

Subject: **Tucson Water & ADWR Task 4 Report**

TUCSON WATER – ADWR TASK 4 REPORT
June – December 2023
October 19, 2023

This Report consists of the findings and recommendations resulting from continuing leak detection project with Tucson Water (TW) and Contractors. Tucson Waters goal is to reduce our non-revenue water loss to 4%. The Condition Assessment Program (formerly Infrastructure Reliability & Infrastructure Systems - IRIS) is utilizing technology as a tool to locate leaks within our water distribution mains, water service meters, and other water assets. The report is divided into three sections which include the Executive Summary, Detailed Leak Detection Technology reporting, and Tucson Water Asset Management follow up system.

Section I.

Executive Summary, Tucson Water continued to perform water service area wide leak detection testing on all water distribution system meters, valves, fire hydrants and mains. Tucson Water accomplished field testing methods internally with Tucson Water staff and outside leak detection companies. As previously mentioned, Tucson Water is fully utilizing technology as a tool to continue our NRW loss goal of 4%. During this time period of the overall leak detection program, we were able to continue to monitor and test assets with contractor's new technology as a pilot project in addition to finding new equipment for Tucson Water to own and use on a daily basis for a successful program.

As you will learn from this report, the contracted pilot projects fell short from locating system leaks. However, the company's technology, structure, ease of use, and client service will be useful for other utility agencies. A total of 100 miles of water infrastructure was tested for leaks. Some water infrastructure was modified for deployment of the tools for testing purposes. This is noted to share the importance of funding for each technology used.

Tucson Water is a member of the ISLE Technology Approval Group (TAG) providing technical consultancy for world leading providers and water end users by identifying and vetting



Subject: **Tucson Water & ADWR Task 4 Report**

emerging and established technologies or practices. ISLE services revolve around the identification, evaluation and implementation of best-fit technologies and practices. ISLE is a company where new companies with water related technologies are vetted and discussed for ease of use and work possibilities.

TAG brings water end users together to evaluate emerging technologies, identify pilot opportunities and engage in collaborative research or deployments. Based off previous presentations performed at TAG meetings and conversations with other member utilities, we were fortunate to pilot leak detection companies/technologies with FIDO, Inc., ElectroScan, Inc., and Fluid Conservation Services (FCS), Inc.

Section II.

FIDO, Inc. is an Artificial Intelligence (AI) Acoustic Sensor Company capable of applying AI technology to data collected from an acoustic sensor (bug) placed within a residential water meter to listen and collect data in real time, interpret data, and provide leak size and location. This pilot project was scheduled for a three-month trial period in the amount of \$36,000.

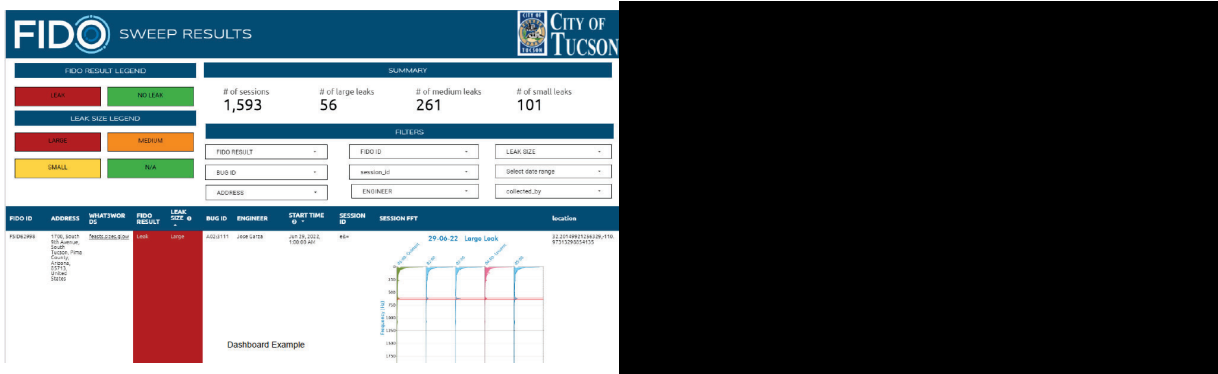
Tucson Water staff and the FIDO company performed an initial site visit to showcase the sensor (bugs) technology and program capabilities. Tucson Water selected a known community experiencing documented leaks and breaks. Due to the amount of work and lack of Tucson Water manpower, we requested the assistance of a local Job Order Contractor by the Request for Proposal process to assist with the field sensor (bug) deployment and recovery. The cost for assistance was \$24,000. Tucson Water staff and contractor was provided training by the FIDO team. Work and location were then set, and a workflow was developed. A sensor was dropped (installed) at a known water feature for a period of one week allowing for data collection and then recovered (picked up). If a leak was identified, the team was alerted, and additional testing was required. Tests consisted of utilizing the FIDO sensors to correlate the location of the leak and physical excavation was scheduled for validation.



