2022

Adelanto Community Water Report

AWJC
Adelanto Water Justice Coalition

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Robert Redford Conservancy for Southern California Sustainability
Community Engagement Center
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Inland Coalition for Immigrant Justice
El Sol Neighborhood Educational Center
Unidos Por Un Adelanto Mejor

2022

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Executive Summary

Members of the Adelanto community have reported concerns over the quality of their tap water. Residents report water that appears discolored and smells or tastes odd. There is a sense among residents that they lack communication with the City's Water and Sewer Department and PERC Water Corporation about water quality and safety. This report was created to address these concerns by bringing together individuals, organizations, and community leaders in an attempt to understand Adelanto's water and to provide information in order to improve the quality of this public resource.

This report compiles contextual information relevant to Adelanto's water and shares the results of qualitative research and quantitative data from water quality. Water analysis was conducted by the Keck Science Department at the Claremont Colleges. Water samples were collected from residents' homes and tested by students in the Advanced Laboratory in Chemistry and Integrated Biology and Chemistry courses during Spring 2022. Further tests from PERC water corporation were also reviewed. Alongside this technical information, this report highlights first-hand narratives of community members. The report concludes with a list of recommendations for the City in order to improve the quality of water, as well as for the community to make claims on this public resource.

After reviewing water quality data from the Consumer Confidence Report (CCR), the California Office of Environmental Health Hazard Assessment (OEHHA), the Environmental Working Group (EWG), and recent testing from the Keck Science Department and PERC Water Corporation, it has become clear that further analysis and action are necessary. There is misalignment between various issues – from the potential contamination of PFAS from George Air Force Base, to the dangerous levels of Trihalomethanes pointed out by the EWG, to the relatively high lead and gross alpha concentrations from OEHHA reporting, and the concerning levels of arsenic from the City's own testing. Furthermore, findings from the Keck Science Department highlight the discrepancy between the low levels of certain contaminants reported by the CCR and the high levels found by recent testing. Despite all of the available information, Adelanto's residents are still left without a clear picture of what contaminants are in their water and why it looks and tastes the way it does. Understanding the source or sources of the problem will require additional research, collaboration, communication, and problem solving.

Adelanto's water system is in a state of fragility. Municipal reports detailing Adelanto's water management demonstrate a system in which water is controlled by the City, while metrics for water quality and supply are determined by state and federal agencies. A managerial focus on water scarcity and conservation leaves little room to address the immediate need for water quality expressed by community members. In other words, the system for dealing with water in

Adelanto lacks opportunities for community members to participate in the monitoring of their own water quality.

The aim of this report is to facilitate informed dialog between community members and municipal or agency representatives, as well as to contribute to community-based efforts to secure equitable access to safe and drinkable water. Recommendations include the implementation of a Community Water Board, development of a structure for self-reporting water concerns that openly displays collected data to the public, subsidization of home water filters, implementation of equitable and sustainable water conservation measures, investment in water infrastructure, expansion of civic engagement workshops, further research to pinpoint problem sources, remediation of PFAS and other pollutants from local wells, creation of partnerships for public health, and expansion of testing for tighter water quality standards. Through the adoption of these recommendations, Adelanto residents, PERC Water Company and City officials may work together towards achieving a more just water system.

Introduction

Project Beginnings

The project accompanying this report grew out of concerns from Adelanto community members over the quality of water coming out of their taps and a lack of access to information about the safety of the water. Council member Stevevonna Evans connected with the Community Engagement Center, an organization of Pitzer College, to collaborate on ways to address these water-related issues raised by residents in the Fall of 2021. A small team began to work alongside professors from the Keck Science Department to integrate the testing of water from Adelanto into their college course curricula for the Spring 2022 semester. With the support of staff, students, faculty, and two additional Pitzer organizations, the Robert Redford Conservancy for Southern California Sustainability and CASA Pitzer, the collaborative research project was expanded. After the initial collection of water samples, the project grew to incorporate an ethnographic research component. By joining forces with the Inland Coalition for Immigrant Justice and El Sol Community Educational Center, researchers were able to better connect with the immigrant and Spanish-speaking community members in Adelanto–some of whom identify as a group called *Unidos por un Adelanto Mejor* (United for a Better Adelanto). A series of interviews was conducted with members from multiple communities in Adelanto to center the voices of those directly impacted by the City's water, in addition to the test results. Through weekly meetings, this diverse group has continued to coordinate efforts to achieve the shared goal of water justice in Adelanto.

What is "Water Justice"?

Water (in)justice implies that water-related issues, such as drought and access to clean water, impact the health and livelihood of certain communities in disproportionate ways. In other words,

unjust water systems create unequal access to water resources, widening the gap between the “haves” and the “have-nots." Calling for water justice requires consideration of the ways in which water-related inequalities relate to broader systems of domination and are situated in local contexts through policies and practices. Water-related concerns often intersect with other health and safety concerns to produce complex problems to solve. Achieving water justice necessitates that we define water not just through its technical dimensions, but also through its cultural, political, economic and material dimensions. A just water system equitably distributes safe and drinkable water that is retrieved from ecologically sustainable and ethical sources. Water justice relies on the participation of impacted communities in decision-making processes and the valuation of local knowledge.

Background on Adelanto’s Water Supply

Looking back into the history of water in the Mojave Desert, up to 14,000 years ago when temperatures were cooler, it is believed that lakes would form in the spring from the runoff of the San Jacinto mountain snowpack (Patterson, 2016). The Yuhaviatam/Maarenga’yam (also known as Serrano) and Vanyumé Indigenous groups have resided in the High Mojave Desert since this time and into the present. Spanish missionaries entered the Inland Southern California region in 1769, reporting a land abundant with saline springs, grasslands, a river, and a swamp. The area’s population began to spike in 1870, initiating a period that began to strain water resources. Marketed for its prospective wealth in the land, the area was developed largely around agriculture and orchards. In 1915, E.H. Richardson founded Adelanto. In the mid-1900s existing orchards and open space eventually turned into George Air Force Base and a small amount of municipal space. This development likely marked the transformation of the water system from one of above-ground irrigation to one of underground pipes for military and municipal needs.

Adelanto currently obtains its water from the Mojave River Groundwater Basin, managed by the Mojave Water Agency. This basin is partially recharged by runoff from the San Bernardino and San Gabriel Mountains. The upper portion of the Mojave River seasonally flows with water, while the lower portion has a subterranean flow (below ground). There is very little groundwater recharge from Victor Valley due to low precipitation and high evaporation rates. Climate change impacts have further strained the water supply. Recharge of the basin is supplemented artificially with imported water from the State Water Project through the 444-mile long California Aqueduct, a project which was extended to service the City of Adelanto in 2020. The project cost $5.1 million, and is funded by the City, the Mojave Water Agency and federal grants.

Information on Adelanto’s current water infrastructure and quality is available on the City’s website under the water and sewer page (https://www.ci.adelanto.ca.us/214/Water-Sewer). The most recent Adelanto Urban Water Management plan is from 2020. This plan is signed by Adelanto’s mayor and council members. The City currently pumps from 7 active groundwater wells that meet water quality standards out 15 wells total. Among the active wells is a cluster of 5 wells close to the intersection of Phantom E and Turner Rd, one on the southwest corner of Bellflower St and Seneca Rd, and one on the southeast corner of Villa St and Calendula. In

times of emergency, Adelanto imports water from Victorville, which occurred at least once in recent years from July to November in 2020 (*Adelanto 2020 UWMP*, 2021). According to the City's reports, one of the more likely causes of water shortage is the need to deactivate more wells due to contaminant levels that reach levels higher than what is allowed (also known as exceeding the Maximum Contaminant Level). Arsenic is the primary contaminant of concern listed by these reports that threaten their disuse, followed by Iron and Manganese, which also the City's wells (*Adelanto 2021 WSCP*, 2021).

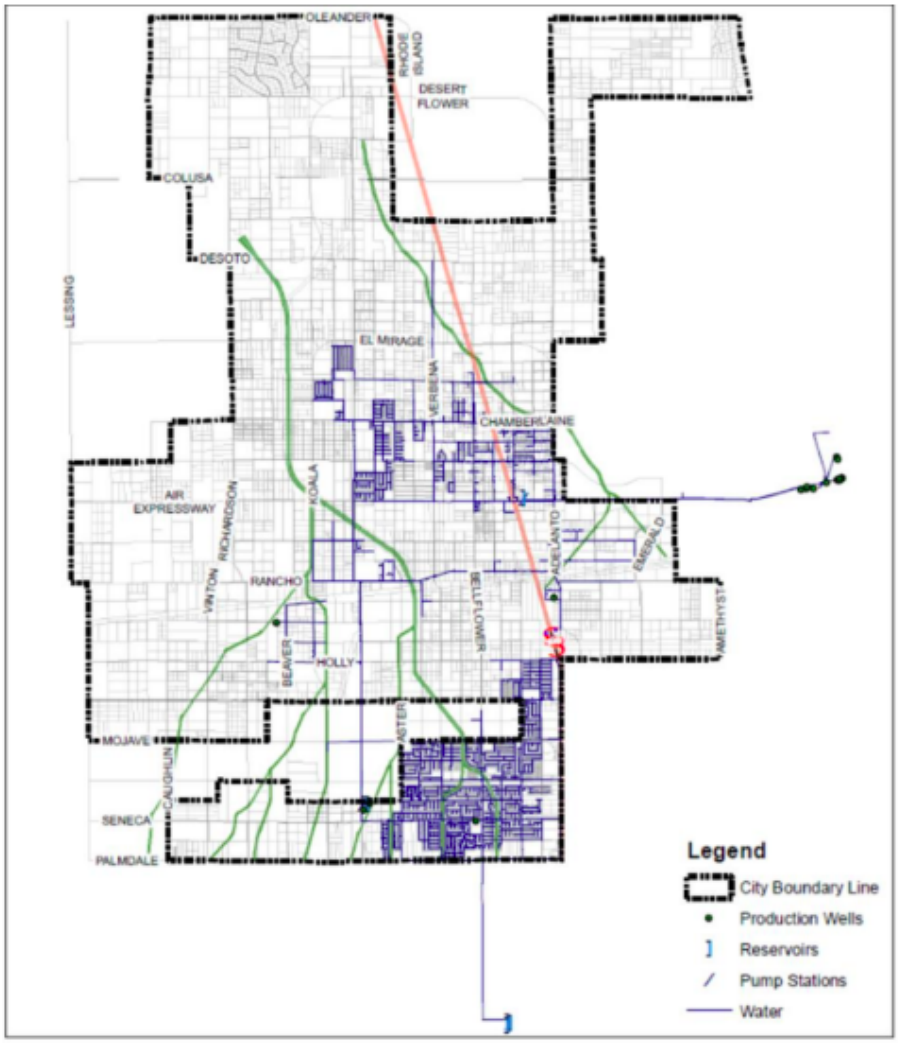

Figure 1: City of Adelanto Water Service Area. Provided by the Urban Water Management Plan.

With 8 out of 15 wells deactivated and the 7 active wells threatened by poor water quality and climate impacts, Adelanto's water system is in a state of fragility. The reports detailing Adelanto's water management demonstrate a system in which water is controlled by the City and metrics for its levels of quality and supply are determined by state and federal agencies. The piped and underground nature of the system means that residents feel largely disconnected from their water supply. There does not appear to be a structure set up for self-reporting issues with water that would be directly transparent to the public. Residents have no choice but to

operate through the City officials to make claims on their water supply, but this depends on City officials that are responsive, transparent and accountable. It is highly recommended that the City adopt a system for addressing water in Adelanto that creates opportunities for community members to participate in the monitoring of their own water quality.

Issues of Special Concern

Water systems are influenced by particular local conditions that shape a community's relationship to water and the issues a water system must confront. This section highlights some of the primary points of interest that were identified in the research process as having relevance to Adelanto's water issues. These include the proximity of the George Air Force Base Superfund Site to Adelanto's wells, the relatively high percentage of low-weight births, and the presence of communities that tend to be impacted disproportionately by environmental hazards.

