

Adapting to Challenging PFAS Analysis with Focused Analytical Workflow Solutions

Vista Analytical leads the industry in PFAS analysis using Waters PFAS specific solutions, including ultra-performance liquid chromatography coupled with tandem mass spectrometry instrumentation

Technology: Xevo TQ-XS Mass Spectrometer, Waters Xevo TQ-S micro Mass Spectrometer, ACQUITY UPLC I-Class PLUS, AutoSpec Mass Spectrometer, Waters MassLynx Mass Spectrometry Software, Waters PFAS Analysis Kit, Oasis WAX for PFAS SPE

ENVIRONMENTAL ANALYSIS AT VISTA ANALYTICAL

Vista Analytical Laboratory defines itself by its credo to meet or exceed the most rigorous regulatory requirements with experience, expertise and responsiveness unmatched in the environmental laboratory services industry. Founded in 1990 as ALTA, the company has specialized in environmental analysis since its establishment. Today, Vista Analytical is a woman-owned small business and industry leader in the determination of dioxins and furans, PFAS, PCBs, PAHs, PBDEs, PCNs, and other semi-volatile organic contaminants.

The company's 9,000 ft² facility in El Dorado Hills, California, USA, houses separate preparation laboratories to maximize throughput and minimize sample cross contamination. Its custom design ensures reliable, compliant results that are not impacted by environmental conditions. The company's 47 employees work to ensure results are precise and delivered in a timely manner.

Vista Analytical serves a wide variety of clients, some of which have worked with the company for more than 25 years. Using the powerful techniques of high-resolution mass spectrometry (HRMS), ultra-performance liquid chromatography tandem mass spectrometry (UPLC-MS/MS), as well as U.S. EPA and CARB methodologies, Vista Analytical provides accurate environmental analysis for a variety of matrices for clients the world over.



Vista Analytical provides environmental analysis for customers around the globe.

PARTNERSHIP WITH WATERS

Vista Analytical and Waters™ have a long history, dating back to the laboratory's initial forays into dioxin analysis. Some of the company's original Waters AutoSpec™ Mass Spectrometers are still in use, and Vista Analytical chemists have used Waters MassLynx™ Mass Spectrometry Software for years.

Recently Vista Analytical invested in both the Waters Xevo™ TQ-XS and Waters Xevo TQ-S micro Mass Spectrometers to expand its capacity for PFAS analysis.

Ms. Martha Maier, President of Vista Analytical, describes how the Waters support team was a factor in their decision: "We've had a really good experience with Waters, particularly their response when there's a problem. We don't have an instrument down for months trying to get an engineer in to fix it, which happens in our industry. That makes a big difference – because if an instrument is down, our business is down too."

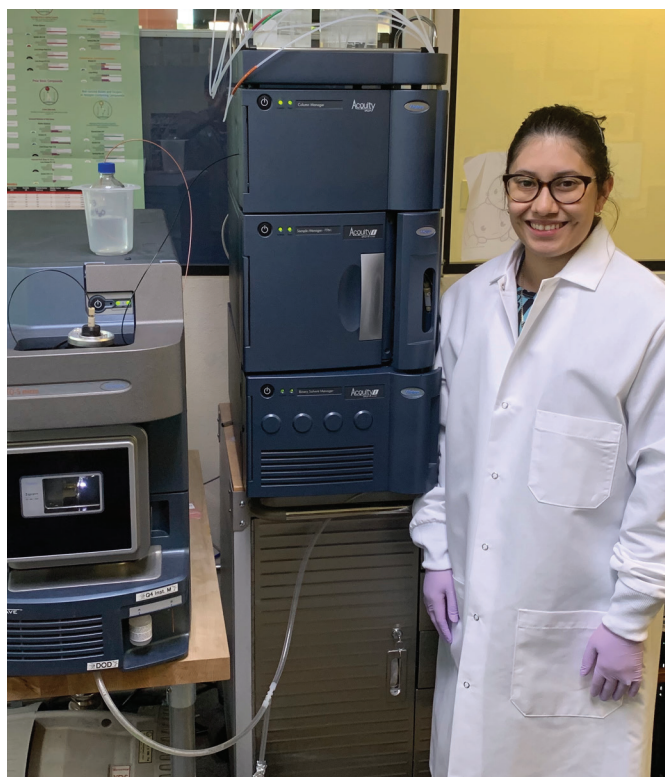
“Our combination of unsurpassed technical quality and outstanding customer service is what distinguishes Vista Analytical. What we do, we do really well. We sell ourselves on quality, and we want the best possible data.”

