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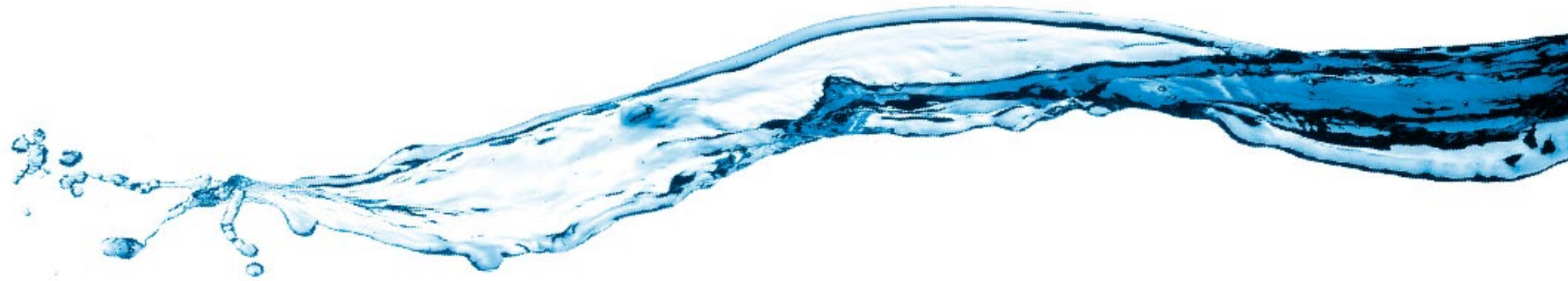
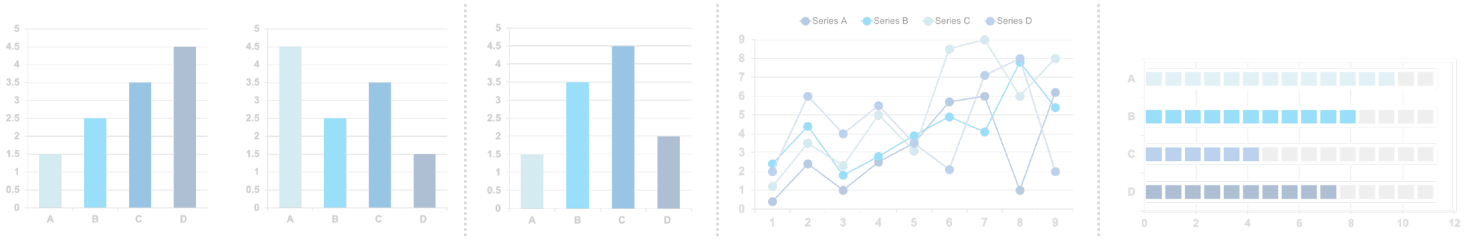


PFAS: THE NEXT CHALLENGE FOR WATER UTILITIES
Emerging Regulations, Technologies, and Forecasts, 2020-2030

Publication Date: June 2020



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About This Focus Report

The health dangers from per- and polyfluoroalkyl (PFAS) compounds—a class of several thousand chemicals with a seven-decade legacy of military, industrial, and commercial use nationwide—have risen dramatically in public consciousness over the past few years. Our current understanding of both the extent of PFAS contamination nationwide in drinking water supplies and the concentrations that produce adverse health effects in the human body are in their early stages. What is certain is that PFAS will become an issue of growing concern over the next several years, if not decades, with the advancement of contamination site and health testing.

The burgeoning crisis has already led several highly affected states, such as Michigan and New Jersey, to pursue regulatory limits on PFAS concentrations ahead of a slower moving federal government to remediate PFAS-contaminated sites. At the same time, concern over how PFAS makes its way back into groundwater or into plant and animal uptake through biosolid land applications is threatening to disrupt the biosolids market.

In This Focus Report

This report supports water and wastewater utilities as well as PFAS technology providers with detailed data, market and policy trend analysis, and growth forecasts in U.S. PFAS remediation projects and biosolid market adjustments. Bluefield's analysis of the market includes examination of policy shifts, technology trends, and strategies influencing the deployment of their innovative solutions.

Bluefield's PFAS market forecast from 2020 to 2030 is rooted in its database of over 200 confirmed contaminated sites and their affected surrounding municipal systems. Projects in key states are highlighted along with technology strategies, project costs, and results.