George Air Force Base and PFAS

The George Air Force Base Superfund site is located just on the other side of Adelanto's North-East border. A Superfund site is an area with a high concentration of toxic chemicals that the federal government has directed funds towards cleaning up. Research shows that negative health impacts generally occur within 1.8 miles of Superfund sites. Coupled with this, lower priced and subsidized housing is more likely to exist adjacent to Superfund sites. Trends demonstrate that the locations of toxic waste sites are often nearest to communities of color (Mascarenhas et al., 2021; Taylor, 2022).

The George Air Force Base Superfund site has impacted the health of those who had lived and worked on the base in the past, and currently those who are incarcerated or working at the Victorville Federal Correctional Complex (FCI Victorville) which was (knowingly) built right on top of the site. Additionally, the Southern California Logistics Airport was built on the site, which has its own list of potential contaminants from the airport that could be entering into groundwater (*SCLA Specific Plan Amendment*, 2020).

Between 1941 and 1992 when the 5,347-acre George Airforce Base was open, contaminants of potential concern (COPCs) leached into soil and groundwater due to the use and disposal of hazardous materials. The US EPA states that groundwater is contaminated with jet fuel, benzene, trichloroethylene (TCE), pesticides, and nitrates (*Superfund Site: George Air Force Base Victorville, CA*, n.d.)[1]. However, there are additional reports that nuclear and other

[1] All contaminants of concern are: Asbestos-Containing Materials (ACM) / Friable Asbestos, Aviation [Avgas], Benzene, Chlordane, Diesel, Explosives (UXO, MEC) [Unexploded Ordnance (UXO) / Munitions and Explosives of Concern (MEC)], Gasoline, Heating Oil / Fuel Oil, MTBE / TBA / Other Fuel Oxygenates, Munitions Debris (MD), Nitrate, Other Insecticides [Aldrin / Dieldrin] / Pesticide / Fumigants / Herbicides, Other Petroleum, Other Solvent Or Non-Petroleum Hydrocarbon, Polychlorinated Biphenyls (PCBs), Polynuclear Aromatic Hydrocarbons (PAHs), Radioactive Isotopes, Tetrachloroethylene (PCE), Toluene, Trichloroethylene (TCE), Vinyl Chloride, Waste Oil / Motor / Hydraulic / Lubricating, Xylene

radioactive waste may be present as well (*Radioactive Material/Waste Timeline*, n.d.). Individuals who were stationed at George Air Force Base experienced health problems attributed to the toxicity of the area, and women were warned to not get pregnant due to disproportionately high birth complications and infant mortality rates (Carpenter, 2020).

George Air Force Base (www.georgeafb.info) has made information available on the water quality results from testing done by the Air Force. Specifically, these records provide useful information about the unregulated contaminants perfluoroalkyl and polyfluoroalkyl substances (PFAS), a family of over 5,000 human-made chemicals used in products such as firefighting foam, non-stick cookware and water-proofing treatments. PFAS are extremely persistent in the environment, lending them the nickname “forever chemicals.” PFAS enter the body through drinking contaminated water or consuming contaminated foods, and they are able to accumulate in the bloodstream. As of June 15th, 2022, the Environmental Protection Agency (EPA) released new drinking water lifetime health advisories at 0.004 parts per trillion (ppt) for PFOA and 0.02 ppt for PFOS, two commonly studied PFAS.[2] Additionally, they set health advisories for GenX chemicals (HFPO - DA) at 10 ppt and for PFBS at 2,000 ppt. The EPA still has not set regulations for PFAS in drinking water, only a non-enforceable, non-regulatory health advisory (US EPA, 2022).

The Air Force tested private and city groundwater wells at George Air Force Base in 2016, and found that all wells that were tested had levels of PFAS. At least one well (located on 18399 Shay Road) exceeded 5,000 ppts of PFAS, far above the near-zero lifetime health advisory (US EPA, 2022). Only a quarter mile away, the landfill (Landfill-1) where the firefighting foam was disposed of is positioned upstream from Adelanto’s 5 drinking water supply wells on Phantom E and Turner Rd, meaning that groundwater from this area would flow towards the wells. According to the Air Force, firefighting foam was no longer being disposed of by the late 1970’s, and yet these contaminants persist in the water (*Final Perfluorinated Compounds Determination at Multiple BRAC Bases Site Investigation Report*, 2016). The EPA states that health effects from PFAS include reproductive effect (decreased fertility and increased high blood pressure in pregnant people), birth defects (low birth weight, accelerated puberty, and skeletal variations), increased risk of cardiovascular disease, increased risk of some cancers (kidney, prostate or testicular), changes in liver enzymes, and decreased immune response to vaccines and infections (US EPA, 2021). Further investigation is needed to determine the extent to which the site impacts Adelanto’s water supply, and a preliminary, non-regulatory analysis of water and soil samples is underway.

[2] The previous health advisory was set at 70 ppt for PFOA and PFOS

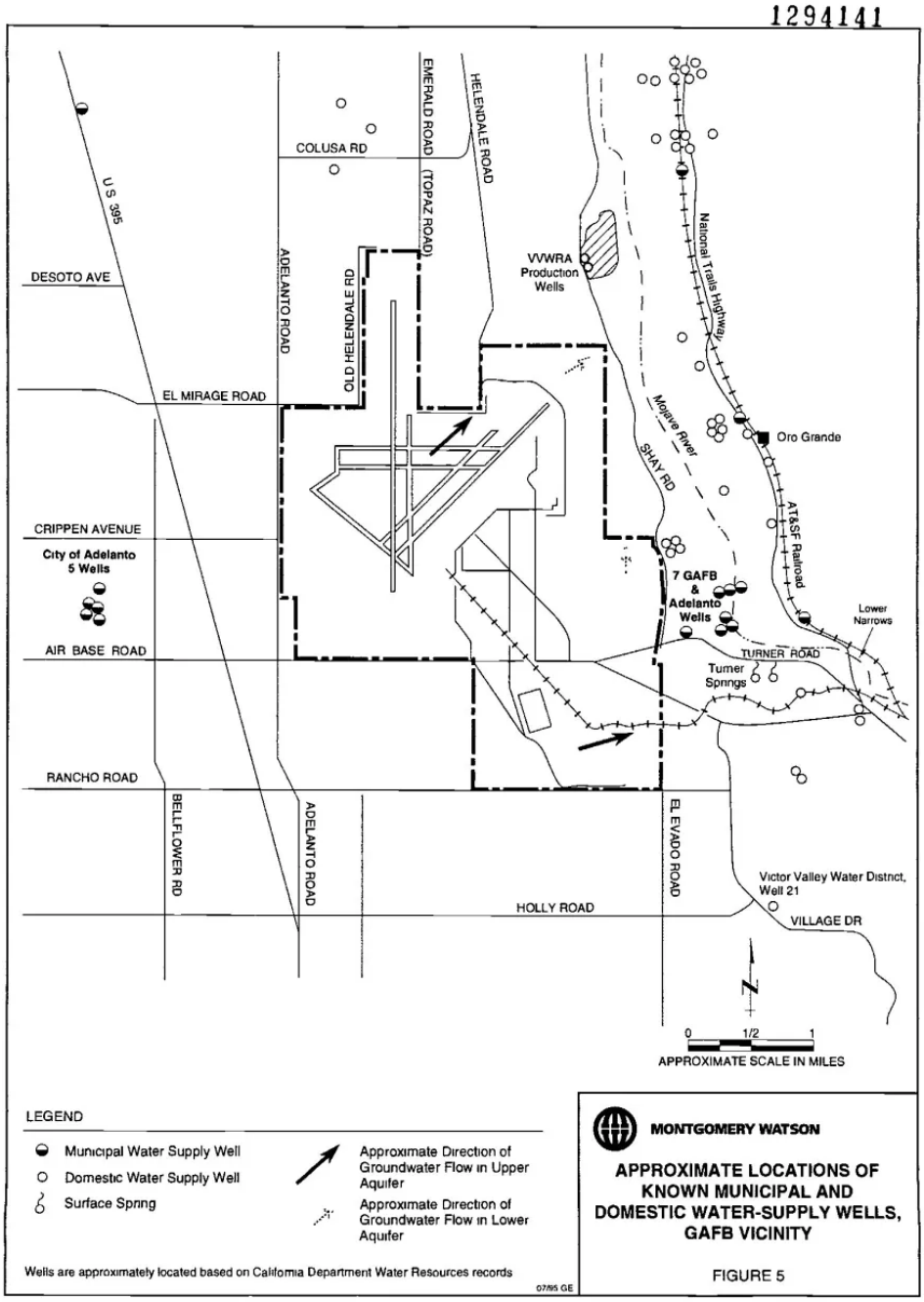

Figure 2: Locations of known municipal and private water supply wells and approximate direction of groundwater flow in upper and lower aquifer. Provided by https://www.georgeafb.info/

Health Indications of Exposure to Environmental Hazards

A second area of special concern is the high percentage of low weight births and cardiovascular disease in Adelanto. The California Office of Environmental Health Hazard Assessment

(OEHHA) releases what is called the CalEnviroScreen 4.0 Indicators Map. The map provides a more complete look at the potential environmental health injustices of an area by comparing rates of common health issues associated with exposure to environmental hazards across census tracts. In Adelanto, the number of low weight births is in nearly the 100th percentile for the northern census tract (closest to the Superfund site), and in the 93rd percentile for the southern tract (*CalEnviroScreen 4.0 Indicator Maps*, n.d.). Low birth weight is a valuable public health indicator and while it may be caused by a variety of factors, it is one health impact shown to be associated with drinking water contamination (Currie et al., 2013) – including PFAS exposure (Verner et al., 2015). Both of Adelanto's census tracts have rates of cardiovascular disease in the 99.9th percentile. Studies show an association between exposure to PFAS and increased prevalence of cardiovascular disease (De Toni et al., 2020). Though cancer rates are not available as an indicator from OEHHA, El Sol Neighborhood Educational Center asserts that they receive a high number of reports of cancer in the Adelanto area.

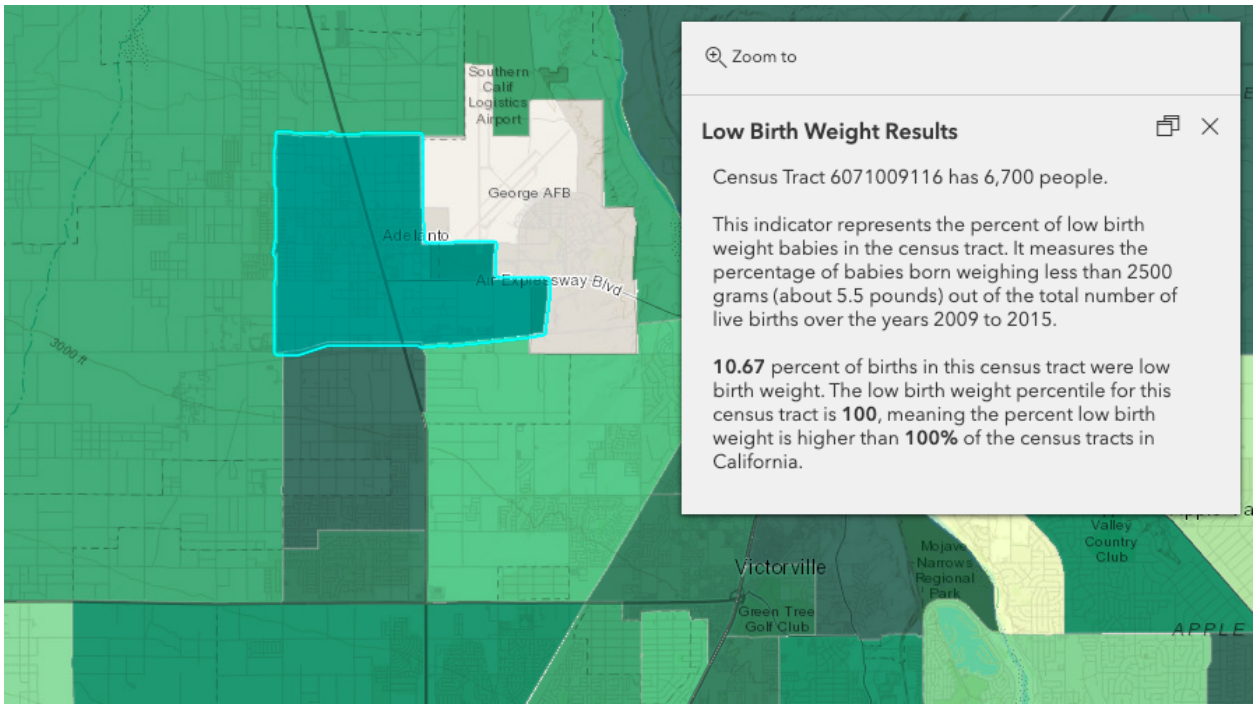

Figure 3: Image of CalEnviroScreen 4.0 Indicator Maps showing the Low Birth Weight percentile in Adelanto.

