source and that the demand for the water will be great enough to support its cost of delivery.

We note that while the need for water from the Sea of Cortez in the future seems clear, the economic, social, political, and administrative viability of the concept are not yet fully understood and have not yet been demonstrated. The present challenge before WIFA is exactly how to move from today's general project concepts to a situation where the viability and merits of the project are sufficiently proven and sufficiently definite to get large-volume Arizona water users signed on to the deal, enable WIFA to remain in control of the outcomes that are important to the state of Arizona, and ultimately secure private capital to fund the work using structured competitive processes.

Our purpose in submitting this RFI response is therefore to offer WIFA some basic principles and a road map by which desalination project options can be assessed, defined, developed, and ultimately financed and built, with WIFA ultimately in control of the process by way of stage-gated decisions along the way. We are hopeful that what follows will assist WIFA in taking a "step back" for some thoughtful observations about the enterprise, and then move forward confidently in a systematic, measured manner.

Administrative Framework and Project Owner

Through the establishment of WIFA and the LTWAF the state of Arizona has put itself in a position to act to address the state's long term water needs, and yet it cannot do so in a seawater desalination context without the full partnership and involvement of the Mexican Federal Government and the State of Sonora. Nor could such a partnership, once assembled, be very successful without the long term support of local Mexican citizens impacted thereby. Mexican water policy makers have significant water troubles of their own, and it seems quite foreseeable that Mexican citizens will demand that a major water project in their backyard yield tangible water benefits to them as well. Further, the Mexican state authorities may soon be – if they are not already – in a position of needing to somehow address desalination proposals from southeastern California entities at the same time as Arizona. All of this means that fundamentally, WIFA must take very deliberate steps to educate itself on the water and power[1] situation in Mexico, build relationships with Mexican partners (both public and private) that may not exist today, and build its strategy and project plan accordingly. Further, we suggest that WIFA would be well served to also address the question of whether or not certain California water interests could be, or should be, included in the enterprise, and what risks and/or benefits may accrue to Arizona from a more

[1] Note recent announcement by the Mexican Federal Government on the "Sonoran Plan" – which includes new energy generation facilities and port improvements

inclusive approach. There are significant opportunities here for Arizona to create new cooperative forms for inter-government, regionally based water solutions, something the world will surely need more of in the near future.

Including California in the WIFA enterprise does carry risks, including the risk of slowing down decision making at the top and having to depend on another state's actions. However, our belief is that the State of Arizona is in a good position to act as a leader of the actions ahead due to its unique position of administrative readiness (through WIFA and the LTWAF), and that it can do so in an inclusive way without compromising its own interests. If it is determined that the desal plan involve the use of Colorado River water, as we are proposing that it does, then Federal authority is also necessary to proceed. This factor alone may bring California and potentially Nevada into the mix of stakeholders.[2]

We will therefore here use the term *Owner* to represent a yet-to-be determined combination[3] of Arizona/WIFA, Mexican Government entities, and potentially California government entities, but with WIFA in the administrative lead role[4]. It will be WIFA's responsibility to identify, organize, and lead this group, since WIFA is in a position to act and these other entities may not be quite ready to do so. In a strict legal sense, the ultimate owners of the various facilities built for the project, such as the desal plant itself or the power plant, may in fact be private entities or Public Private Partnerships in various forms; but here we will use the term Owner to refer to *the combination of public entities for whose constituents the project will be built*. This use of the term is important to how the project gets developed using the FEL process which we explain later.

Limits to WIFA's Range of Action

We begin with some qualifiers that have guided our ideas, based on our understanding of the WIFA enabling statutes and basic Federal law relating to the Colorado River and the Sea of Cortez. As we are not a law firm, these qualifiers should be verified early on by WIFA so that if possible, some of the limitations we have imposed here could be lifted.[5]

1. WIFA may contract with private entities outside of AZ, and enter into intergovernmental agreements, but its authority to plan, construct, acquire, own assets is limited to assets within the State of Arizona. As we understand it this means that WIFA cannot have an ownership interest in a desalination facility located in Mexico.
2. We suspect that neither WIFA nor the State of Arizona could hold a water concession granted from Mexican Federal water authorities.
3. WIFA may not enter into agreements relating to Colorado River water without 1) ADWR's express consent, and 2) U.S. Secretary of the Interior consent.

[2] The inclusion of California in the Owner mix might properly take on a fairly simple, localized form, such as including the Imperial Irrigation District and a few more Southern California Water Users.

[3] Determined during FEL2 Work

[4] "WIFA" and "Owner" are also used interchangeably throughout this document for these reasons.

[5] Qualifiers (1) and (2) have strongly influenced our ownership and development approach. If these are found to be inaccurate, additional development models are opened up to WIFA. In any case, we stand by our recommendations (in the next section) that an FEL process be used to frame the project, including these administrative and legal questions.

Project Investigation and Development

Our recommended approach for WIFA to move forward from its present position is based on well established, time-tested Front-End Loading ("FEL") study and decision gate processes that have been used with great success in many market sectors – municipal water, industrial, mining, oil and gas, and others. The essential premise is that a project is thoroughly studied before significant commitments (investments) are made. Normally there are three study periods and three decision gates: FEL1, FEL2, and FEL3, followed by the implementation period. Each of the study periods advances the definition of the work, the state of WIFA's knowledge, reduces project risks as they are identified, and allows for incremental buy-in from crucial stakeholders. Each of the study periods concludes with a decision gate at which point the Owner looks at the study findings and decides 1) whether or not to move forward to the next stage, and 2) the scope of the next stage of work. By its very nature the process is designed to expose any latent fatal flaws, giving WIFA the confidence to make decisions on next steps along the way. Undertaking studies is very different than undertaking projects, since the purpose is to *examine* the various dimensions of a business proposition (in this case, an international water project) rather than to advance it. Ideas showing promise are advanced to the next step, while ideas that are impractical or too expensive are discarded.