Report Features

- Database with 200+ impacted water systems by size and location
- State and federal policy dashboard
- Analysis of the competitive landscape including drinking treatment technology providers and biosolids service providers
- Economic analysis of biosolid management options and potential for market disruption due to PFAS
- 2020-2030 forecast of CAPEX and OPEX for drinking water PFAS remediation

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BLUEFIELD TAKEAWAYS

- **This is just the beginning.**
  The health risks of PFAS ingestion as determined by the U.S. EPA's third Unregulated Contaminant Monitoring Rule in 2016 and lowering of its Drinking Water Health Advisory from 600 parts per trillion (ppt) to 70 ppt for PFAS brought significant public attention to the issue, and growing public outcry has led to an increase in site testing, health studies, and a flurry of litigation across numerous states with long-ranging exposure to PFAS due to multi-decade legacies of industrial and military use near drinking water sources. The number of PFAS compounds (4,500+) and pervasiveness of use since their inception in the 1940s point to a problem that will take decades to identify and effectively address.

- **Regulatory environment emerging, but still uncertain, particularly at the federal level.**
  Bluefield's forecasts follow three distinct scenarios (Base Case, Low, High) based on current signals about the timeline of federal PFAS regulation, with an emphasis on 12 states that have taken the most active role in testing for and identifying PFAS contamination. Variances in regulatory timing manifest in cumulative market forecasts between US$500 million and over US$12 billion in CAPEX + OPEX from 2020-2030.

- **PFAS pervasiveness threatens across the water value chain.**
  While most efforts to date at PFAS remediation have understandably focused on removal from drinking water to prevent ingestion, the near-indestructible and pervasive nature of the compounds means they are found across the water value chain, with early studies showing PFAS uptake in plants and animals through lands making use of wastewater biosolid-augmented fertilizers contaminated with PFAS. As fertilizers have become a more strategic and important revenue source and disposal method for wastewater treatment plant biosolids, emerging PFAS regulations threaten to disrupt the wastewater treatment plant operations and the biosolid management firms with whom they contract.

- **Current and well-known technologies are effective, but with significant OPEX and trade-off calculations.**
  Granular activated carbon (GAC) and ion exchange (IX) resins are adsorptive media shown to be effective at removing PFAS compounds from drinking water, though competing co-contaminants and concentrations of PFAS have significant effects on replacement times and quantity needed. Reverse osmosis has been shown to be effective on smaller chain PFAS but at higher costs. Utilities will ultimately need to consider many factors as they seek to tackle PFAS.

> "The continued growth in identified PFAS contamination across the U.S. and rapid state regulatory and legal responses to public outcry indicate this is an issue that will have profound effects on water utilities for many years to come.