MS. MARTHA MAIER

President of Vista Analytical

Vista Analytical is accredited under the National Environmental Laboratory Accreditation Program (NELAP), an organization designed to foster the generation of environmental laboratory data of a known and documented quality through uniform national performance standards. Additionally, the company maintains assorted state and government certifications, including Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP), ISO-IEC 17025:2005, and a U.S. Department of Agriculture Soil Permit.

Using Waters technologies, Vista Analytical has enhanced environmental analysis as the industry adapts to changing regulatory requirements.



Gabriela Mendiola is the LC-MS lead at Vista Analytical.

PFAS IN THE ENVIRONMENT

Per- and Polyfluoroalkyl substances (PFAS) are man-made compounds used as surfactants in chemical processes. Used in industry and consumer products since the 1940s, PFAS are characterized by a chain of strong fluorine-carbon bonds, leading to an incredibly stable chemical. Sometimes called “forever chemicals,” this stability prevents PFAS from breaking down easily, so they are extremely persistent after entering the environment.

The most studied PFAS are perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), which gained interest because of their use in the Teflon (PFTE) manufacturing process. However, there are thousands of PFAS in existence. PFAS have historically been referred to as perfluorinated compounds (PFCs) and are used in aqueous film forming foams (AFFF). AFFFs are typically used at airports or military bases where the danger of large fuel fires is greatest.

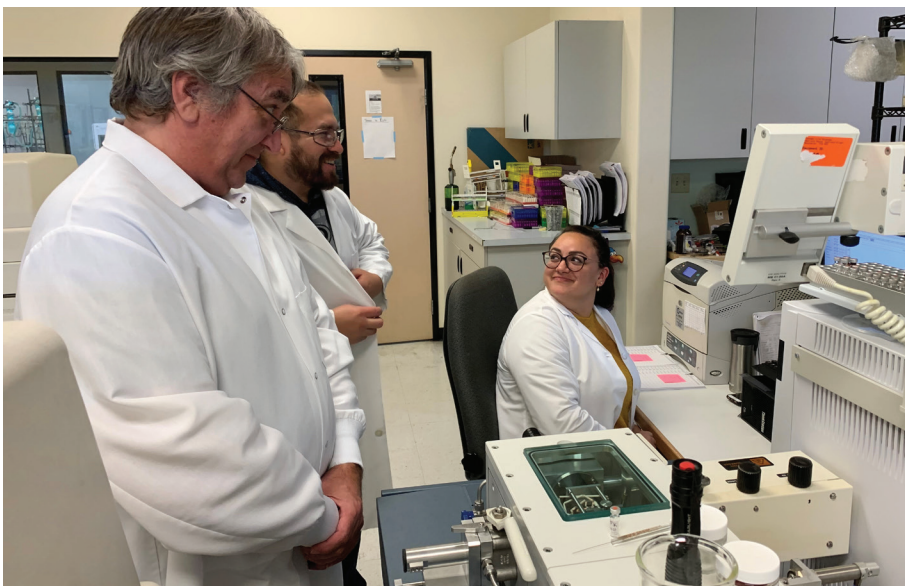
Some PFAS are bio-accumulative and have been identified in environmental samples around the globe, even in wildlife far removed from the industrial world. Many studies have also shown that most humans have parts-per-billion levels of PFAS in their blood. While the health effects from PFAS in humans are still being studied, these substances have been linked to potential immune suppression and increased risk of some cancers. Subsequent research on PFAS and its potential health risks have increased the need for accurate measurement of PFAS in environmental applications.

ADAPTING TO EVOLVING REGULATIONS

Globally, government bodies are working to put regulations and testing methods in place to tackle the ever-growing concern about PFAS in the environment, as they work to remove these chemicals and protect the health of their communities. Laboratories supporting PFAS testing must be ready to adjust and comply with regulatory expectations associated with the samples they are testing.

Some testing in the US follows federal EPA guidelines. In 2016, the EPA issued a non-regulatory Lifetime Health Advisory of 70 parts per trillion (ppt) for individual and combined PFOA and PFOS in drinking water. In late 2019, the EPA made preliminary regulatory determinations for these two PFAS contaminants and continues to work towards further regulations.