In the hoped-for study pathway outcome, a point is reached at the end of FEL3 where WIFA and its prospective water sub-contractors are fully satisfied that they understand all of the dimensions of the enterprise, its benefits and risks, and are ready to commit to buy the water on behalf of AZ citizens. Their readiness to buy the water at a well-defined pricing formula, as would be formalized in a Water Purchase Agreement, will enable private equity and institutional financing for the construction of the project. If, however, the risks and uncertainties exposed by the due diligence work, the estimated costs of the water, or the social and administrative issues are not favorable to a "go" decision, then WIFA can hit the pause button and reassess alternative options at that point.

We believe that the existing body of work already puts WIFA in position of having completed most of what would be required in FEL1. The Minute 323 Desalinization Work Group Study (Black and Veatch, 2020), the supply/demand forecasts by ADWR and various Arizona water users, provide the foundational body of knowledge for desalination locations and supply/demand forecasts for Owner regions. WIFA's government to government strategy, and administrative details related thereto still need to be determined. We have placed these elements at the start of FEL2.

The commercial arrangement and study process we have outlined in this RFI is different from that presented to WIFA in December 2022 by a private consortium. In that offering, the consortium would (or had already, at the time of the presentation) determine such things as the list of ultimate water users, the appropriate size, capacity, and location of the desal plant; the size, location, and capacity of the power plant; determine the phases of construction and operations; select the corridor routing; engage with the public; secure all needed permits, work out the legalities of an international water transfer, negotiate with water users and authorities in Sonora, decide how to build the assets, oversee construction, commissioning and operations and so on. The natural appeal of this approach is that it seems to be a risk free, low effort deal to WIFA.

However, we believe this approach fails to account for several crucial realities that underpin the work. Consider the following:

- The essential buy in from the people of Arizona
- The readiness to contract for this more expensive water by Arizona's water users in the municipal sector
- The importance of the Arizona/Sonora relationship and its broader economic dimensions beyond water
- Social acceptance in Mexico, or worldwide, of what could appear to be exploitation of natural resource from a poorer country for the benefit of a richer one;
- The importance of site selection and land use decisions to minimize environmental impact and to allow for public input
- Various legal and contractual aspects of transfer of Mexican water to United States users, including U.S. border challenges
- The unique makeup of Arizona's water users, their water supply portfolios and various perspectives on higher cost (desal) water as a part of their planning
- The unique context of Arizona's Active Management Areas, the water providers therein, and their reliance on both CAWCD and CAGRD for portions of their supply, and on CAWCD for potential wheeling of non-Colorado River water for this project; the effect these elements will have on the accurate building of a supply-demand and business model for the project
- Interests of, or influence in other Lower Basin states in desalinated water project

These issues, all of which underlie the desal project, lie squarely in the domain of the State of Arizona and/or other public entities, those which we herein refer to as the *Owner* of the work.. The factors are crucial to defining the right project that meets the needs of the water users and in securing their buy in. They involve crucial long term state and Federal interests. A private consortium under pressure to deliver investment returns, and under pressure to achieve payback on its own due diligence activities, is likely to hurry past several of these factors, or possibly under appreciate their importance to the detriment of the Owner.

Further, it is our view is that the project is too large a public sector project to be awarded to any party without a professionally structured, well-defined, and prescriptive bid process.

For all of these reasons, we believe it to be in WIFA's best interest to proceed with the desal concept using a staged due diligence approach where these and other fundamentals are addressed systematically, and where appropriate decision points allow WIFA to continue, pause, or shelf the idea. Private equity and institutional capital are certainly a part of the full solution, and these dollars should be brought in later via competitive bidding if and when the *Owner's* needs are all fully understood and baked into the project concept.

In all which follows, we are providing WIFA <u>concepts to consider</u> for the organization of its team, the final water contracting strategy, and major FEL development phases. We will use specific concepts to illustrate some of the important issues and angles of the enterprise, and to indicate a possible Initial direction for the FEL work based on our understanding today. These specifics should not be considered studied recommendations by Worley.

Proposed Development Framework

WIFA will need the support of professional services firms to undertake the FEL Studies. WIFA may organize the work resources into several functional roles, and the FEL process into several key work objectives. These are illustrated in the following.

Project Development FEL Process

- Figure 1a: Project Development Organization Concept **(See Appendix A)**
- Table 1
- Figure 1b: FEL Process Map (See **Appendix B**)

Figure 1a and Table 1 illustrate the functional roles and relationships of the parties developing the work during the FEL study periods and into Implementation. Figure 1b illustrates the major work objectives and sequences of FEL2 and FEL3 and which party would be responsible for the various work elements. The colors of bars under the "Major WIFA Contracts" lane are used to identify the major contracts WIFA would enter into. In the other lanes, the work activities are mapped to these colors to show which contract is used to deliver the work.

End State Water Delivery

- Figure 2: Power and Water Delivery Agreements Architecture Concept (See **Appendix C)**
- Table 2: Power and Water Delivery Agreements Outlines

These illustrate a possible end state of commercial agreements for the delivery of water to the various Owner entities.

We will refer to these figures extensively in the responses to questions below.

For each opportunity, please include:

a. General explanation of the augmentation supply and delivery strategy.

Physical Water Delivery Systems

We suggest a phased approach to project delivery allowing the Owner and water off takers to make a smaller initial water commitments, and for a lower unit cost, and also to deliver water from the project more quickly. Note the "Phases" here are construction/operations phases. The phasing approach itself, which is driven by a water demand and risk tolerance factors, would itself be determined during the FEL2 work. What we illustrate here serves as a straw man for illustrating the starting point of the FEL2 work.