Presence of Disproportionately Impacted Communities

A final issue of special concern is the presence of Environmental Justice (EJ) communities, in which communities of color and low-income people are disproportionately impacted by environmental hazards (Bryant & Mohai, 1993). Adelanto is a minority-majority town with a high proportion of immigrants and low-income community members (*U.S. Census Bureau QuickFacts*, n.d.). Immigrant communities face environmental injustice as an intersectional issue. As a result of anti-immigration politics, the Latinx population has been racialized as a suspect group, regardless of documentation-status. These perceptions deemed immigrants and

US-born Latinx as illegitimate bodies and have led to the denial of social services in Latinx-majority areas. Additionally, trends of environmental policy failures in predominantly Black and African American areas (Henderson & Wells, 2021) indicate that the devaluation of populations on the basis of race is an issue that may affect multiple communities present in Adelanto. Thus, the racial makeup of Adelanto, in addition to low levels of income and education, is a factor that has likely contributed to harmful perceptions of residents as more disposable than majority-White areas, which pave the way for environmental injustices to go unattended.

Adelanto also houses a significant incarcerated population, which is spread across two prisons and detention facilities. Incarcerated populations are disproportionately impacted by environmental injustices. The FCI Victorville prison that is located on the George Air Force Base is a prime example of the intersection between environmental injustice and incarceration, wherein government negligence of environmental hazards can be clearly linked to serious health issues within the prison's walls. In 2021, the EPA issued a report revealing that the Adelanto Detention Center was misusing a pesticide for disinfecting the air, causing those incarcerated to experience nose bleeds and other health complications. While the US EPA was mandated by a 1994 executive order to take federal actions to address environmental justice in minority populations and low-income populations, prisons were excluded from this environmental justice mandate (Pellow, 2017). It is imperative that the incarcerated population in Adelanto's prisons are included in the fight for achieving water justice. Not only are incarcerated people at a higher risk of exposure to environmental harms, but their voices and actions are an indispensable part of a just present and a sustainable future.

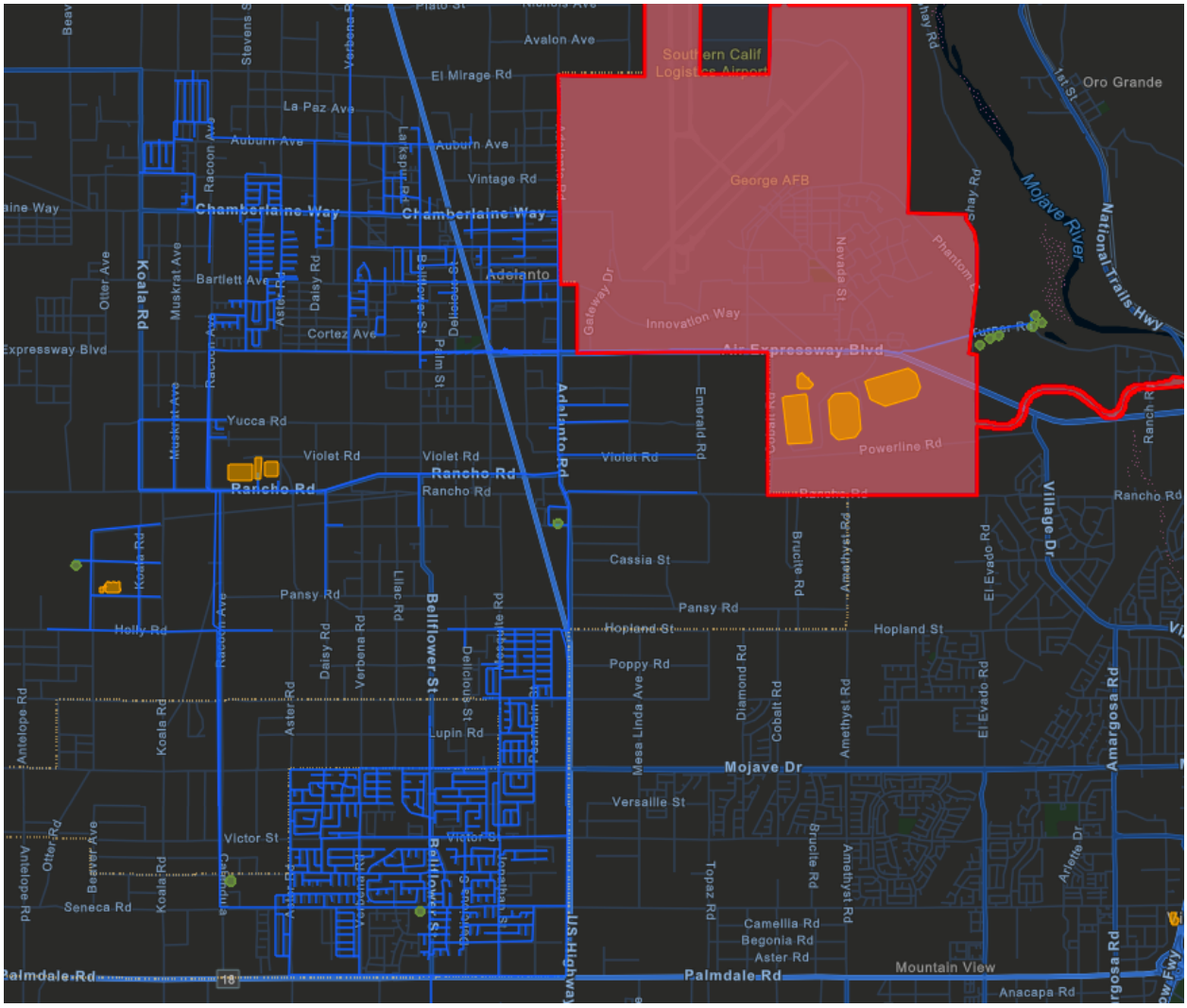

Figure 4: Visualization of the water-related environmental justice concerns in Adelanto, including the water pipe system (blue) and groundwater wells (green) mapped alongside the George Air Force Base Superfund Site (red) and the local prisons and detention centers (orange).

Climate Change and Drought

Global climate change will have local effects on Adelanto's water quality. Severe drought is likely to occur as rising temperatures mean that precipitation is reduced and water in soil evaporates at a faster rate. Drought leads to aridification, which leads to decreased water quality, in part due to the concentration of contaminants (Mosley, 2015). Students from the Global Climate Change course offered by the Keck Science Department have prepared a Climate Vulnerability Assessment for the City of Adelanto, which details the current and future risks of climate change and provides recommendations for climate resiliency adaptations to reduce harm (*Climate Vulnerability Assessment City of Adelanto*, 2022). Since the 1950's, winter temperatures have already warmed over 2.5°F, and summer temperatures have warmed just over 0.9°F (Fan & van den Dool, 2008). By the end of the century, temperatures are projected to increase 5.4 °F and 9.0 °F under a medium emissions scenario and high emissions scenario, respectively (Thomas et al., 2018).

In 2021, the City released a Water Shortage Contingency Plan. By natural cycles, the Mojave River is an inconsistent source of water, filling up only when rainfall is abundant. The overbuilding of the watershed basin to create a sustained water supply conflicts with these natural cycles, resulting in its overdraft (depletion is faster than recharge) (Stamos et al., 2001). The fear of "running out" of water is not unfounded based on projections of climate change; however, the conversation of water scarcity appears to leave little room for the conversation of water quality among city officials.

At the same time, there seems to be inefficiencies in the actual conservation of water. System water loss is the amount of water that was not consumed out of what was produced (through the drawing of groundwater). In 2020, there was a loss of 987 acre feet of water, which is about a fifth of the total water production that year. Combined with the overdraft of groundwater and intensifying drought, water losses can not be afforded. According to the UWMP, the current reasons for water loss are unclear, but the City is working to identify and reduce losses.

Adelanto was required to reduce water use by 20% by 2020 as mandated by the California Water Conservation Act (SBX7-7). The city uses what they call "Conservation Pricing," which means that water billing rates are heightened to encourage water conservation. In addition to a flat rate, meters determine what users pay in addition to the flat rate. There is minimal public education and outreach about conserving water besides signs such as "Save Water: Live Like a Desert Native" and "Make Every Last Drop Count" that scatter Adelanto. Thus, it appears that increasing water bills is the main way that the City attempts to reduce water consumption. This approach places the burden of climate change and groundwater overdraft on individuals and households, and subsequently poor water quality, rather than taking accountability for the lack of foresight in the governance of water resources.

Figure: Sign in Adelanto by the City of Adelanto and PERC Water Corporation demonstrating the narrative of water scarcity.

We urge the readers to view the “Climate Vulnerability Assessment” for the City of Adelanto, which was also produced by the W.M. Keck Science Center at the Claremont Colleges. This report stresses the importance of maintaining a quality water supply during the time of climate crisis.

Qualitative Results: Adelanto Residents Speak about their Water

Nine interviews were conducted with Adelanto residents with the aim of gaining insight directly from the people of Adelanto into their place-specific relationships with water. These interviews served an important role in the report to value the non-scientific forms of knowledge to the same, if not higher, degree as data from water quality testing and City documents. As such, this section honors *the people’s* truth about the water, regardless of test results. Interviews were conducted at people’s homes or businesses, and names were changed to protect identities of the participants.

Odd appearance, taste, smell, and feel of water

One of the main concerns about the water from the residents was that it comes out brown, yellow, or a “milky” color. It was noted more than once that water tends to be more discolored from taps where the water has not been used in a while, or water usage is low, and that the water would become clearer if left running long enough. One interviewee who recently graduated from high school, Jorge, said he sometimes spends “seven minutes just waiting there for water and then it’s still coming out brown.” He explains that this is how it is at the high school in particular, and that he would bring bottled water to school every day because the water was so bad there. Other residents said that they have only experienced brown water once or a few times while living in Adelanto. Mostly, people reported that they have heard of others with brown and yellow water, not that they themselves had consistently had this issue. It was more common for residents to say that they experienced water that looks like milk, which they associated with a chlorine/bleach smell.

Water typically becomes discolored when it contains minerals, rust, or other sediments. It tends to be a sign that pipes are corroding and that pipe materials are entering the water. Iron and manganese produce a yellow to brown color, while lead makes the water darker and may include small particles. Water that has been stagnant can build up higher levels of iron and manganese, which is likely why water from unused taps starts out discolored and then becomes clearer over time.