US State agencies also have the authority to act and address PFAS contamination within their jurisdiction. States have adopted health advisories and regulations that are more stringent than the EPA, with 18 states establishing their own limits (some as low as 10 ppt).



Vista Analytical's 47 employees work to ensure that results are precise and reliable.

Because of the global presence of PFAS, addressing this challenge will require action from all levels of government – international, federal, state, and local.

Ms. Maier explains: "We've done this work for a long time, and we're very comfortable with the EPA methods for drinking water. If we're doing work for agencies other than the EPA, we use our own isotope dilution method, which significantly improves our results. We first obtained our certification with the Department of Defense in 2014. The DoD was an early adopter of isotope dilution and has done much of the PFAS work in the US."

PFAS ANALYSIS

Vista Analytical has spent decades building its strong portfolio in environmental analysis. The original company was one of the first to do dioxin analysis, relying on its five Waters AutoSpec Mass Spectrometers to achieve the necessary detection limits. Today, the company offers PFAS analytical services that include methodology outlined by EPA Method 537 rev 1.1 and 537.1; EPA Method 533; isotope dilution methods; ISO 25101; and TOP Assay. About 50 percent of the laboratory's work includes PFAS, along with the traditional dioxin and PCB testing services.

"We use isotope dilution for almost everything that's not drinking water. EPA 537/537.1 works fine for drinking water because you don't have interferences. But for anything else, the numbers may not be accurate. Isotope dilution is the accepted methodology for non-drinking water regulations in many states, such as California and Michigan."

MR. OLIVER CAWDELL

Technical Director at Vista Analytical

PARTNERSHIP WITH WATERS

Current EPA methods related to PFAS analysis include:

- **Method 533:** Determination of Per- and Polyfluoroalkyl Substances in Drinking Water by Isotope Dilution Anion Exchange Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC-MS/MS)
- **Method 537.1:** Determination of Selected Per- and Polyfluorinated Alkyl Substances in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC-MS/MS)
- **Method 537, Rev 1.1:** Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC-MS/MS)
- **Method 8327:** Determination of Per- and Polyfluoroalkyl Substances (PFAS) Using External Standard Calibration and Multiple Reaction Monitoring (MRM) Liquid Chromatography/Tandem Mass Spectrometry (LC-MS/MS)



Waters technology has allowed Vista Analytical to enhance its environmental analysis in line with changing regulatory requirements.

The Vista Analytical team works mostly with consulting firms who are hired via government contracts for specific projects, as well directly with municipalities and private industry. The company tests a wide variety of samples, including drinking water, wastewater, soil, human serum, milk, textiles, and fish tissue. While much of the work involves water and soil samples, Vista Analytical's experience spans a range of project types.

Ms. Maier describes her company's services: *"We do enjoy doing the one-off things. We like a challenge. Our quality system ensures our data is technically accurate, legally defensible and appropriate for its intended purpose."*

Many of the laboratory's projects stem from government efforts to determine PFAS exposure via surveys. When the surveys get high PFAS hits from certain areas, it triggers studies to determine sources, pathways, populations exposed and levels of exposure to determine potential risks.

Ms. Maier explains: *"If we're doing drinking water surveys, and we get a high hit, very likely there will be an investigation starting somewhere."*


Using a combination of Waters instrumentation and software, Vista Analytical has established itself as a leader in the environmental analysis of PFAS as the industry adapts to changing regulatory requirements and lower detection limits.

WATERS INSTRUMENTATION AND SOFTWARE

Vista Analytical has used Waters instrumentation and software for PFAS analysis since 2007, when the company established its LC-MS/MS laboratory after receiving a request to develop a method for analyzing PFOS in human serum. Today, more than 15 scientists in the department conduct analysis for over 40 different PFAS compounds.

Those years of experience with PFAS enabled Vista Analytical to develop a depth of expertise and technical knowledge that leads the industry. With four ultra-performance LC-MS/MS instrument configurations, Vista Analytical has the capacity to handle even the largest projects.

Environmental testing laboratories like Vista Analytical face many analytical challenges, including sample throughput, trace detection, complex matrices, data management and regulatory standards. To address these issues, the company invested in the Waters Xevo TQ-S micro and, more recently, the Waters Xevo TQ-XS Mass Spectrometers. These investments have helped Vista Analytical meet growing demand for PFAS analysis, as well as keep pace with changes in regulatory requirements.