First Production Phase:

- Phase 1 Desal Plant at a selected location in the Sea of Cortez. The location would be determined as a part of the FEL2 study work.
- Water delivery system to Morelos Dam for U.S. exchanged water, and to other selected delivery points in Sonora.

- Water provided to Owner via exchange agreements, wherein portions of the Mexico Allocation of Colorado River Water[6] of 1.5MAF are exchanged for the clean delivered water of the Desal Plant.
- First phase of power system infrastructure.

Subsequent Production Phases:

- Desal plant capacity expansions.
- Additional Colorado River water included in U.S./Mexico exchange agreement and allocated to states. If appropriate, upgrades to delivery system to Morelos Dam.
- Water delivery system to multiple delivery points in AZ and CA. The delivery system would be built in Phases to follow the demand curve. Generally this "wet water" would be delivered in accordance with water purchase agreements that are unrelated to Colorado River entitlements. By deferring this major pipeline infrastructure into later phases of the work, WIFA can lower the initial cost of water and achieve water deliveries to its users in a shorter amount of time.

Power Plant Considerations

During FEL2 the framework for power delivery would be conceptualized and developed. The Power Consultant would address the following issues:

- Potential energy source options, including existing utilities (MX or AZ), self-developed, combinations thereof
- Land and siting options of self-developed energy sources
- Existing transmission capacity, new transmission routes/corridors. Opportunity to combine transmission corridors and later phase piping corridors
- Power delivery commercial arrangements and models
- Synergies between this desal project power needs and other, system-wide utility or state initiatives, additional power off-takers, etc.
- Renewable energy storage approaches

It is possible that existing energy sources could serve the early phases of the desal plant. The phasing of power assets will need to be determined as a part of FEL2.

Assuming that eventually new power generation will be required for later desal plant phases, it may be good for strategic reasons to site the power plant in the United States since the desal plant is cross border. By having some of the critical infrastructure on the U.S. side of the border, the U.S. can demonstrate to Mexico its willingness to bear a significant portion of the environmental/land cost of the overall enterprise.

Commercial and Legal Arrangements

[6] Exchanges for Mexican water would be limited to preserve a minimum environmental flow all the way to Morelos Dam.

The commercial and legal arrangements necessary to implement this concept are illustrated in Figure 2 and described in Table 2. These are represented here in their final form, with notes in the right hand column that explore how the agreements might be developed along the FEL pathway.

Legend Code	Type	Parties	Final Structure/Content Notes
WT1	Minute XXX to U.S./Mexico Treaty for Co River Water Deliveries.	U.S. Secretary of Interior, Mexican Federal Counterpart	Mexico agrees with the U.S. to exchange portions of its Colorado River allocation for desalinated water, substantially funded (via separate agreements WC1a) by U.S. based water users, delivered to Morelos Dam. The WT contains provisions that enable U.S. Colorado River Water Users to purchase from the USBR portions of the exchanged Mexican River water, and to allow for the flow of funds from U.S. Colorado River Water Users to the Desal PPP, enabling both contracts WC1a and C1.
WC1a	Water Delivery Contract for Exchanged Colorado River Water	USBR, United States Water Users	U.S. Water Users contract for Colorado River Water from USBR, which is received by exchange from Mexico via the WT. The WC1a agreements, and their parent treaty WT, are foundational to obtaining private funding of the first phase of development. The WC1a agreements are executed jointly with the WC1b agreement.
WC1b	Water Purchase Contract for Desalinated Water used for Exchange	United States Water Users, Desal PPP	U.S. Water Users who desire to receive exchanged Mexican Colorado River water per WT1 and WC1a agree with Desal PPP to pay for equivalent amount of water delivered to Morelos Dam. This agreement is executed jointly with WC1a agreement.

Legend Code	Type	Parties	Final Structure/Content Notes
WC2	Water Purchase Contract for non-exchanged water	WIFA, Desal PPP	WIFA is aggregate purchaser of all direct water deliveries into AZ for later phase water deliveries (non Colorado River deliveries) Since WIFA buys the power separately from the water, the cost of water sold includes either no power or a limited power component. WIFA thus retains control over significant portion of delivery cost of water to AZ via its power purchase agreement. Foundational to obtaining private funding of later development phases.
WC2-Sub	Water Purchase Subcontracts for non-exchanged water	U.S. Water Users, WIFA	Subcontract to WC2, whereby WIFA delivers water purchased under WC2 to its U.S. users. Applicable to later phase water deliveries (non-Colorado River deliveries). Water cost to U.S. users includes Power and Water components. Along with WC2, foundational to obtaining private funding of later development phases.
WC3	Water Purchase Contracts	Desal PPP, Mexican Water Users	Mexican Municipalities agree to buy water from Desal PPP.

b. Estimated annually available water supply, if estimates exist. Also provide any information available on the reliability and sustainability of the supply along with any information on annual or seasonal variation of the supply, if available.

A desal project offers Arizona and other users the opportunity to decide in advance what they need the project to deliver and then shape the project accordingly. Desal plants based on Ultra-Filtration and Reverse Osmosis principles of design have few scaling limitations, and can be designed and constructed in steps that follow the demand projections very closely. Thus, the physical water available by use of these assets will be limited not by technology but by other factors such as available energy, land use/area limits, or environmental factors.

Water extractions from the coastal waters of Mexico require a water right, called either a “concession”, or “allocation”[7] from the Mexican Government agency CONAGUA, or the National Water Commission. The water available for extraction by the plant on an annual basis would be limited by this concession.

The concession should be considered in three parts:

- The part that is used directly in Sonora; (first phase + later phases)
- The part that is exchanged with the U.S. for Colorado River water (first phase + later phases)
- The part that is delivered across the U.S. border for use by Arizona and potentially California (later phases only)

Concessions are granted typically for up to 30 years with prescribed provisions for mutually agreed end of term renewals.