The City has attributed brown and yellow water to their water flushing program. By increasing the speed at which water moves through the pipes to “flush” the sediment from the system, this program aims to improve water quality (*Water Flushing Program*, n.d.). These changes in water pressure may cause brown and yellow water to come out of the tap for a period of time. Flushing is a quick-fix to corroded pipes, which will only worsen over time. Replacing the piping is more costly but prevents discolored water and other water quality issues more effectively in the long run.

Along with discoloration of the water, the majority of residents interviewed complained of the taste and smell of their water. In particular, people reported smells of chlorine or bleach in their tap water. Along these lines, Carmen says, “Before I got the filter it would come out milky. Milk, milk, milk. I wonder if there's a lot of chlorine or something. It really smells like Clorox. Like if I wash my mouth it tastes like Clorox.”

In the US, the EPA requires the chlorination of all public water supplies. Chlorate (which is derived from chlorine) is used in the water supply to disinfect bacteria, parasites, viruses and other microorganisms from the water. Generally, people begin to smell chlorine when it is above one milligram per liter of water (the EPA limit is four milligrams per liter or less). When this chemical interacts with organic matter, the smell of chlorine becomes more prominent. Thus, it is possible that the chlorine smell indicates a high levels of organic material in the water supply, or possibly that the City is adding a lot of chlorine in the water due to concerns about bacteria.

The hardness of the water in Adelanto was an issue for residents as well. Christine says, “You can feel when it's hard and sometimes when you get out of the shower you still feel dirty and I don’t think that’s right. And with my son being so sensitive skinned as well.” Christine says that her skin breaks out more when she is living in this area, and multiple other residents report feeling like the water was contributing to the dryness and sensitivity of their skin. Groundwater, which Adelanto sources its water from, tends to be harder than surface water.

Much of the concern for the water was not directly related to residents' own experiences with poor quality water, but other people’s in the area. Clearly, the residents in Adelanto are talking about the water, especially within the Spanish-speaking community. Catalina for example has begun organizing with local nonprofit El Sol because of her own experiences with the water and understanding that the issue extends beyond her house. She says that, “We hear from everyone that the water here is dirty. I noticed that a lot in my house, the tap water in the bathroom comes out pretty much like sand. It comes out white so the water is clearly dirty. It's like milk.” She explains the inconvenience of having to deal with water like this. She has a filter, but has to change it every five months, and she also spends at least 25 minutes traveling to pick up bottled water to drink. Catalina remarks, “Now everybody is noticing. We're talking to her, Leonor, and everyone that lives here is noticing that the water is yellow and has a lot of dust and they are starting to talk about it. The community's talking about it.” She goes on to say that El Sol has played an important role in connecting people who have had similar experiences with their water, which has helped people broaden their perspective to understand that it’s more of a systemic issue. Even those who have not had major issues with their own water are aware of the issue. For example, Malena says, “I've heard that the water comes out a really dirty color and smells bad. And that's what I've heard from neighbors I've talked to.” Malena buys bottled water for this reason. Almost none of the residents had heard anything about the quality of the water directly from City officials or other official sources.

Figure 5: Photograph taken of water from the Adelanto High School. Water became clearer after letting it run, demonstrated by the difference in samples moving left to right.

High price of water

Christina grew up in Victorville and, after living in other areas, recently moved back to the High Desert to raise children. When asked what her biggest issues with Adelanto are, Christina says, "Water and probably rent because as much as this is not a very popular area -- it's not like LA or Ontario -- Why should we pay their cost of living? We don't make that much down here at all." Multiple residents commented on their discontent with what they pay for water and rent, conveying a sense of frustration with the price of living in Adelanto compared to the quality of life. Reporting from the OEHHA reflects this issue – North Adelanto is in the 98th percentile for census tracts that are “housing burdened,” meaning that those who live there are both low income and severely burdened by housing costs (*CalEnviroScreen 4.0 Indicator Maps*, n.d.). The high price of water in Adelanto is related to the City’s “Conservation Pricing” approach. In addition to a flat rate, meters determine what each user will pay. Multiple residents reported paying water bills of at least $100 per month.

Joe and Malena share this feeling of unfairness when it comes to water pricing. Joe mentioned that there was one point in time when Adelanto “actually tripled the water rates." He tells a story of letting his grass die because of the high rates, and replacing it with rocks. Shortly after making this change, he received an exorbitant fine from the city for the way his lawn looked. When asked about the one thing he would like the City to change, Joe exclaims, “don’t raise the rates!" For the price of water residents are paying, their expectations for the quality of it are not being met. Malena comments "we have also had bad experiences [with the water] and conversations with neighbors of high [water bill] increases and a lot of errors, a lot of errors." Not only did Malena feel frustrated by the high price, but she shared a sense that it was unjustly taking advantage of her community.

Purchasing bottled water and filters

Multiple interviewees mentioned that they have turned to purchasing bottled water and spending money on filters instead of using the tap water. Carmen says, “We drive to buy a lot of bottles because our kids bring bottles of water to school. And our son was the one who took the water sample from the school because he was saying that at school the water is really bad. He's like, ‘I don't like the water at school. We need to take bottled water.’” Carmen has also installed filters for all the water at her house, even to water the grass in the lawn, saying that it cost around $7,000 in total to do. She expresses that her husband in particular was nervous about the water based on what they have heard about getting cancer from poor water quality.

When Miriam was asked whether she has experienced an odd taste and smell of her water, she responded, “Oh yes, and even my daughter bought a faucet from the Home Depot for bathing her kids that has a filter. My husband never uses water when brushing his teeth, he always uses bottled water. We want to buy those filters that we use to filter water but it is very expensive.” Filtering and buying bottled for all the water used seemed to be a common practice among those who could afford it.

The purchasing of bottled water highlights how socially-constructed meanings around water can highly influence actions. Bottled water is often assumed to have a good quality of water. However, this is often not the case. Microplastics and contaminants from where the water is sourced tend to be present in the water, even if it looks clear and tastes clean. Additionally, bottled water is an expensive and unsustainable way to acquire drinking water. When water is consumed in bottled form, it becomes an individualized commodity, as opposed to a public good. To understand water as a commodity, nevertheless a single-use commodity, does not empower communities and individuals to make claims on water as a public resource.

Water Pipes

Some residents related the water quality issues to the age of the pipes in the City. When Malena was asked about any reasons she had heard for the poor water quality, she responded “We've heard that it's because of the old pipes and that the piping is really old.” Carmen, along with others who were interviewed, shared this belief. “About 30 years of old pipage and they haven't changed the tubes and so I would assume that's why it's a lot dirtier than here,” Carmen says about the piping in the North side of Adelanto.

Jorge, who works in construction, mentioned that he had seen the water pipes on multiple occasions at work. He stated that the pipes looked, "..worn out, like they haven’t replaced it… like they haven't been replaced for a while. Like probably the 90s, 80s, I don't know. But it just looks old.” He said that there is often conversation among the other construction workers about how poorly taken care of the pipes are in comparison to where they have done construction work in other cities. He seemed pessimistic that the City would ever complete as large an endeavor for its residents as replacing the piping. I often encountered the mindset that the City was likely never going to fix the issue with the pipes, which echoes frustrations that the City does not invest in its infrastructure and residents.

Perceptions of Adelanto

The ways in which people understand water also shape the way they understand their identities, especially as it relates to place. This section reviews the perceptions residents have of themselves, their communities and the City and draws connections between these perceptions and the meanings attached to water.

The dryness and dustiness of Adelanto’s landscape as a water-parched land was apparent in the way that interviewees identified themselves and their communities. One of the interviewees affectionately called himself and his friends “dust rats," and that his favorite thing about Adelanto is that people have your back. Joe also describes his love for his community on his block, saying he has “the greatest neighbors on the planet." Multiple respondents also mentioned the quietness of Adelanto being one of the reasons they live there. It is Adelanto’s location in the arid desert, a place that allows a quiet way of life as it is somewhat barren and removed from the big cities, that draws people here. At the same time, Adelanto is perceived as a lower-income town that is not particularly safe or well kept. Jennifer’s comments demonstrate

the conflict this creates in her feelings about living there: “I really liked the area. And I like living here. But we also don't like it. Because they throw a lot of trash and there is not a lot of light in the streets – not a lot of public light.” Multiple residents connected these perceptions to the issues of water in the City.
Anita, for example, moved to Adelanto with her young family three years ago for financial reasons, and hopes to move once they can afford it. She doesn’t feel particularly connected to the community here, saying that her husband and her don’t interact much with their neighbors and that she’s been displeased with how the elementary school community has not done enough to address bullying. Anita also mentions a high level of crime in the area, reporting that someone once destroyed her gate while she was gone.

Anita says that she buys bottled water to drink, but will shower in the tap water. When asked why, she states, “the area that I live in, it's not like a higher class neighborhood. You know, it's kind of like poverty. So that's why I feel like the water is not as good." Anita’s sentiments about her water reflect an association between the poverty of an area and poor water quality. Further on, she connects the potential for water issues in Adelanto to what she knows about Hinkley, CA, and other places nearby: “I used to live in Barstow for like a year or two. And I know they had water issues, and also heard like the Hinkley out there and really had really bad water. You know, I just pretty much figured that Adelanto's kind of similar to them most likely." These comments show a general perception of the water in the Inland region as untrustworthy. To add to this, Anita hasn’t received much information about the quality of her water from anyone, saying she feels like it seems like “a big secret." Anita’s frustration with the lack of information about the water coincides with her sense of the general lack of attention by the City that is given to the quality of life of residents.

Interviewees tended to show more concern over the water in the North side of Adelanto, which is seen more for its poverty and poor infrastructure than the South side. When Arianna was asked about whether she suspects that the water has impacted her health, she responded, “Up until now no, thank God, but we have heard of people in North Adelanto that have had health problems. And so that's why we're nervous. Because we're very close to them.” Carmen echoed these concerns about the North side, attributing their water issues to the old infrastructure. This perception was consistent among some of the respondents in the North, who shared the frustration that the City did not care or pay much attention to the water, and similarly, to its residents. There may be truth to this narrative of the North side, however, it is a narrative that should be approached with caution. Water seen as “dirty” or “contaminated” can reinforce negative associations people have with themselves and their own communities, or serve as language for those on the South side to “other” those on the North side.

Qualitative Summary

Across interviews, it is apparent that water was the primary issue they would like to see addressed by the City of Adelanto. Interview respondents generally said that they have not heard much from City officials about the water, or that they don’t trust what is being said. As a

result, most residents did not know what contaminants may be in their drinking water. Residents who filter or buy bottled water either made that choice based on personal experience with odd taste/smell/appearance, norms in their community, or assumptions of poor water quality based on general perceptions of the region. A sense of frustration with not being satisfied with the water coming from the taps, paired with the high price of the water or inconvenience of filtering or buying bottled water, and lack of transparency about the water from City officials, was shared among many residents. Interview respondents, both from and not from lower-class neighborhoods, connected issues of water quality with the poverty in Adelanto and the poor infrastructure in areas with more poverty.

Ultimately, water in Adelanto has been constructed in the public eye as undrinkable. Tap water is undesired and not to be trusted. Water, which should be a resource that replenishes and revitalizes life, is instead seen as harmful. Regardless of the results of water testing, there are inequalities produced in the distribution of drinkable water due to the costs of filtering and buying bottled water. Until the residents are able to confidently drink out of the tap when they've spent the day in the dry heat, or to shower off the layer of desert dust from their skin and feel truly clean, there is no water justice.

Having access to water they can trust is more than just a demand about water in Adelanto. Arianna sums up this vision for a future Adelanto:

> I would like Adelanto to be clean. I advocate for a clean Adelanto with healthy water. A good school for the kids so that they can get to university college. We want more parks. We want bicycles. So we can ride our bikes and walk around the city; make it walkable. We want to care for our elders. Because right now we don't have anything for them.

Having good water quality is about a good quality of life and the City following through on its responsibilities for creating a healthy and safe place.