Subject: Tucson Water & ADWR Task 4 Report

In summary, numerous FIDO sensors were deployed and monitored for more than a month. Multiple sensors identified leaks at residential meters. The Tucson Water and contractor team performed multiple excavations to locate the leaks with no success. In addition, the Tucson Water team performed a simulated leak in areas to try and fully utilize the FIDO sensors, and again had no success. After one and a half month, the pilot project was halted, and all sensors were returned to FIDO.

The project information shared above does not reflect success as it relates to our Non-revenue water loss program. It is our intent to provide transparency on the path to our final goal of a 4% water loss and the costs we incur to arrive at that commitment.



ElectroScan, Inc. is a company performing Machine-Based leak detection technology by modular multi-sensor robotic inspection platform featuring conductivity and acoustic and closed-circuit television (CCTV) sensors. The technology identifies a leak by the current loss amount and data is quantified in GPM or LPS. This pilot project was scheduled for a one-time test on an 8-inch Asbestos Cement pipeline (AC) in the amount of \$12,500.

Tucson Water staff and the ElectroScan company held several meetings to discuss the scope of work and job execution details. Due to the amount of site civil work and lack of Tucson Water manpower, we requested the assistance of a local Job Order Contractor by the Request for Proposal process to perform pipe modifications. Two sites were identified for excavation and



Subject: **Tucson Water & ADWR Task 4 Report**

the process to install two pipe saddles, gate valves, and traffic rated surface vaults to accommodate the tool insertion. Construction costs were \$51,000.

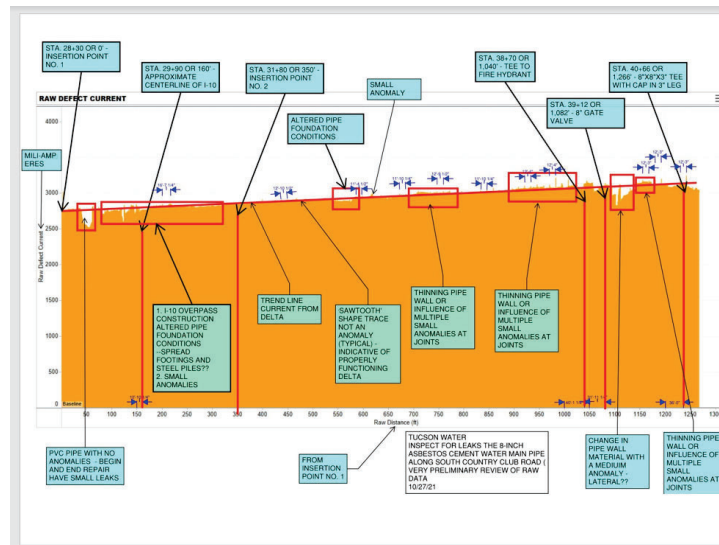
The test equipment was inserted at the pipe tap south of Interstate 10 and traveled internally for approximately 2,800 feet downstream. A few complications were encountered, and velocity increase was needed. A fire hydrant downstream of the insertion point was opened to create the flow and allow the tool to travel. This is not the ideal method for leak detection however the solution was effective. If a leak was identified, the team would have immediately been alerted. We once again struggled to maintain a high velocity for the tool to travel and ceased the operation. If the tool continued with the fire hydrant open, there was a probability the tool would of went down the lateral and not the pipeline.