The FEL2 work would establish the framework for the water supply – including the basic size of the desal plant, the concession needed from CONAGUA, and the minimum guaranteed off-take based on the portfolio of committed water users on both sides of the border.

c. Duration of resource availability if there is the potential that the supply may not be available in the long-term or in perpetuity.

The desal project physical assets would be subject to all of the ordinary risks of living in a climate affected world including sea level rise, storms, extreme weather. The project should include careful assessments and mitigation plans.

The pre-work environmental studies during FEL2 and FEL3 will seek to demonstrate that the project can withdraw water and eject brine into the Sea of Cortez without adverse, unmanageable environmental impacts. There remains the possibility that unanticipated adverse effects are realized during operation which could limit the amount of production from the plant based on permitted limits. Given the maturity of desal technology and application throughout the world, however, this risk should be small.

[7] Depending on applicant context. Generally “allocations” is used to describe water rights given to municipality, while “concessions” are granted to agricultural, commercial, or industrial users individually. Which one would apply to the project is unclear at this point, but we will assume a concession for now as the probable more restrictive assumption.

d. Environmental and/or regulatory considerations and/or limitations.

Environmental/regulatory considerations will be a principal driver for project decisions around site selection. All of these need to be studied thoroughly during FEL2 and FEL3. Some of the critical issues to be examined are set forth below.

Desal Plant Site Selection Factors – Environmental/Regulatory

- Impacts to aquatic life
- Availability of local construction/operations support industries for construction
- Potential economic benefits to community of having one of the western hemisphere's largest desal plants to build and operate indefinitely
- Potential social, health, and economic benefits of water delivered to local community

Power System Planning – Environmental/Regulatory

- Total GHG burden of plant by phase
- Land usage required for new renewables power sources
- Sensitive species, ESA
- Same considerations as desal plant with respect to economic, social, health benefits for renewables generation project(s)
- NEPA for U.S. Public Lands for project elements therein
- Approval of the Mexican Secretariat of Environment and Natural Resources (SEMARNAT) for project elements in Mexico including the Desal Plant itself, power elements, water distribution works.

e. Jurisdictional/political considerations and/or limitations.

The proposed desal project, in the form proposed in December 2022, has already been the subject of international media headlines. WIFA can and should expect that this mega project will attract significant interest from media entities on both sides of the border, NGOs, and the general public for better or worse. We recommend a fact-based, thoughtful PR and messaging strategy from the outset to counter any misunderstandings or otherwise financially or politically motivated attempts at mischaracterizing the project. We suggest one of WIFA's directives to its advisory team be to develop and articulate such a strategy for the public communications and political aspects of the project. This strategy gets developed during FEL2, as a joint effort between WIFA and its advisors, the Program Manager, and the Mexican Water Consultant.

f. Capital investment, repayment or other financial considerations and/or limitations.

See item 3 below.

g. Approaches to enhance the sustainability, security and resilience of the water supply.

The concept behind the Phase 1 use of Colorado river water is to leverage what may be an opportunity for a lower initial cost of water for the Owner and their constituents. By utilizing the exchange agreement as proposed for Phase 1, the delivered water cost does not need to account for the capital cost of hundreds of miles of water pipelines. There is some possibility that the Phase 1 project, in combination with reasonably favorable precipitation seasons, could serve the Owner for a number of years before later phases requiring the pipeline were built. While this approach has these benefits, it does carry the risk inherent to all Colorado River delivery obligations. If, for example, the river allocations to Mexico are reduced by further drought negotiations, these reductions eat into the amount of water available for Mexico to exchange for desalinated water. The initial phase of exchanged water would need to be an order of magnitude lower than Mexico's full 1.5 MAF allocation to allow for this possibility in order to protect the exchange amount from cuts.

The project will need to be structured and planned in such a way that WIFA may pull the trigger on later phase work whenever the situation on the Colorado River calls for it. It is the later phase work, which allow for the direct delivery of water from the ocean, that provides water security to WIFA in the long term.

For all phases of development, the following should be considered as foundational to water security:

- Government to Government relations between the United States, Mexico, Arizona (and other U.S. States, if applicable), and Sonora
- The stability of Mexican Federal Water Policy and risk of changing politics and social conditions that could influence the same
- The cost of energy for desalination and delivery
- The security of the necessary corridors for transmission of energy and water, where the sprawling, extended nature of the assets increase the costs of securing them

These issues need to be addressed carefully and deliberately in the FEL2 and FEL3 work.

2. WIFA may consider a variety of delivery and/or ownership models for augmentation opportunities, including long term purchase contracts, a variety of P3 agreements (ref A.R.S. § 49-1211), or other models. Please provide information on factors that will positively or negatively influence your consideration of various potential delivery models. Does an alternative delivery or P3 agreement make the identified water augmentation initiatives more or less attractive business opportunities?

As discussed in the introduction, our belief is that WIFA will be better served by following a traditional approach for FEL2 and FEL3 stages before it enters into any long term PPP agreement for project implementation. Potential private partners for the work, both on the power side (Power PPP) and desal side (Desal PPP), will need to see the following matters structured in the proposed deal:

- The aggregate demand of users on both sides of the border;
- The legal framework for the water contracts, including the international exchange aspects discussed above
- The cross boundary political strategy
- Environmental due diligence and site selection for the desal plant and critical infrastructure corridors

These matters, along with many others, would be explained in the deliverables of FEL2 and FEL3 showing favorable investment conditions and a financeable project risk allocation.

Figure 1a and Table 1 explain in greater detail the roles of various entities during development and production.