Quantitative Data: Comparison of Sources on Water Quality

There are multiple sources of information available on Adelanto's water quality. This section will compare the most relevant water quality information provided by the Adelanto Consumer Confidence Report, the Environmental Working Group, the California Office of Environmental Health Hazard Assessment, the George Air Force Base website, and the results from recent testing completed by the Claremont Colleges Keck Science Department. Each of these sources tests for a different set of contaminants and/or presents the data in varying ways that influence what contaminants are highlighted. Two points should be considered while viewing the following information:

1) No level of a contaminant is "safe" to drink. There are only levels of contamination deemed acceptable.
2) You can only find what you test for.

Consumer Confidence Report

A Consumer Confidence Report (CCR) is required by the EPA, under the Safe Drinking Water Act, to ensure that drinking water meets quality standards. The CCR is produced by the PERC Water Corporation, the water company that is contracted with the City of Adelanto. This report is useful for providing basic information on levels of contaminants regulated by the EPA and includes some educational components, such as definitions of terms and general information on Adelanto's water system. The report is not useful for understanding Adelanto's water quality relative to other cities.

The CCR for Adelanto highlights the presence of arsenic in the water supply, mainly affecting the usability of the wells. While the contaminant is naturally occurring, it is still a serious contaminant that may cause cancer, skin damage and circulatory problems. The report also states that filtration treatment is to be used for at least four of the wells that contain high levels of iron and manganese (*City of Adelanto 2020 Consumer Confidence Report*, 2020).

PFAS Testing

PERC Water Corporation performs quarterly sampling for PFAS, which is then tested by a subcontractor. The most recent results available at the time of this report were completed for samples taken on April 13th, 2022. Five wells that are assumed to be active were sampled, identified as wells 1G, 4G, 3G2, 8G2, and 14A. The testing included the four forms of PFAS that the EPA has set health advisories for (PFOA, PFOS, GenX and PFBS), as well as other forms of PFAS. Results reveal that PFOA was found in 3 wells at 1.8, 2.3, and 2.4 ppt. PFOS was found in 3 wells at 4.5, 4.5 (again), and 4.2 ppt. Wells 4G and 14A shared both PFOS and PFOA contamination. These numbers exceed the EPA health advisories set at 0.004 ppt for PFOA and 0.02 ppt for PFOS. GenX and PFBS also appear, but at levels lower than the EPA health advisories. The results from these wells are included as an appendix to this report.

Environmental Working Group (EWG)

The EWG, a nonprofit specializing in research and advocacy, has created their own health guidelines on what should be considered safe levels of contaminants in drinking water. The EWG points out that legal limits for contaminants have not been updated for 20 years, and that legal does *not* equal safe. The EWG uses data from the public water utility, provided by the California State Water Board. The health guidelines they set for each contaminant are determined in peer-reviewed studies by EWG and represent a one-in-one-million lifetime cancer risk level. A useful aspect of this source are the easy-to-understand descriptions of each contaminant that is present.

According to this database, total trihalomethanes (TTHMs)† are present in Adelanto's water at 189x the EWG's health guidelines. Trihalomethanes are contaminants that result from water treatment with chlorine and other disinfectants, and are known to cause cancer. Arsenic is present at 130x and dibromoacetic acid is at 121x EWG's health guidelines (EWG, 2019).

Dibromoacetic acid is another contaminant formed when chlorine or other disinfectants are used to treat drinking water, and increases the risk of cancer and pregnancy-related health issues. Additionally, the water was apparently tested for perfluorohexane sulfonate (PFHXS) in 2019, measuring in at 47 ppt (EWG, 2019). Per- and polyfluorinated chemicals will be expanded upon in the section on testing by the George Air Force Base.

California Office of Environmental Health Hazard Assessment (OEHHA) CalEnviroScreen 4.0

The OEHHA has created an online mapping tool for visitors to easily compare environmental health data between cities. This source is most useful for placing Adelanto's water issues in a broader context because the data is presented as a percentile. It is less useful for understanding what the specific contaminant levels are and the reasons why a contaminant is present.

According to the CalEnviroScreen 4.0 report, Adelanto's water scores above the 95th percentile for two contaminant categories: 1) Gross Alpha and 2) Maximum Contaminant Level (MCL) Violations and Lead and Copper Rule and Lead Action Level Exceedances. Additionally Adelanto is in the 66th percentile for Hexavalent Chromium (*CalEnviroScreen 4.0 Indicator Maps*, n.d.). While all three contaminant categories pose negative health impacts, lead contamination in particular is associated with cases of environmental racism, as it continues to affect low-income communities and communities of color at disproportionate levels as a result of state disinvestment (*EPA's Lead and Copper Rule*, 2021). Overall, the drinking water contaminant percentile for Adelanto is 49, meaning it contains more contaminants than 49% of census tracts in California. This number is not particularly striking, however, the census tract to the East of Adelanto (where the George Air Force Base is located) scores in the 95th percentile for the Groundwater Threats indicator (*CalEnviroScreen 4.0 Indicator Maps*, n.d.).

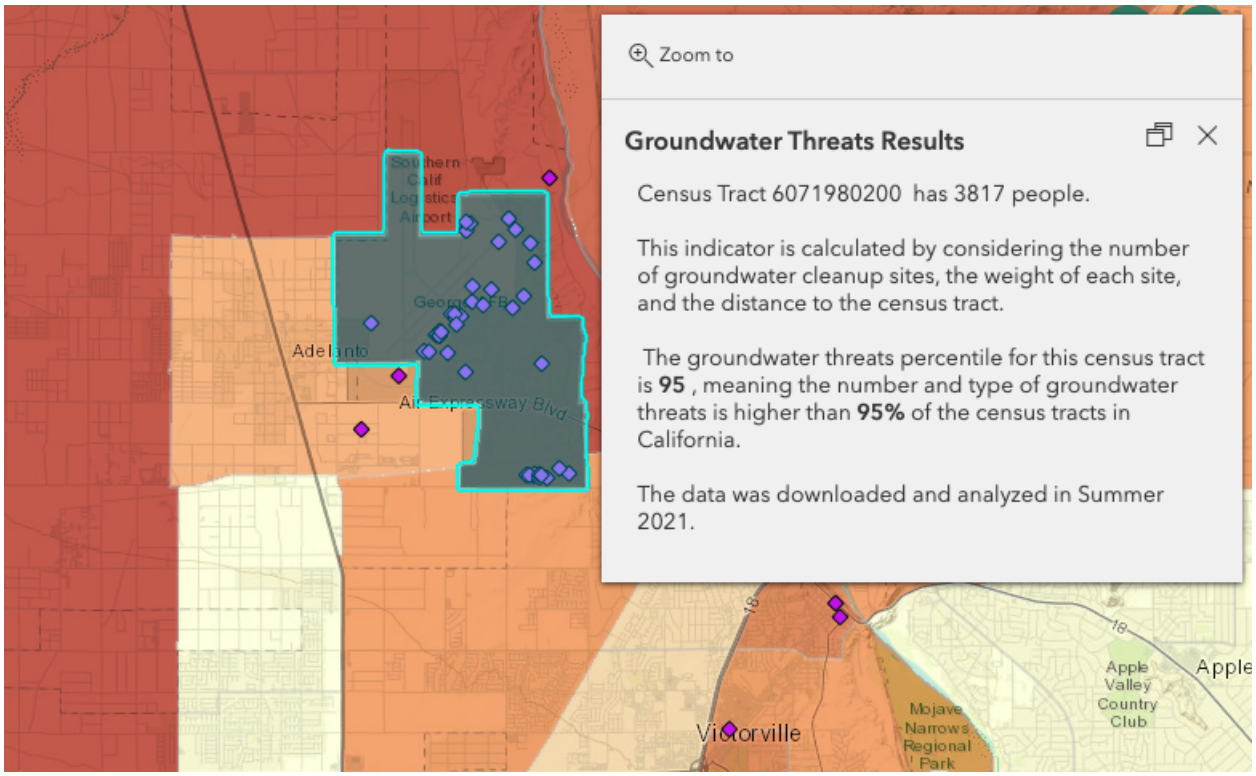

Figure 6: Image of CalEnviroScreen 4.0 Indicator Maps, showing the Groundwater Threats percentile for the census tract East of Adelanto.

Keck Science Department

The Keck Science Department at the Claremont Colleges completed independent water quality testing analysis in collaboration with this project during the Spring of 2022. In the Advanced Laboratory in Chemistry course, taught by Katie Purvis Roberts, students majoring in Chemistry and Biochemistry analyzed 20 water samples collected from homes in Adelanto. Additionally, 6 samples used as preliminary testing were tested by A & R Laboratories, and were included in the analysis. Testing was specifically done to find elements in the water, finding that calcium, magnesium, potassium, and sodium had the highest concentration. In particular, the presence of calcium and magnesium indicate that the water is hard. Importantly, the analysis compares these results to those detailed in the Adelanto CCR, and demonstrates that the CCR consistently reported lower concentrations of these elements than found by the Keck Science Department (Appendix 1).

The Integrated Biology and Chemistry class, taught by Jason Tor, tested 12 water samples. The students measured water hardness, alkalinity, chlorine, chromium (VI), and the occurrence of microorganisms. Total alkalinity and total hardness were both measured at levels higher than reported by the Adelanto CCR. The ranges reported by the CCR would classify Adelanto's water as *soft*, which seems to contradict the results from both Keck Science classes and the experiences of residents. Some people using hard water notice they have drier skin or eczema. The students found that 4 of the 12 samples had significant levels of heterotrophic bacteria,

which Adelanto is not required to test for and report. While most microbes in this category are benign (safe), some of the species revealed by the results may be pathogenic. UV light and chlorine were found to be effective in killing the bacteria in the samples (Appendix 2).

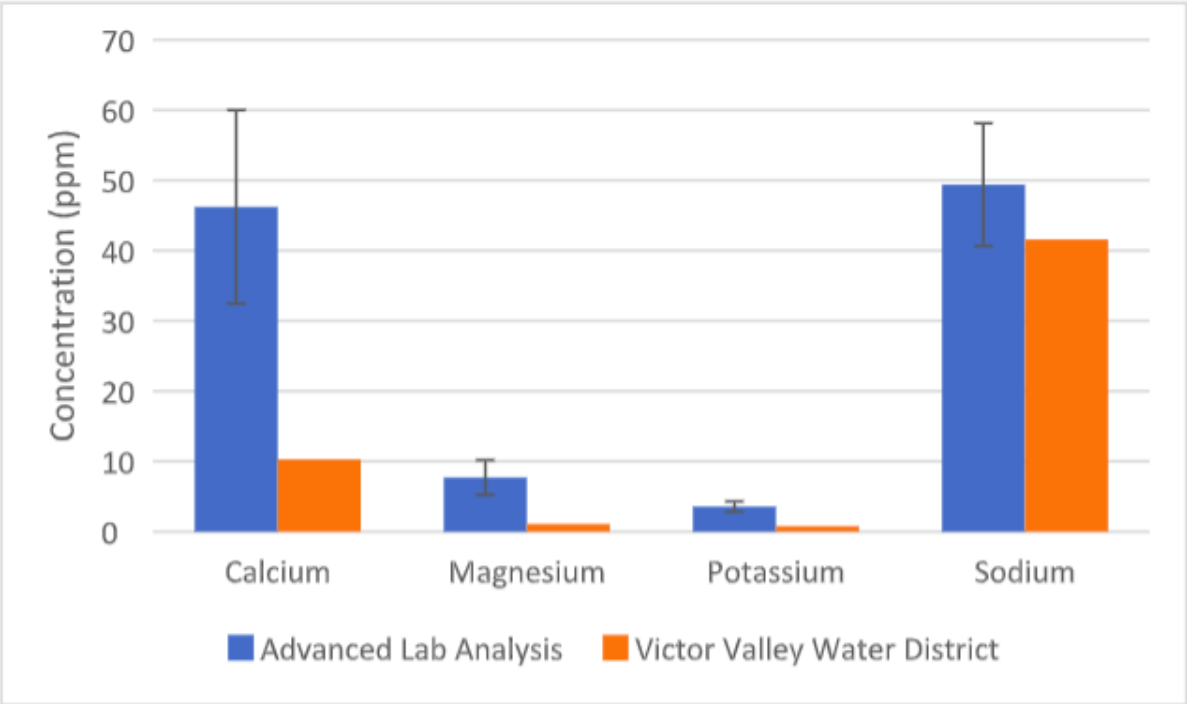

Figure 7: Concentrations of elements found in water samples (n=26) from the City of Adelanto with ICP-OES in comparison to concentrations reported in the City of Adelanto 2020 Consumer Confidence Report.

