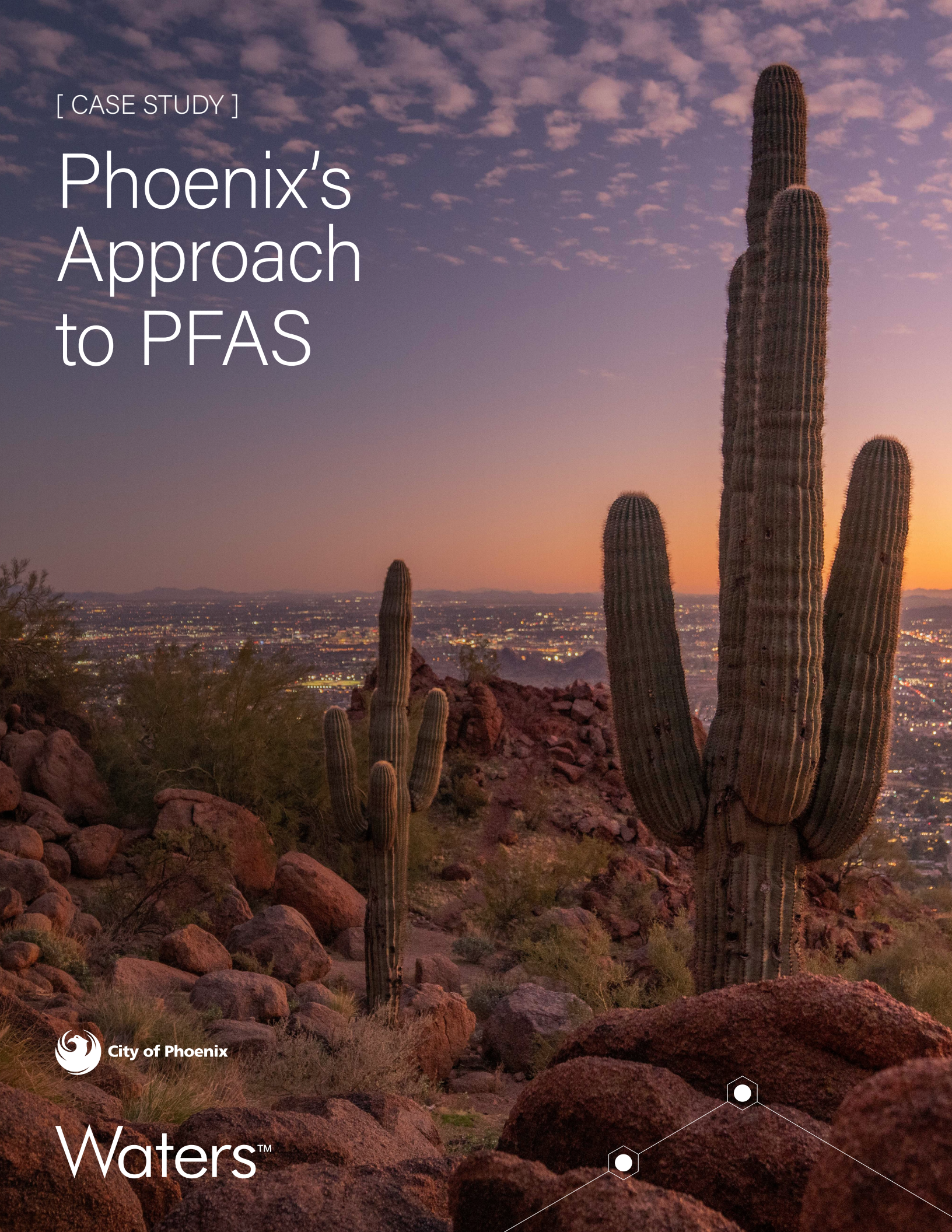

[CASE STUDY]

Phoenix's Approach to PFAS

City of Phoenix

Waters™

Background

The City of Phoenix, Arizona, is responsible for providing safe and reliable drinking water to approximately 1.7 million residents. The city's Water Services Environmental Laboratory, one of the largest in the state, plays a crucial role in ensuring water quality through extensive testing and regulatory compliance. As concerns about PFAS (per- and polyfluoroalkyl substances) continue to grow due to their persistence in the environment and potential health risks, the City of Phoenix recognized the need to build robust in-house PFAS testing capabilities. This initiative was not only a response to regulatory requirements but also a proactive measure to safeguard public health.

Challenges Faced

One of the primary challenges the City of Phoenix faced was the need to comply with the EPA's Unregulated Contaminant Monitoring Rule (UCMR5), which mandates monitoring for emerging contaminants, including PFAS. The city needed to establish in-house testing to monitor PFAS levels accurately, prepare for potential future regulations, and provide timely data.

Another significant challenge was the need to develop these capabilities within the existing infrastructure. The laboratory required sophisticated instrumentation capable of detecting PFAS at trace levels, as well as trained personnel to operate the equipment and analyze the data. Additionally, preventing PFAS contamination during the testing process was a concern, given the widespread use of PFAS-containing materials.

"Waters technicians assisted in setting up the LC-MS/MS system, optimizing methods, and familiarizing the team with software and hardware."

JAMIE WALSH
Chemist II, City of Phoenix

Solution Implementation

To address these challenges, the City of Phoenix partnered with Waters™, selecting advanced LC-MS/MS instrumentation specifically designed for PFAS analysis. They chose the ACQUITY™ UPLC™ coupled with the Xevo™ TQ-S micro detector, which was compatible with EPA Methods 533 and 537.1. This platform was selected for its reliability, compact size, and the laboratory's familiarity with the software, which facilitated a smoother integration into their workflows.