Table 1a: Key Development and Water Delivery Entities			
Entity	Composition	Development Role during FEL Process and Implementation	Water Delivery Role (After Commissioning)
Steering Committee	Comprised of key AZ Water agencies in partnership with WIFA in guiding project objectives. Might also include CA or MX entities. See B.1.	Development role would be formalized in some kind of MOA between agencies. This MOA would provide a governance structure wherein WIFA could receive input from its partner AZ based agencies on the project development, particularly on the water demand modeling.	None
Advisory Team	Development Advisor	The Advisory Team provides project structuring and development guidance to WIFA in mapping out the timeline and activities including defining project specifications, delivery partner candidate qualifications, and devising and administering the competitive bid process to award the project on terms most beneficial to the State of AZ and in the public interest of AZ. Key areas of support to WIFA would include: 1. Further refinements or revisions to development conceptual mapping provided in this RFI 2. Identification of and mitigation tracking of key project risks (social, political, cost, regulatory) 3. Assist in the formation of governance structures such as the Steering Committee 4. Develop initial architecture of Water Financial and Business Model 5. Provide support for acquisition of Federal financing for FEL tasks 6. Scoping of Program Management role 7. General guidance for shaping the project activities so as to enhance investment interests post FEL3.	

Table 1a: Key Development and Water Delivery Entities			
Entity	Composition	Development Role during FEL Process and Implementation	Water Delivery Role (After Commissioning)
Program Manager	Management and engineering services consultant contracted to WIFA	Program Management role serves as an extension of WIFA staff to provide comprehensive management glue to the various parts of the enterprise. For an undertaking of this size, the role of Program Manager is essential to WIFA's maintaining a proper level of oversight to the various contracted parties that would need to be involved, and to ensure that WIFA's interests are maintained. T The Program Manager would at a minimum 1) scope, qualify, oversee the execution of the various contracts 2) Ensure technical and informational consistency; 3) Manage technical interfaces; 4) Own and manage the water demand model, cost estimating, and water pricing structures that underpin project economics, 5) Self perform certain engineering functions (if qualified) 6) provide management control of costs, schedule, procurement activities.	None
Mexico Water Consultant	Mexican service provider with extensive experience and relationships in Mexican water commercial, municipal, and engineering aspects.	1) Identify potential Mexican water Users, working with appropriate govt agencies and municipal providers. 2) Develop the Mexican Water Users Demand model. 3) Serve as interface with local Mexican governments and other key stakeholders in Mexico; 4) Serve as consultant on the formation of the Mexico-based Desal PPP. 5) Provide advice and support in shaping the project to maximize benefits to Mexican citizens and obtaining their buy in.	None
Desal Consultant	Engineering service provider with experience in Desalination.	This consultant is responsible for the FEL2 work relating to the Desalination plant siting, concept engineering, and cost estimating for the same. Could, but does not need to, carry over into FEL3 Desal PPP.	None

Table 1a: Key Development and Water Delivery Entities			
Entity	Composition	Development Role during FEL Process and Implementation	Water Delivery Role (After Commissioning)
Power Consultant	Engineering service provider with extensive power generation and transmission experience	Responsible for FEL2 power studies. Could, but does not need to, carry over into FEL3 Power PPP.	None
Desal PPP	The Desal PPP would be a PPP wherein the "Public" partner consists of the appropriate entity or entities within the Mexican government, and the "Private" partner could be a private consortium with business experience and objectives in line with engineering, construction, and operations of desal plants. There are precedents for desal projects, with Mexican based PPPs, that WIFA can learn from in designing this PPP relationship. The precise arrangement of the PPP, its Mexican composition, its interactions with WIFA, the U.S., IBWC, and others would need to be explored, determined, and arranged during FEL2. WIFA would rely largely on the Mexican Water Consultant for help in identifying potential partners and arrangements.	The Desal PPP has the major development role during FEL 3, Implementation, and Water Delivery.	The Desal PPP is the water concessionaire, owner and operator of the Desal plant, and holder of Mexican required permits. It contracts for water delivery to the Mexican water users (WC3, first phase + later phases). It contracts for water delivery to Morales Dam in accordance with its agreement with Mexican Federal authorities (C1, first phase + later phases). It contracts for direct water deliveries directly with WIFA (WC2, later phases).

Table 1a: Key Development and Water Delivery Entities			
Entity	Composition	Development Role during FEL Process and Implementation	Water Delivery Role (After Commissioning)
Power PPP	The Power PPP would be a PPP wherein the "Public" partner would be WIFA and the "Private" partner could be a private consortium with business experience and objectives in line with engineering, construction, and operations of renewable power plants.	The Power PPP has the major development role during FEL3, Implementation, and Water/Power Delivery.	The Power PPP sells power directly to WIFA as a part of WIFA's total cost of water. See PC1 in Table 2.

FEL Milestones

The FEL stages are mapped out in Figure 3 and explained below.

1. *FEL2*

- Establish the management framework for the enterprise
    - Steering Committee
    - Agency to Agency working agreements
    - Mexican/Arizona/Federal working relationships
- Alignment between U.S. and Mexico on Colorado River Draft Exchange Agreement
- Build Commercial Water Model
    - Identify list of committed and potential Off Takers
    - Build Demand Model
    - Conceptual Water Pricing and Commercial Framing
    - Buy in on concept water price from Off Takers
    - Draft Off-Take Agreement Principles
    - Project benefits agreement(s) in Mexico
- Concept Engineering
    - Desal Plant location selection
    - Desal Plant Sizing, Technology
    - Power Studies
    - Capital Cost, Operating Cost Estimating
- **WIFA go/no go decision to proceed with FEL3**

2. *FEL3*

- Administrative
    - Finalize (but not execute) U.S./Mexico exchange agreement
    - Solicit, Identify, partners and form PPPs
        - Mexico (Desal)

- U.S. (Power)
- Engineering
    - 30% Engineering on all project elements
        - Intake/Outfall
        - Desal Plant
        - Water Transmission in Mexico
        - Power Supply and Transmission
        - Water Transmission in U.S. (Phase 2)
    - Project Execution Plan
    - Capital Cost, Operating Cost Estimate Updates
- Permitting
    - Obtain permits for land use
    - Secure water concession
- FORMALIZE FOR EXECUTION ALL AGREEMENTS, READY FOR ACTION BY WIFA, MEXICO, U.S. AGENCIES, ALL WATER USERS, PPP's
- **WIFA go/no go decision to proceed with Implementation**

3. Implementation

- First Phase of Construction and Operations

3. Given constraints on funds available for water augmentation projects, are there recommendations on how to best prioritize, finance and pay for proposed WIFA augmentation opportunities including those utilizing P3 agreements?