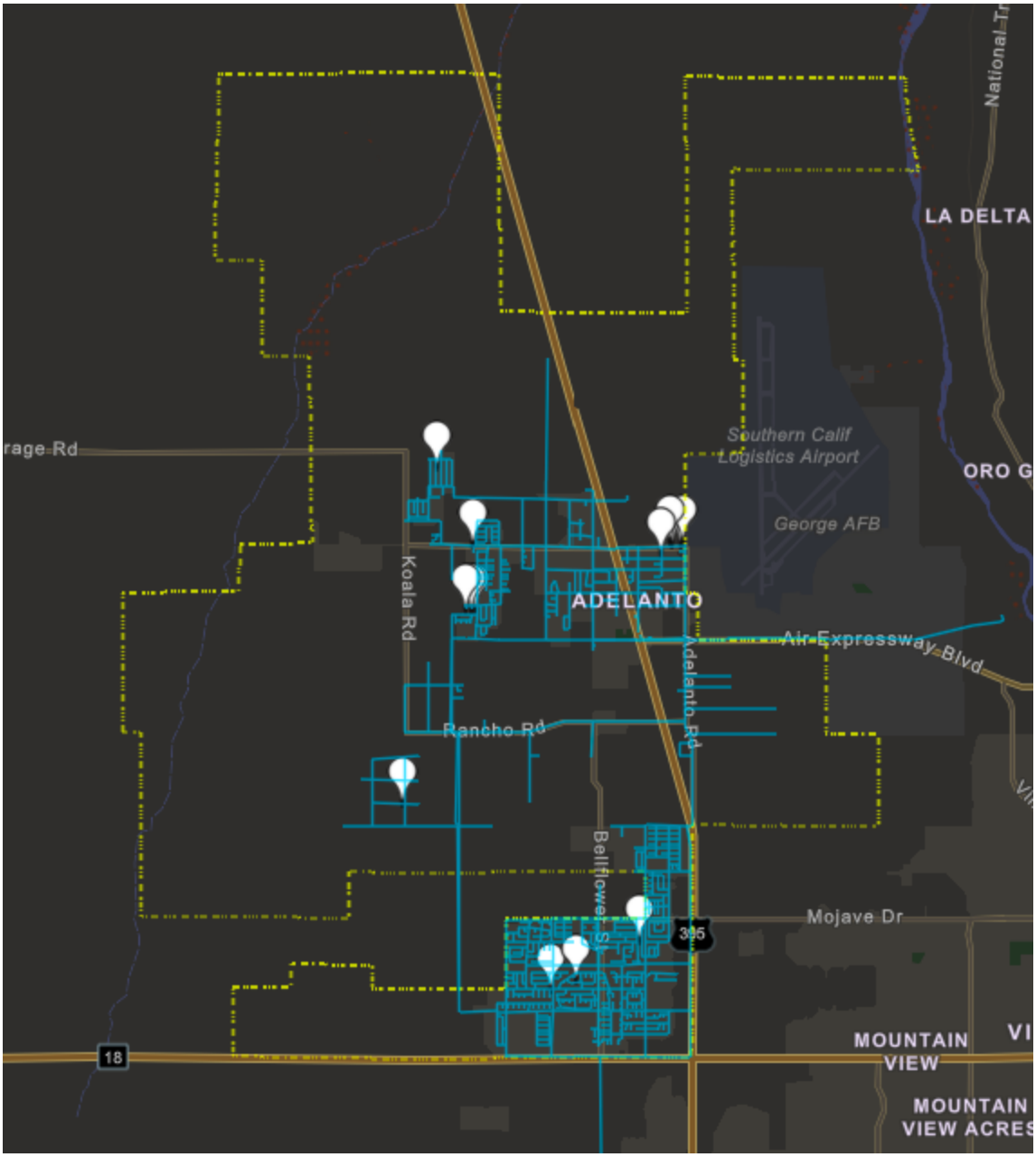

Figure 8: Locations of samples collected and provided to Keck Science Department for testing, layered with the water pipe system for the City of Adelanto.

Quantitative Summary

Even after reviewing water quality data from PERC, the OEHHA, the EWG, and recent testing from the Keck Science Department, it remains unclear what exactly is in Adelanto's water. There is misalignment between which issues are highlighted by each informational source – from the potential contamination of PFAS from the George Air Force Base, to the dangerous levels of Trihalomethanes pointed to by the EWG, to the relatively high lead and gross alpha

concentrations from OEHHA reporting, and the concerning levels of arsenic from the City's own testing. Furthermore, findings from the Keck Science Department that highlight the discrepancy between the low levels of certain contaminants reported by the CCR and the high levels found by recent testing is especially concerning. Despite all of the available information, Adelanto's residents are still left without a clear picture of what contaminants are in their water and why it looks and tastes the way it does.

Findings and Conclusions

Through the review and analysis of water quality information and testimonies from residents, this report finds that the water system in Adelanto produces injustices in the distribution of safe and drinkable water. The managerial approach to water supply and quality values technical knowledge over local experience-based knowledge. Across the board, residents are unhappy with the quality of their water, yet the City continues to insist that it is safe to drink. Residents deserve to know with certainty what contaminants (even if at low levels) are in their water, and why their water looks, smells and tastes the way it does (even if it is still considered safe by EPA regulations). Sentiments shared across interviewees about the lack of clarity and transparency regarding the quality of Adelanto's water is echoed by the variation apparent in the available information on what contaminants are present and are of most concern.

In addition, the water-related risks associated with climate change are projected to intensify drastically if widespread measures are not taken. It is important that focus on conserving the water supply does not take away from ensuring the water is drinkable in the first place, nor should it shift the main responsibility of water shortage onto individuals. The EPA supports research findings that disproportionate harm from climate impacts falls on underserved communities – particularly, African American and Latinx communities (US EPA, 2021). Due to the interconnectedness of water quality and climate impacts on water supply, it is imperative to consider the equitability of approaches to conservation.

First-hand narratives from community members and leaders support that the people of Adelanto envision a water system that delivers reliably safe and drinkable water, and that is managed with values of transparency and accountability. This vision is an integral part of achieving a high quality of life for everyone in Adelanto, regardless of income, race or citizenship status. Knowledge shared between Adelanto's Water and Sewer service and the public must be a two-way street. On one hand, the inclusion of local knowledge in decision making provides important and relevant details on the actual lived experience with the water. On the other hand, residents would like to know (and trust) consistently garnered information from the City on the status of the water quality.

It is imperative that those who plan to be in Adelanto in the long-run are empowered and have the tools to continue this project. The following section provides a list of recommendations for both the City of Adelanto and the community organizations and leaders to take the next steps

towards achieving water justice. These goals will be achieved when water becomes *drinkable* in Adelanto.

Recommendations

1. Utilize a Justice-Oriented Approach to Water Management

Purpose: Leverage multiple forms of knowledge and disciplines to improve the water system. Build trust with residents. Establish lines of open communication. Improve information transparency and accessibility. Increase public participation in decision making.

Specifics:

A. By October 15, 2022, establish a Community Water Board that consists of community-serving nonprofits, residents, city personnel, businesses, academics, and engineers; this board should share reporting and regulatory authority with the city water officials. Ensure that water-based decisions are made in a democratic, community-based, and inclusive manner
    a. Community-serving nonprofits should lead efforts to empower residents to participate in water management and recruit for the Board. Refer to Recommendation 9.D. for further guidance.
    b. Work with engineers who understand community-based methods and can communicate to and collaborate with the lay public to remediate PFAS and other toxins in the water.
    c. Hold quarterly town hall meetings on water with the Community Water Board and residents to share information and hear concerns directly.

B. By October 2023 (or as soon as feasible), establish a presence for Adelanto on the local water advisory committee. The city is part of the Mojave Water Agency, which has a Board of Directors. Adelanto is part of the Alto Subarea, which has an Advisory Committee. No one from Adelanto is on the committee (AV, Helendale, Hesperia, Victorvill and Mojave Resource Management LLC). We highly recommend that Adelanto pursue membership on the Alto Subarea Advisory Committee.

C. By December 1, 2022, increase the dissemination of educational and informative resources on all water systems and quality in English and Spanish
    a. Information must be dispersed alongside educational materials. Residents need to *understand* the reasons why their water is discolored or has an odd taste or smell, even if contaminants are below EPA thresholds. Instructions about what to do if residents think their water is contaminated must be included in these materials.
    b. Given the high proportion of Spanish-speaking residents, it is paramount for any information to be released in English and Spanish.
    c. As required in the Safe Drinking Water Act, water quality information and educational materials must be sent with the water bills and efforts must be made to provide information to residents who do not receive water bills. For water

quality issues that are below EPA thresholds, information and educational materials should be sent in the same manner as the annual Consumer Confidence Report.

d. All water test results should be easily searchable and accessible through the City's online database, not just the results for the contaminants listed on the Consumer Confidence Report.

2. Subsidize water filters

Purpose: Take actions available now to improve the quality of water and of life of residents. Equitably distribute drinkable water, which is both safe and trusted.

Specifics:

A. By September 1, 2023, provide water filtration in-home to remediate odd taste, smell, appearance, as well as contaminants not detectable by these senses.
   a. Supply appropriate filter technologies that remove 98% of the contaminants of highest concern in Adelanto (arsenic, hexavalent chromium, bromodichloromethane, total trihalomethanes, PFAS, etc.) prioritizing low-income households. A **Granular Activated Carbon (GAC) system** will reduce PFAS contaminants and remediate most issues that affect appearance, smell and taste, such as chlorine byproducts which are related to complaints of an intense "bleach-like" smell and taste.
   b. Clear instructions and programming need to accompany how to instal such systems and when filters need to be changed.
   c. Subsidize whole-house systems and/or showerhead filters. These filters improve skin and hair related impacts of poor water quality (i.e. eczema, dermatitis, dryness, etc.)
   d. Supply bilingual educational material to describe the reasons for the filters and information on system installation and replacement of the cartridges.
   e. Advocate for funding to be supplied through the state or federal government. Work with Assemblymember Thurston "Smitty" Smith, who is a part of the Committee on Environmental Safety and Toxic Materials, to inquire about support for state funding.
   f. We do not recommend Reverse Osmosis systems, as they do not last long and they deplete the water of beneficial components.

3. Implement equitable and just water conservation measures

Purpose: Equitably distribute the burdens of water shortage and related impacts of climate change. Consider the association between water quality and water supply; one issue should not eclipse the other. Justly meet reduction requirements by California's Water Conservation Act (SBX7-7).