"We invested in our Waters instrumentation to address capacity issues. We deal with high levels of contamination, so it makes sense to have redundancy. We want something reliable and rigorous. These instruments also offer extremely high sensitivity. When we first got our certification, we had the lowest detection limits in the business. Those levels are going even lower, which is why we purchased the Waters Xevo TQ-XS Mass Spectrometer about a year ago."

MS. MARTHA MAIER
President of Vista Analytical

The Waters Xevo TQ-S micro and TQ-XS Mass Spectrometers are tandem quadrupole instruments that reproduce high quality analytical performance injection after injection, even with the most complex sample matrices. These instruments fit virtually any lab and deliver consistent low levels of quantitation with a wide dynamic range, maximizing laboratory efficiency and delivering outstanding sensitivity and reproducibility that environmental laboratories like Vista Analytical need.

"In one of our tests with the Xevo TQ-XS, we lowered our MRLs from 5 nanograms per liter to 2 nanograms per liter. That was something that immediately made a difference when we added this Waters instrument. It has allowed us to offer lower reporting limits for our clients, giving us a competitive advantage. We're able to work with more complicated samples and achieve consistently low detection limits. Plus, the lack of carryover is remarkable with the XS. That's where we shine – we always make extra efforts to limit lab contamination."

MS. GABRIELA MEDIOLA
LC-MS lead at Vista Analytical

In addition, Vista Analytical has continued to use Waters MassLynx mass spectrometry software to quickly acquire, analyze, manage and share sample data. MassLynx intelligently controls any Waters MS system, from sample and solvent management components to Mass Spectrometer and auxiliary detectors – acquiring nominal mass, exact mass, MS/MS, and exact mass MS/MS data.

Mr. Cawdell describes the impact of the software: *"We're very familiar with MassLynx. There's a learning curve, but we have used it on our high-resolution instruments for a long time. We export the data into electronic deliverables required by our clients. The reporting end is becoming more and more complicated. Everyone has their own format, so we need to be able to share the results in different ways."*



Waters' relationship with Vista Analytical began in 2007, with some of the original instruments still in use today.

Additionally, Vista Analytical uses the Waters PFAS Kit, which includes the ACQUITY™ UPLC™ BEH C₁₈ Column, reference standards from Wellington, PEEK tubing for use with the mobile phase delivery lines, an isolator column for use on the UPLC, and a selection of SPE cartridges for sample prep, such as Oasis™ WAX for PFAS.

Not all Teflon parts can be removed from an LC System as they are needed for proper operation. The isolator column in the kit is used to delay the elution of any system induced PFAS compounds to avoid interference with incurred PFAS in the sample analysis. The Oasis WAX for PFAS is prescreened for background PFAS, allowing for ultra-low-level detections. The Waters PFAS Kit and chromatography products are ideally suited for PFAS analysis. They provide a robust and reproducible solution that helps organizations like Vista Analytical limit background PFAS contamination and successfully deliver reliable PFAS testing support to their customers.

NEXT STEPS

Vista Analytical has seen how PFAS analysis has evolved over the years, and they see more changes coming down the line – including lower detection limits and more analytes of interest, as well as stronger regulatory requirements. Competition from other environmental laboratories is likely to continue to increase as well, particularly as growing concern about PFAS contamination sparks even more investigations from government agencies and private industries.



The PFAS analysis equipment available from Waters.

Ms. Maier explains: *"There's a lot of interest in it. However, PFAS analysis is challenging, so that helps us because we have so much experience with it. I do see them expanding the analyte list even further and identifying more sites where PFAS is an issue. It's still a growing area."*

To manage those changes, Vista Analytical plans on staying nimble, enabling the company to continue its leadership and maintain its technical expertise and experience in PFAS analysis.

That includes both the company's reputation for technical quality, as well as outstanding customer service. As such, Vista Analytical continually makes every effort to improve and better serve the company's clients.



"We're continually adding analytes every few months. We're also always looking to improve our processes. So, if new technology comes out that we're interested in, we'll slot in the time to check it out. If we can get something with a better response, we'll definitely look at that."

MS. MARTHA MAIER
President of Vista Analytical

Waters

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