Major FEL steps, participants, and funding are illustratively described in Figure 2.

Early-stage due diligence studies, whose purpose is to examine and develop the *case* for investment, are shown as FEL2 and FEL3. These should be funded by the project Owner which in this case is made of WIFA and its adjacent Mexican (and possibly Californian) government stakeholders, all of whom collectively represent their respective public interests. By paying for these studies directly, the Owner retains sufficient control of the key project shaping parameters (Cross border govt agreements, social benefits, water demand model) that are vital to success.

As of today, WIFA may be the only government entity who has a fund established that is in a position to pay for any of this. As a multi-government, multi-citizen enterprise, it would be appropriate for other govt partners to participate financially in the due diligence activities and making these arrangements could take some time. WIFA's readiness to act, however, puts WIFA in an ideal leadership role with respect to the other government partners and this puts Arizona in the driver's seat.

The suggested strategy of waiting to bring the PPP's on board until after FEL2 is intentional. It allows the FEL2 investigative work to proceed in a more unbiased manner, wherein WIFA is supported by consultants who do not necessarily have a shared long term financial interest in the outcome of whether or not the project goes forward. It also buys WIFA and other government entities involved some time to make some progress on the administrative arrangements as a part of the FEL2 period. Moreover, the FEL2 consultants will be supporting the Program Manager in developing the solicitations for the PPPs to respond to for the FEL3 work.

At the beginning of FEL3, the Desal PPP and the Power PPP are brought on board to complete the FEL3 due diligence work. The private partners for these PPPs would be selected via a formally structured competitive proposal process. The initial contractual arrangement between WIFA and these PPPs is such that that private partner in each of the PPP's is brought on to help shape the project, and to fully validate the business concept, in such a way that it is attractive to private sector investors at the end of the FEL3 work, while still holding to the administrative, legal, and technical framework established by the Owner during FEL2. During this phase, the Desal PPP and the Power PPP are reimbursed for their due diligence services by the Owner. WIFA makes no final commitment to buy water until the end of FEL3, when (and if) the project's costs (thus water costs), social benefits, etc. – are known with a greater degree of accuracy.

The FEL2 and FEL3 due diligence work would be funded directly by WIFA, its partner Owner governments, and could include funding from Federal sources such as USBR's Water Smart Program.

If the FEL2 and FEL3 work demonstrate a socially, legally, environmentally, and economically viable project arrangement to the Owner, this would trigger the following:

1. Finalization of WT1, WC1a, WC1b, and WC3 enabling agreements (see Figure 2 and Table 2)
2. Final WIFA Board Decision/other Owner Decisions to make necessary commitments for water;
3. Execution of next step of PPP agreements, wherein the private partners become invested partners rather than fee-for-service as they were during FEL3;
4. Execution of WC1 subcontracts for water and PC1 for power.
5. Full engagement of the PPPs to take subsequent steps to obtain requisite financing and proceed into EPC realm.

4. Are there any practical market capacity constraints to deploy water augmentation plans (e.g., physical construction limits, current water pipeline manufacturing and delivery capacity in a given year, other supply chain constraints, labor or any other constraints that may impact the capacity to deliver a total augmentation plan)?

These issues would need to be examined carefully during FEL2.

5. If Respondents have perspectives on challenges (financial, political, social, regulatory) that may not be project/program specific, they are invited to share opinions that may aid WIFA in analyzing potential responses.

Earlier we made reference to some of Mexico's water supply challenges. There can be little doubt that certain of these realities will influence the way that Mexican authorities, particularly those of the Sonoran state and CONAGUQ, view WIFA's interest in a desalination project. We believe that it is key to overall success that these realities be understood and addressed strategically and creatively in early discussions between WIFA, IBWC, and Mexican authorities.

Some ideas to consider include:

1. Partner with a major industrial water user in Mexico who can buy a portion of the desal water from the Desal PPP to support the financing and bolster the potential for "cheaper" water delivered to Sonoran municipalities;

2. Design the project execution plan so as to maximize employment opportunities for Sonoran citizens, considering both construction, manufacturing, and long-term operations jobs. Build this into the Desal PPP charter;
3. Make use of the fact that the desal water, which during phase 1 is delivered to Mexican users, is cleaner and of a higher quality than the water the U.S. would be exchanging it for (Colorado River water). Perhaps through blending the desal water can be used to improve the water quality of existing municipal systems, or reduce local treatment costs;
4. Formalize a water policy knowledge sharing framework between Arizona and Mexican water authorities wherein Mexico could potentially benefit from understanding Arizona's water planning and policy best practices and where regional groundwater issues can be considered together;
5. Consider power synergies between this desal project, other desal projects in Mexico, and general industrial power users on both sides of the border to potentially reduce the power (thus water) delivery cost.
6. Consider brine valorization opportunities and other potential economic development synergies catalyzed by seawater desalination.
7. Prioritize environmental improvement, sustainability and climate resilience in project decision making.