Specifics:

A. By July 1, 2023, work with the Community Water Board to set a fair price for water that is scaled based on income-level. Boost programs that offer support to low-income households for paying water bills, such as the Low Income Household Water Assistance Program.
B. By 2025, Reduce system water losses. Aim to use 100% of water produced by identifying and remediating the causes of water loss.
C. By November 1, 2022, increase monitoring of large water users. Financial burdens of water shortage should be proportionate to the amount of water used and company size. Large, non-local corporations that use more water should take the most financial responsibility for these costs. Ensure that monitoring water usage is included in the $12,000 increase in oversight of the cannabis industry.
D. By February 1, 2023, Implement land changes to promote groundwater recharge and storage.
    a. Transform impermeable surfaces to permeable surfaces that allow water to percolate through the surface back into the ground.
    b. Implement water-wise landscaping. In particular, native plants play an important role in the water cycle by helping to filter stormwater runoff and recharge groundwater.
E. By November 1, 2023, promote non-penalizing water conservation methods among individuals and households.
    a. Increase education for the public on water conservation and climate-adaptive practices.
    b. Subsidize low-flush toilets, low-flow faucet aerators, and low-flow showerheads for older residencies in addition to new ones.
    c. Partner with nurseries in the High Desert to sponsor native plant give-aways and increase the spread of educational materials on water-wise landscaping for households.
F. Continue to enforce Water Conservation Emergency Regulations set by the State Water Board, such as the ban on watering ornamental turf on public medians and filling decorative fountains.

4. Develop a community-based water monitoring system

Purpose: Hold local knowledge to the same level of importance as expert knowledge. Generate participation in monitoring the water system. Learn about issues with the water system sooner.

Specifics:

A. By November 1, 2022, develop a bilingual system of self-reporting for community members to document their water concerns for both public and official reference
    a. Community organizations should lead the development of this monitoring system, but access to it should be supported by the City's website, and the system should work in harmony with the pre-existing water monitoring system.

b. Case studies on community-based research and water quality monitoring indicate that there are positive impacts of increased community participation in decision-making related to water (García & Brown, 2009; Wilson et al., 2018).
c. Community-Based Monitoring (CBM) is a way to improve the accountability and quality of social services through public oversight. CBM is driven by local information needs and community values. Additionally, involving community members in testing procedures will likely increase trust in water quality test results.
d. One method of CBM is through the development of a self-reporting system, in which community members would be able to post their water quality concerns directly to a central database. Compiling this information through GIS mapping may be a way to identify patterns of water quality issues locationally. As an example, Erin Brockovich has spearheaded a national self-reporting project using mapping that can be viewed at *https://www.communityhealthbook.com*.
e. Another model of CBM can integrate educational goals by involving the local high school. High school labs may have the correct equipment to conduct water quality testing. A curriculum that integrates testing of local water would not only provide hard data for monitoring purposes, but could also improve STEM training for high school students. The sampling procedure for water quality testing may even benefit from this type of project, as students may be able to cover a larger sample area by collecting samples from their homes. Additionally, testing at the high school would shorten the time frame between when the sample is taken and when it is tested, providing more accurate results.

B. By January 1, 2023, the City should integrate access to this self-reporting system through their website.

5. Expand water testing practices and tighten quality standards

Purpose: Ensure that Adelanto has good water quality in the future. Protect the health of residents. Make water testing accessible to residents.

Specifics:

A. Hold polluters responsible for their impacts on water now. Enforcement of environmental regulations on Adelanto's industries should be paramount, especially as drought concentrates any pollutants in the water supply.
B. By May 1, 2023, aim for near-zero levels of contaminants, as opposed to levels within limits, and expand upon the number of contaminants to include emerging contaminants of concern (which are not necessarily regulated).
    a. This report indicates the possible presence of PFAS and microbial contaminants in the water supply. While these contaminants are unregulated, they do pose negative health effects and guidelines for acceptable local limits should be reconsidered.
C. By November 1, 2023, supply residents with home water sampling kits – including, but not limited to, tests for heavy metals, microbial contaminants, disinfection byproducts

and PFAS. Doing so will improve the reliability of the water system and ensure any contaminants are addressed in a timely manner.

6. Remediate PFAS and other pollutants from groundwater.

Purpose: Protect water resources from existing groundwater threats.

Specifics:

A. By December 1, 2022, work with the Community Water Board (or engineers, consultants, community members, businesses and academics) to identify potential threats to the water supply and come up with an inclusive, community-oriented remediation plan for groundwater and well contamination.
B. By October 1, 2022, we ask that the City commit to actively pursue applying to funding to address Per- and Polyfluorinated Chemicals (PFAS) contamination
    a. PFAS are a risk to Adelanto residents due to the proximity of Adelanto's water supply to the George Air Force Base Superfund site, the levels of PFAS found in Adelanto's wells that are above the EPA health advisories, and the high-level health indicators associated with PFAS contamination.
    b. State and Federal funding opportunities exist, such as the Emerging Contaminants (EC) in Small or Disadvantaged Communities Grant (SDC) that provides the funding to address PFAS through California's State Water Control Board. Funding is available on an annual basis and LOIs should be sent in June. This and other funding sources should be explored for suitability for the City of Adelanto.

7. Replace old water infrastructure with sustainable options

Purpose: Invest in the community and quality of life. Safeguard public health. Improve climate-resiliency for current and future generations by paving the way for sustainability. Reduce water loss.

Specifics:

A. By December 1, 2022, evaluate the actual condition of water infrastructure in every neighborhood so that investments are made where they are most needed first.
B. By December 1, 2023, replace old piping and well infrastructure to ensure that water supplied to residents is reliably safe and drinkable. Doing so will ensure that water users are not exposed to material flaking into the water supply from corroding pipes, such as lead, copper, iron and manganese. New piping will decrease the need for flushing from hydrants, which is likely the cause of resident's complaints regarding water discoloration.
C. By December 1, 2023, adopt sustainable water infrastructure.
    a. Use cost, energy and water-efficient practices and technologies that focus on water reuse, resource recovery, and green infrastructure

b. Refer to the EPA's report, "Moving Toward Sustainability: Sustainable and Effective Practices for Creating Your Water Utility Roadmap" for guidance on these methods.

8. Build public health partnerships centered around certain health issues

Purpose: Address the health impacts indicative of exposure to environmental hazards. Expand organizations' reach in supporting the health of residents. Understand access to trusted, safe and clean water as a social determinant of health. Leverage and maximize resources. Improve quality of life.

Specifics:

A. By October 1, 2022, reach out to local hospitals to see if they are interested in partnering with the City to address the shared goal of improving public health and have resources that may be shared.
    a. Build upon linkages with local hospitals to spark dialogue about the high-level health indications for exposure to water contaminants, such as low birth weight, cardiovascular disease, cancer, and obesity. The partnership should agree to focus on specific health issues that are well defined. Local hospitals often have funding and reach to address these health impacts related to exposure to environmental hazards as part of their natural directives.
    b. Data should be shared between the community and public health partners as part of the dialogue for a successful partnership.
    c. The partnership should strive to harmonize activities, share resources and enhance the other partner's capacity.
B. By December 1, 2022, begin/support public health campaigns to spread resources for and awareness about disproportionately high rates of specified health issues.
    a. Leaders from the community who are already committed to public health and have influence among residents should help sponsor initiatives.
    b. Campaigns should direct residents who may be experiencing these health issues to relevant resources that are supported by local hospitals and public health organizations.
    c. Messaging should be in alignment between partners to maximize communications.
C. We highly suggest partnering with these and other organizations specializing in public health/water connections to model/revitalize our work:
    a. Loma Linda University Medical Center: https://lluh.org/?utm_source=google-local&utm_medium=organic
    b. Healthy Adelanto: https://www.facebook.com/groups/402057617811864/
    c. El Sol Neighborhood Educational Center: https://www.elsolnec.org/
    d. Unidos por Adelanto Mejor
    e. Community Health Action Network - High Desert: https://chanhd.com/
    f. https://hasc.org/

9. Encourage civic engagement

Purpose: Increase community participation in the regulatory process. Recruit for the Community Water Board.

Specifics:

A. Community-serving organizations should continue mobilizing for the city council meeting public comment segment.
    a. It is the job of the council member to listen and act on their constituents' needs and demands. This is accomplished mainly through the public comment section of a city council meeting, which is a part of the regulatory process during which the community's voice on matters affecting them is sought. Greater participation in public comment improves the efficiency and transparency of projects, policies and laws put in place by the City, which includes those that deal with the water system.
    b. Holding frequent public comment training will help community members feel prepared and empowered to speak up for their concerns. Public comment can unfortunately be an intimidating experience, especially for undocumented and non-English-speaking people. Holding context-specific training will help people feel validated in their concerns and informed about how to present information to make demands. Receiving community support before and during public comment can increase participation.
    c. Sponsoring rides to city hall will remove the barrier of transportation to improve the accessibility of participating.

B. By November 1, 2022, provide workshops on letter writing and making phone calls to elected officials. Letter writing may also serve to uplift the voices of community members and empower them with group support.

C. By October 1, 2022, include opportunities, events and deadlines for civic engagement in a community calendar

D. By October 1, 2022, spread awareness about the Community Water Board
    a. Utilize the pre-existing partnerships with community-serving organizations to build a base for the Board. Between two active partners working on this project, Unidos Por Un Adelanto Mejor has around 20 members and Inland Coalition for Immigrant Justice has around 17 contacts who may be interested in the Community Water Board.
    b. Phone and text banking to connect with new residents.
    c. Prepare posts to circulate on social media and distribute flyers to residencies and community spaces

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Appendix 1: Resources

National database for self-reporting water concerns:
https://www.communityhealthbook.com

Resources on Water Quality
CalEnviroScreen 4.0 Indicator map
https://experience.arcgis.com/experience/ed5953d89038431dbf4f22ab9abfe40d/
Water quality information from the Environmental Working Group (EWG):
https://www.ewg.org/tapwater/system.php?pws=CA3610001
PFAS contamination map:
https://www.ewg.org/interactive-maps/pfas_contamination/map/
California maps on groundwater quality from the State Water Board GAMA Program and the U.S. Geological Survey:
https://www.waterboards.ca.gov/water_issues/programs/gama/online_tools.html

Paying Off Water Bills
Low Income Household Water Assistance Program
https://www.csd.ca.gov/Pages/WaterBill.aspx

Climate change projection for Adelanto:
https://cal-adapt.org/tools/local-climate-change-snapshot

George Air Force Base Information:
https://www.georgeafb.info/
Military Bases with PFAS Contamination:
https://www.ewg.org/interactive-maps/2020-military-pfas-sites/map/

City of Adelanto Resources:
Water and Sewer service
https://www.ci.adelanto.ca.us/214/Water-Sewer
Urban Water Management Plan
https://www.ci.adelanto.ca.us/DocumentCenter/View/1781/Adelanto-2020-UWMP
Water Shortage Contingency Plan
https://www.ci.adelanto.ca.us/DocumentCenter/View/1782/City-of-Adelanto-2021-WSCP

Water Filter Guide:
https://www.ewg.org/tapwater/water-filter-guide.php#findfilter

Questions to ask elected officials about water:
https://www.ewg.org/tapwater/contact-local-government.php

Appendix 2: CHEM 127L Analysis

Adelanto Water Samples Analyzed by Advanced Laboratory in Chemistry (CHEM127L) at the W.M. Keck Science Department of Claremont McKenna, Pitzer, and Scripps Colleges

The Chemistry and Biochemistry majors in the Advanced Laboratory in Chemistry course analyzed 20 water samples taken at various homes in the city of Adelanto, California. Students analyzed the concentration of different elements in the tap water with Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES). In order to calculate actual concentrations of the elements present in the water samples, students made standard solutions of 1, 50, and 100 parts per million (ppm) of the target elements, which is also equal to a milligram per L in water (mg/L). The standard solutions included the following elements: aluminum, barium, bismuth, boron, calcium, cadmium, chromium, cobalt, copper, gallium, indium, iron, lead, lithium, magnesium, manganese, nickel, potassium, silver, sodium, strontium, thallium, and zinc.

An additional 6 water samples were analyzed by ICP-OES in December 2021 by A&R Laboratories, Inc. The same target metals were included in the analysis, with the added analysis of mercury. No mercury was identified in these samples, so it was not included for analysis for the Advanced Laboratory students.