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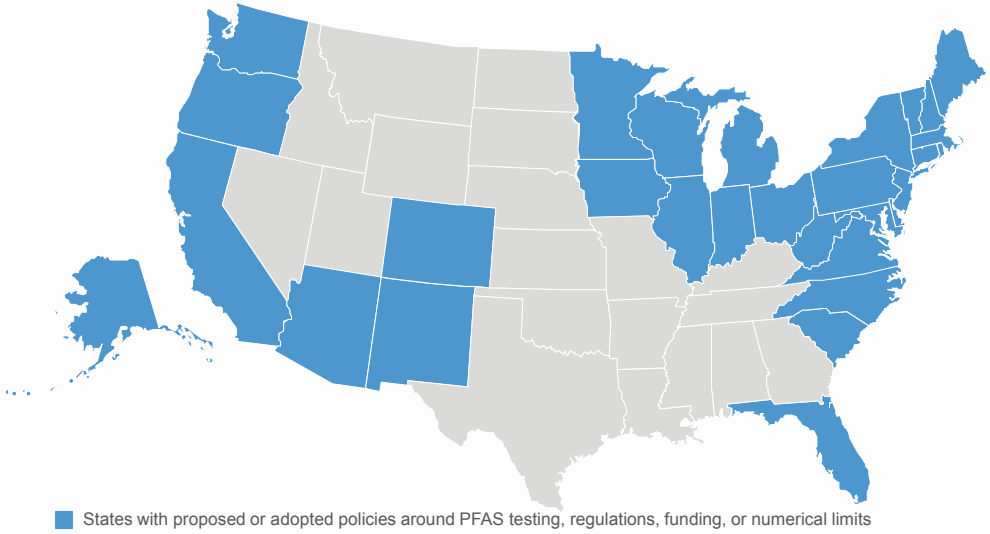
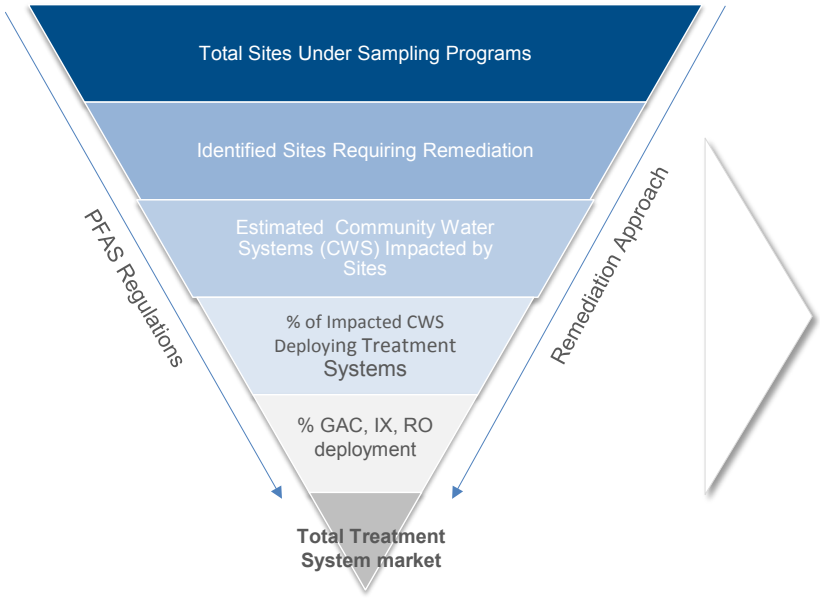


LIST OF EXHIBITS

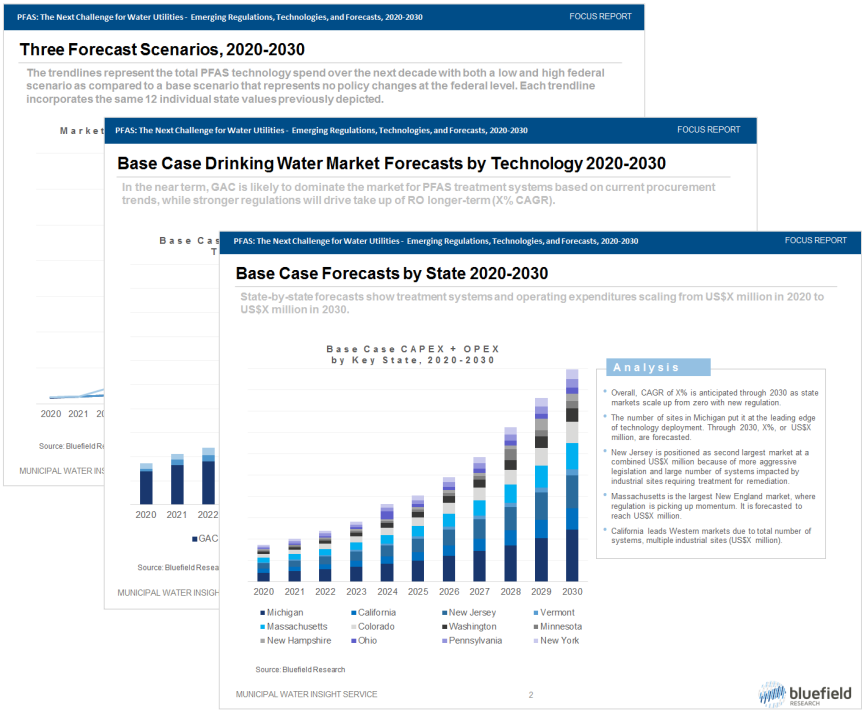
METHODOLOGY

Bluefield's transparent research methodology empowers clients to make stronger strategic decisions backed by a thorough understanding of critical inputs & assumptions driving the 10-year forecast.

Mapping the Addressable Market



Forecasting Market Spend by CAPEX + OPEX, 2020-2030



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Companies across the value chain are developing strategies to capitalize on opportunities in water but are often challenged by a lack of high-quality, reliable intelligence. Bluefield bridges this gap with actionable, data-backed analysis that is supported by a transparent research methodology and ongoing access to our global team of water experts.

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