Waters Corporation provided extensive support to the City of Phoenix, including training and technical assistance. Jamie Walsh, a Chemist II Specialty at the city, noted the importance of a three day intensive training session where Waters technicians assisted in setting up the LC-MS/MS system, optimizing methods, and familiarizing the team with software and hardware. This support extended to method development, allowing the team to become proficient in using SPE and other PFAS-specific workflows.

To enhance efficiency, the City of Phoenix invested in automated solid-phase extraction (SPE) technology. The PromoChrom Automated SPE Extractor played a crucial role in streamlining sample preparation. Jamie Walsh highlighted the significant time savings achieved by using automated extraction, which reduced manual handling and ensured consistency across sample preparations.

Contamination control was another critical aspect of their strategy. The laboratory implemented rigorous protocols to prevent PFAS contamination, including using PFAS-free materials, maintaining dedicated equipment for PFAS testing, and adopting stringent cleaning and maintenance practices. These measures were crucial in maintaining the integrity of their testing environment and ensuring the accuracy of results.

Results and Impact

The implementation of Waters Corporation's solutions enabled the City of Phoenix to build robust PFAS testing capabilities, which are crucial for regulatory compliance and proactive monitoring. By developing in-house testing, the laboratory improved control over sample analysis, reduced reliance on external laboratories, and increased the speed of data turnaround.

The use of automated SPE extraction significantly enhanced operational efficiency, allowing the laboratory to manage a higher volume of samples without compromising quality. This efficiency not only supported internal testing requirements but also allowed the City of Phoenix to assist other municipalities with their PFAS monitoring efforts.

Looking ahead, the City of Phoenix is preparing to expand its testing capabilities to include EPA Method 1633, which covers a broader range of PFAS compounds in various matrices. This expansion will further strengthen the city's ability to monitor and manage PFAS contamination, ensuring the continued safety of its water supply.

Insights from the Field: Expert Q&A with the City of Phoenix

The following insights were gathered during a Q&A session with Erin Huff and Jamie Walsh, which provides additional practical advice for laboratories and professionals involved in PFAS analysis:

- **Preventive Maintenance Measures**

  Regular preventive maintenance is critical to ensure the optimal performance of PFAS testing equipment. Jamie Walsh emphasized the importance of having an annual preventive maintenance check performed by a trained technician. During such checks, potential issues like leaking valve cartridges can be identified and resolved, preventing unnoticed performance degradation.

  Routine maintenance tips include flushing the system with a mixture of organic solvents and water after using mobile phases containing salts, such as ammonium acetate. This helps prevent buildup and maintains system sensitivity. Cleaning the cone regularly is also recommended to ensure consistent performance.

- **Sample Handling and Storage**

  Proper sample handling and storage are crucial to maintaining the integrity of PFAS testing results. The City of Phoenix adheres to the holding times specified by the EPA methods they use: 14 days for EPA Method 537.1 and 28 days for Method 533. Following these guidelines helps ensure that the samples remain viable for accurate testing and compliance.

- **Challenges with Specific Analytes**

  The City of Phoenix encountered challenges with the recovery of specific PFAS analytes, such as 4:2 FTS, 6:2 FTS, and PFBA. To improve recovery, the team adjusted their spiking levels during method detection limit (MDL) studies, ensuring these compounds could pass quality control criteria. Adjusting spiking levels helped manage contamination and improve overall recovery rates.

- **Managing Sensitivity and Chromatographic Issues**

  Maintaining sensitivity and effective chromatographic separation is vital in PFAS analysis. Minor losses in sensitivity can be monitored using non-affected internal standards. Jamie Walsh suggested that changing mobile phases and cleaning the cone could address sensitivity issues. When further troubleshooting is needed, technical support from Waters Corporation is invaluable.

- **Contamination Control and Identification**

  Contamination control is a key concern in PFAS analysis. Using high-quality LC-MS-grade solvents, dedicated syringes, and sample bottles specifically for PFAS analysis helps minimize contamination risks. To identify contamination sources, Jamie recommended starting with calibration standards and systematically testing each component of the workflow.

- **Atmospheric Interactions**

  While Jamie had not observed significant atmospheric interactions affecting their LC-MS/MS performance, she noted that humidity and other environmental factors could impact GC-MS systems. This highlights the need to consider local environmental conditions and their potential effects on analytical equipment and results.

Lessons Learned and Best Practices

The City of Phoenix's experience offers valuable insights for other municipalities and laboratories embarking on PFAS testing:

- **Utilize Vendor Support**

  Partnering with a reliable vendor like Waters Corporation and utilizing their training and technical support can significantly ease the implementation of new testing methods.

- **Invest in Automation**

  Automated sample preparation equipment can reduce manual workload, improve consistency, and enhance overall laboratory efficiency.

- **Prioritize Contamination Control**

  Implementing strict contamination control protocols is essential for accurate PFAS analysis. Using dedicated, PFAS-free materials and maintaining clean, controlled laboratory environments can minimize background interference.

- **Continuous Learning and Collaboration**

  Engaging in ongoing training, webinars, and industry collaborations helps laboratories stay updated on the latest developments in PFAS analysis and continuously improve testing methodologies.

Conclusion

The City of Phoenix's proactive approach to developing in-house PFAS testing capabilities underscores the importance of strategic planning, investment in technology, and strong partnerships. With the support of Waters Corporation, the city has successfully enhanced its ability to monitor and manage PFAS contamination, ensuring the safety and quality of its water supply. This case study serves as an example for other municipalities seeking to build or enhance their PFAS testing capabilities, demonstrating that with the right resources and support, effective PFAS management is achievable.

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