All 26 water samples were used for data analysis. The elements observed at the highest concentration included calcium, magnesium, potassium, and sodium (figure 1 & table 1). These metals are unregulated, meaning that human health exposure at these concentrations is not a concern. The Advanced Lab results are compared to the concentrations reported by the Victor Valley Water District in the City of Adelanto Consumer Confidence Report for 2020 and the values are in a similar range.[1] During certain months of the year, water is imported from the Victor Valley Water District to the City of Adelanto.

No bismuth, cadmium, cobalt, indium, iron, lead, lithium, manganese, nickel, silver, strontium, and thallium were detected in the samples. Barium (0.04 +/- 0.03 ppm) and vanadium (0.021 +/- 0.001 ppm) were detected in the A&R Laboratory analyzed samples at very small concentrations. Other elements were observed in the Advanced Laboratory analysis at very low concentrations that were below the concentrations of the standards for our methods, including aluminum, boron, chromium, copper, gallium, and zinc. These results are not reliable with the method used for analysis. Chromium and copper are regulated elements in drinking water so additional analyses could be done to confirm the results of the City of Adelanto 2020 Consumer Confidence Report, but chromium and copper were not detected in the samples analyzed by A&R Laboratories.

According to the Advanced Laboratory Analysis, the water samples are safe for consumption with regards to elemental analysis. The high concentrations of magnesium and calcium mean that the water is hard, so calcium carbonate solid could deposit on faucets, sinks, bathtubs and shows. The high concentrations of calcium and magnesium could also impact the performance of personal care products like soap and shampoo.

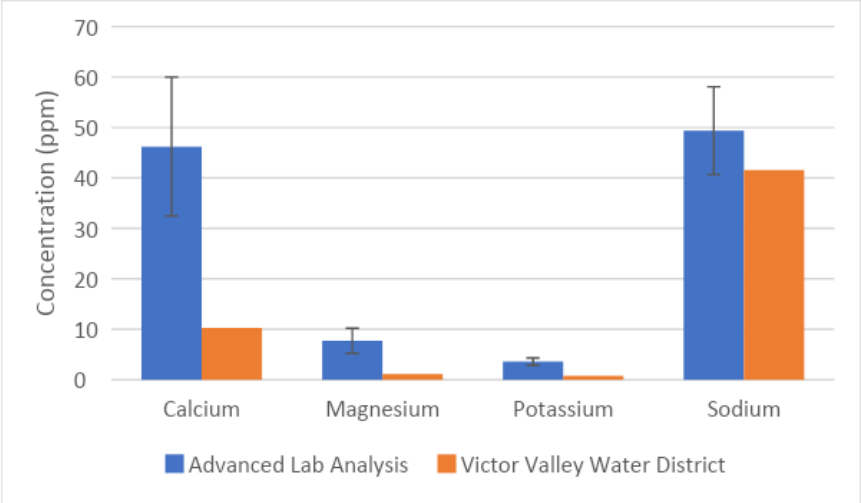

Figure 1 Concentrations of elements identified in water samples (n=26) from the City of Adelanto with ICP-OES in comparison to concentrations reported in the City of Adelanto 2020 Consumer Confidence Report.

Table 1 Elements Observed in City of Adelanto Water Samples

Element	Advanced Lab Analysis Average concentration (ppm)	Standard Deviation (ppm)	City of Adelanto Concentration (ppm)
Calcium	46.22	13.77	10.3
Magnesium	7.72	0.47	1.11
Sodium	49.39	8.70	41.6
Potassium	3.57	0.73	0.8

1. City of Adelanto 2020 Consumer Confidence Report. https://www.ci.adelanto.ca.us/ArchiveCenter/ViewFile/Item/85. Accessed 3 May 2022.

Appendix 3: BIOL/CHEM 042L Analysis

Adelanto Water Samples Analyzed by Integrated Biology & Chemistry (BIOL/CHEM 042L) at the W.M. Keck Science Department of Claremont McKenna, Pitzer, and Scripps Colleges

The students in the Integrated Biology & Chemistry course analyzed 12 water samples collected in January 2022 from various homes in the city of Adelanto, California. This report is a summary of those findings and when appropriate an indication of their significance is provided.

Following the protocols for water analysis outlined in Standard Methods for the Examination of Water and Wastewater (1999), students measured water hardness, alkalinity, chlorine, and chromium (VI). In addition, the occurrence of microorganisms was assessed using the standard heterotrophic plate count with R2A agar and MacConkey growth media for the detection of enteric microorganisms. The effectiveness of chlorine and UV treatment was assessed against the microorganism in the water. Finally, a characterization of the microbial community was conducted from enriched samples grown on R2A media.

Total Alkalinity

Alkalinity relates to the pH buffering capacity of the water or more generally the capacity of the water to resist a change in pH. Typical drinking water has a range of 20 – 200 mg $CaCO_3$/L. In the City of Adelanto 2020 Consumer Confidence Report an average alkalinity value of 70 mg $CaCO_3$/L is reported with a measured range of 67 – 73 mg/L. Whereas the average value students measured was 171 mg/L with a range of 142 – 190 mg/L. In the case of Adelanto's water, the alkalinity appears to arise from bicarbonate (HCO_3^-), which likely originates from carbonates that have dissolved from the underlying rocks the groundwater comes in contact with before treatment and distribution. From a safety perspective the higher values are desirable because it decreases the risk of corrosion in the water distribution system. However, increased scaling in faucets and sinks is also common.

Total Hardness

Water hardness is the sum of the concentrations of calcium and magnesium ions dissolved in water. These two ions are the major hardness constituents, and although some other salts may contribute to hardness, their concentrations in natural waters are typically so much smaller that their significance as hardness is considered negligible. From an aesthetic perspective, values around 150 mg $CaCO_3$/L are generally ideal. In the City of Adelanto 2020 Consumer Confidence Report an average hardness value of 86 mg $CaCO_3$/L is reported with a measured range of 73 – 96 mg/L. Whereas the average value students measured was 202 mg/L with a range of 168 – 232 mg/L, indicating *hard* to *very hard water*. The ranges reported by the City of Adelanto would classify it as *soft water*, which seems to contradict the experiences of residents reporting scaling and the buildup of soap scum, a common occurrence with *hard water*. While most complaints about hard water are considered aesthetic (e.g. scaling, soap scum), some people using hard water notice problems with dry skin and potentially eczema. There are no known

health concerns associated with drinking hard water. While calcium and magnesium are essential nutrients, hard water is not a significant source to meet dietary needs.

Residual Chlorine

The presence of free chlorine (also known as residual chlorine) in drinking water indicates that: 1) a sufficient amount of chlorine was added initially to the water to inactivate the bacteria and some viruses that cause diarrheal disease; and 2) the water is protected from recontamination during storage. The presence of free chlorine in drinking water is correlated with the absence of most disease-causing organisms, and thus is a measure of the potability of water (CDC). While free chlorine levels at the tap can vary widely, the WHO recommends free chlorine levels of approximately 0.2-0.5 mg/L. In the City of Adelanto 2020 Consumer Confidence Report chlorine levels were reported with an average of 0.53 mg/L and a range of 0.2 – 1.11 mg/L. The average value recorded by IBC students was 0.09 mg/L and a range of 0 – 0.84 mg/L. Although our measured values are below recommended levels, it is difficult to draw conclusions because of the time that passed between sampling and analysis. Measurement of free chlorine is best conducted within hours of water collection, which was not possible in this case. The occurrence of some residual chlorine is reassuring but further analysis is warranted to get more accurate results.

While the importance of chlorine in controlling for the growth of potentially pathogenic bacteria can not be emphasized enough, it does sometimes come with undesirable aesthetic side effects, such as taste and odor byproducts. Some residents have raised concerns about taste and odor in their water and while the City of Adelanto 2020 Consumer Confidence Report indicates that the measured concentration of disinfection by products and odor are within legal allowable limits. IBC students did not conduct these analyses, but they could potentially be included in future studies.

Chromium (VI)

Chromium is an odorless and tasteless metallic element primarily found in chrome-iron ore ($FeO \cdot Cr_2O_3$). Through rock weathering it can be found naturally in sediments, plants, animals, soil, and volcanic dust. Chromium also becomes available in the environment through mining operations and industrial processes, where it is used in alloys, electroplating, and pigments. Chromate compounds frequently are added to cooling water for corrosion control. There are demonstrated instances of chromium being released to the environment by leakage, poor storage, or inadequate industrial waste disposal practices. In the environment, chromium primarily exists in two valence states, trivalent chromium (Cr^{3+}) and hexavalent chromium (Cr^{6+}); these two forms of chromium can convert back and forth in water (and in the human body), depending on environmental conditions. Whereas Cr^{3+} is an essential human dietary element and can be found in many vegetables, fruits, meats, grains, and yeast; Cr^{6+} been shown to be carcinogenic by inhalation and is corrosive to tissue.

EPA has a drinking water standard of 0.1 mg/L (or 100 parts per billion) for total chromium (Cr^{3+} & Cr^{6+}). In the City of Adelanto 2020 Consumer Confidence Report chromium was not detected in the Adelanto water. However, the Victor Valley Water District supplemented the town of Adelanto's water supply for a period of time and their water report indicated an average total chromium value of 0.1 ppb (range: 0 – 11 ppb) and chromium (VI) at 5.6 ppb (range: 0 – 19 ppb). These values are well within legal limits. The students did not detect any chromium (VI) in the water samples.

Microbial Contaminants

The heterotrophic plate count (HPC) is a procedure for estimating the number of live, culturable heterotrophic bacteria in water. Heterotrophic bacteria are those that use organic nutrients for growth. They are ubiquitous in the environment, being present in all types of water, food, soil, vegetation, and air. This is a very broad definition, capturing all manner of microbes, most of which are benign, but some are bacterial pathogens, including coliforms (e.g. Escherichia, Klebsiella, Enterobacter, Citrobacter, Serratia). Although it is a useful tool for assessing drinking water quality or measuring changes during water treatment and distribution, most municipalities, including the City of Adelanto, are not required to test and report HPC values. The students in IBC found that 4 of the 12 samples had significant numbers of heterotrophic bacteria with an average of 8.9×10^4 bacteria/ml and a range of 1.5×10^3 – 3.0×10^5 bacteria/ml. A follow up analysis using growth media specifically designed to detect coliforms indicated their absence across all samples.

An additional analysis of the microbial community in the drinking water was conducted by cultivating bacteria that may exist in nominal quantities followed by extraction of their DNA and genetic analysis to determine their species. This advanced analysis is not conducted by municipal water supplies, so to the best of our knowledge this was the first occurrence of such tests on Adelanto drinking water. The results revealed bacteria from 7 major families, including the Sphingomonadaceae, Comamonadaceae, Enterobacteriaceae, Moraxellaceae, Pseudomonadaceae, Erythrobacteraceae, and Microbacteriaceae. While the vast majority of the bacteria in these families are considered benign and common in soil, sediment, and water; a few species of the Enterobacteriaceae, Moracellaceae, and Pseudomonadaceae are known to be pathogenic, thus warranting continued monitoring of residual chlorine concentrations in drinking water to control for their occurrence.

Because the quantity of heterotrophic bacteria in some samples was concerning, as well as the presence of potentially pathogenic microorganisms, the students did a follow-up study to assess the effectiveness of disinfectants on killing the bacteria in these samples. Both UV light and chlorine were effective at killing 99% of the bacteria present. Chlorination at the water treatment facility is important for controlling the occurrence of bacteria. However, if it is not present at high enough concentrations, the growth of bacteria in the home plumbing system is possible.

City of Adelanto 2020 Consumer Confidence Report.
https://www.ci.adelanto.ca.us/ArchiveCenter/ViewFile/Item/85. Accessed 3 May 2022.

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Appendix 4: PFAS Tests Provided by the City of Adelanto

Visit https://www.adelantowaterjustice.com/pfas-tests to access items in this appendix.