In summary, ElectroScan's technology is very promising and the capabilities can grow substantially if equipment upgrades were made and improve the relationship between the client and company staff. The testing results did not reveal any leaks. However, the technology was able to provide unknown changes in pipe material from AC to PVC. This is indicative of a previous repair. Additionally, the technology was able to detect AC pipe joints where a rubber gasket exists and provide a CCTV snapshot.

The project information shared above does not reflect success as it is relates to the location of leaks because no leaks were found. This is a positive as it relates to our Non-revenue water loss program. It is our intent to provide full transparency on each leak detection project and the costs associated with the project.



Subject: Tucson Water & ADWR Task 4 Report



Fluid Conservation Services (FCS), Inc. is a company known for water loss recovery utilizing leak correlation technology and acoustic sensors placed within a water infrastructure assets as residential water meters or valves to listen and collect data in real time. This pilot project was scheduled for approximately three-month trial period with no dollar amount. An understanding was made between Tucson Water and FCS for Tucson Water staff to perform leak detection on Tucson Water assets. If leaks were identified, the leak would be validated by repair and the success would be a driving factor in purchasing the equipment.

During the pilot test, Tucson Water had the opportunity to pilot the FCS correlating system to better locate leaks. The correlating equipment has significantly increased our leak detection methods with success. FCS equipment was \$26,000. Tucson Water service area is divided up into four areas consisting of North, East, Central, and West. Crews from each area occasionally call on the Condition Assessment team to perform a finite leak detection test to pinpoint the location. Note: at times water does not always surface and make the location immediately known. This tool and testing method save from over excavation and saves on maintenance costs. All work is trackable with our Asset Management program.



Subject: Tucson Water & ADWR Task 4 Report



Additional equipment called the PermaNET Su single unit correlating telemetry noise loggers were also provided to pilot. The task is to set (install) at a known water feature for a period of one week allowing for data collection and then recovered (picked up).



In summary, numerous FCS PermaNET SU loggers were deployed and monitored for a few months. Multiple loggers never identified leaks at any installation site. Tucson Water staff performed simulated leaks in areas of easy access to validate the equipment's capabilities and arrived again with no success. After months of testing, the pilot project was halted with the SU loggers and were returned to FCS. However, the leak correlating technology proved to be successful on areas of leak detection.



Subject: **Tucson Water & ADWR Task 4 Report**

The project information shared above does not reflect complete success with all the equipment FCS provided. However, we were fortunate to find some testing equipment capable of leak detection to add to our inventory. In a small way the equipment will assist with continued efforts to lower our water loss. The intent of this information was to provide transparency of our path to a 4% water loss goal commitment.

Section III.

Asset Management Program

The City of Tucson is proud to share the implementation of the Hexagon (formerly INFOR) asset management program to manage all Tucson Water assets within the water infrastructure.

HxGN EAM is an industry-leading asset management solution designed to extend asset lifecycles and improve productivity. Its wide range of risk, condition, and reliability-based maintenance instruments, and applied technologies like AI and ML can deliver accurate, trusted data and strategic insights to drive better decision-making while ensuring policy compliance.

HxGN EAM's cloud-native foundation, device-independent work orders, and GIS or BIM capabilities enable organizations to access vital information when and where they need it. Tucson Water utilizes the asset management program as a tool to document all non-revenue water issues as documented as leaks. When a leak is identified and validated, the Condition Assessment Program (CAP) team creates a work request for Maintenance crews to mobilize and repair the leak. In addition, the CAP team will also create a work request for leaks identified within an owner's private line. The notification will come by a person to person discussion or by a Tucson Water note alert them of the discovery. The benefit is documentation of all leaks and the success of the program.