Appendix A Figure 1a: Project Development Organization Concept

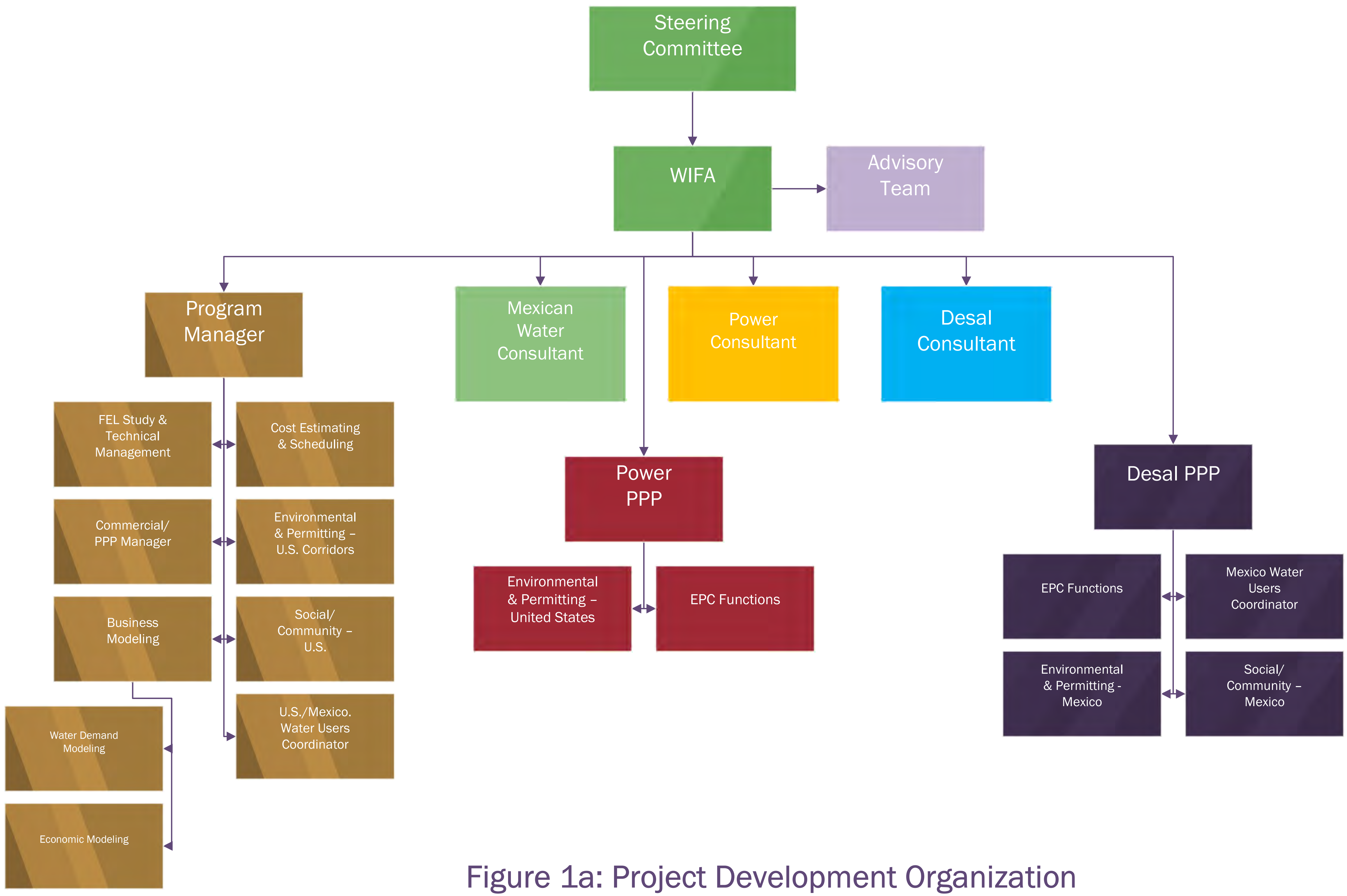
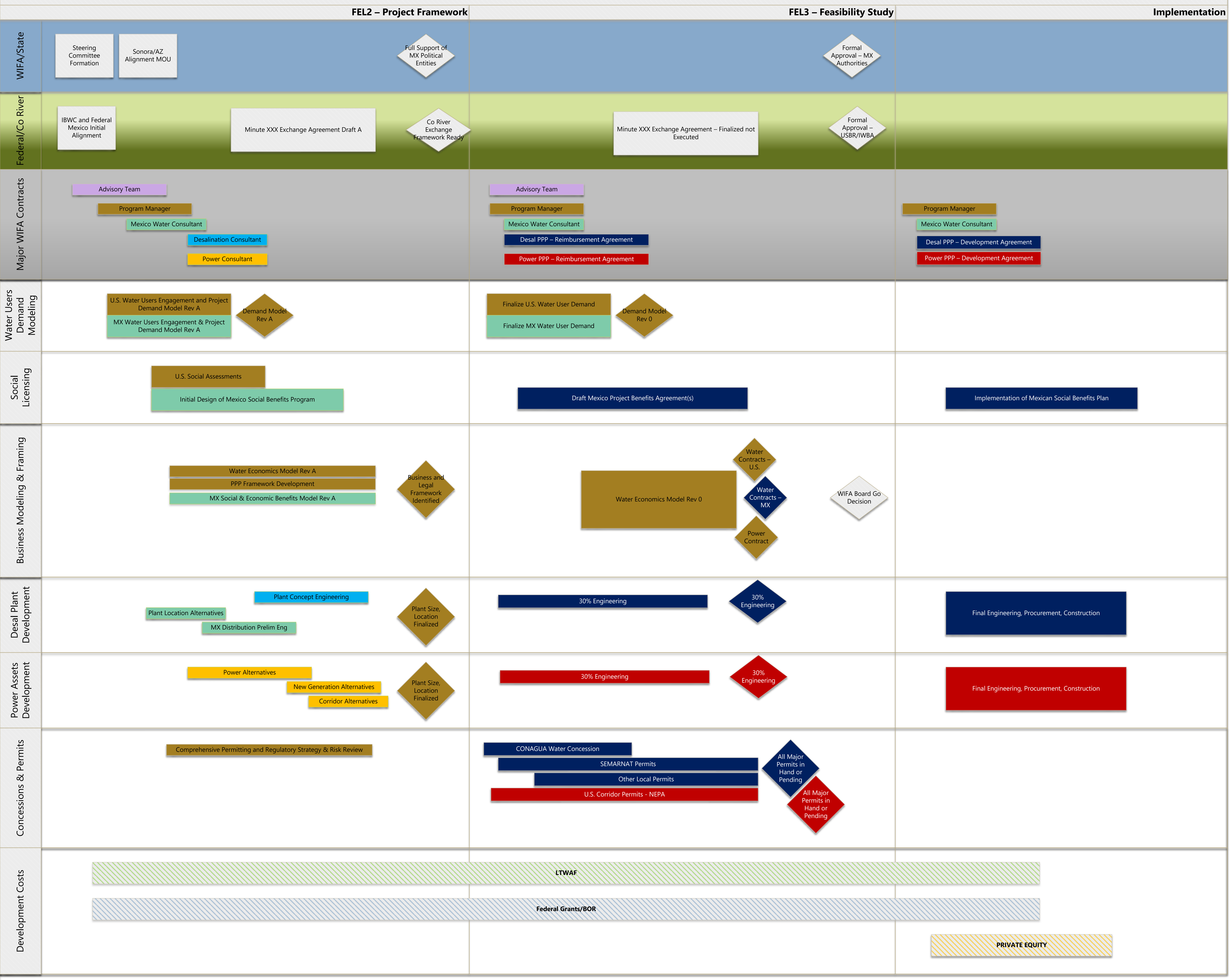


Figure 1a: Project Development Organization Concept

Appendix B Figure 1b: FEL Process Map

Figure 1b: FEL Process Map



Appendix C Figure 2: Power and Water Delivery Agreements Architecture Concept

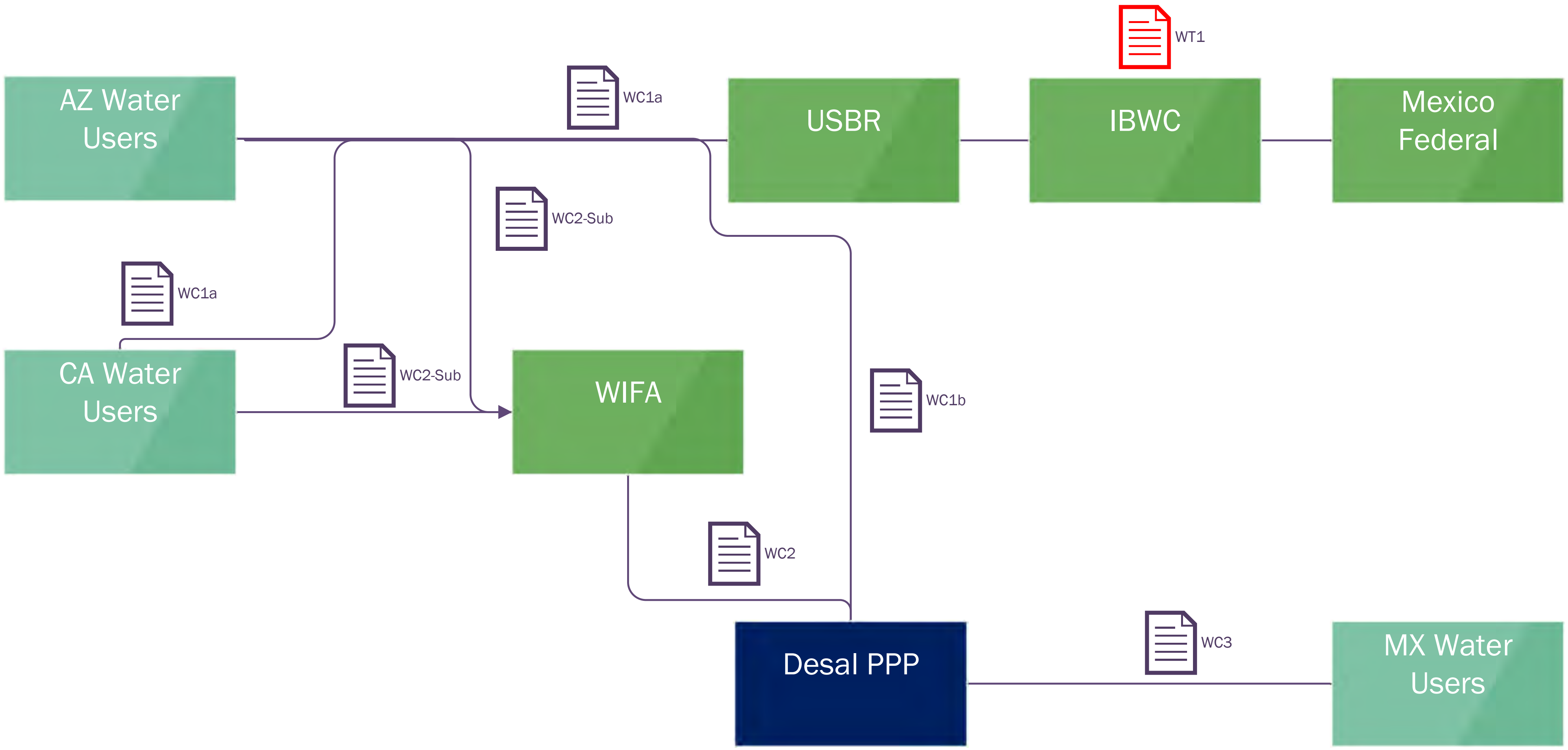


Figure 2: Power & Water Delivery Agreements Architecture Concept