



Minimizing Airport PFAS Risk

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Per- and polyfluoroalkyl substances (PFAS), a suite of thousands of compounds, are the contaminants *de jour* and are receiving public and regulatory scrutiny as their harmful properties are increasingly understood. It is now known that PFAS are ubiquitous, contained in numerous household products, (including food packaging, cookware, clothing items, floss, carpets, and furniture), as well as in certain chemicals and, increasingly, in the environment around us. It is widely understood that PFAS can cause negative human health impacts, including cancers, through drinking water ingestion, though much is still unknown about other potential pathways of exposure, what PFAS exposure levels may be deemed “safe,” and the relative risk of different types of PFAS compounds.

Meanwhile, media coverage of PFAS has intensified. Lawsuits alleging harm from exposure to PFAS are proliferating nationwide. Now half of U.S. states have laws or regulations that set standards for levels of some PFAS in water, soil, and/or other media, and the federal government is poised to impose nationwide standards for drinking water, impose liability on entities responsible for past and current releases of some PFAS under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and regulate PFAS in multiple additional ways. In the recent 2021 Infrastructure Investment & Jobs Act, Congress provided \$1 billion to states for PFAS cleanup projects in the Clean Water State Revolving Fund, \$4 billion for publicly owned and privately owned community water systems to address PFAS contamination, and \$5 billion to address PFAS contamination via drinking water projects that serve small or underserved communities.

As institutions worldwide grapple with the problem of PFAS risk management, U.S. airport operators are in an especially fraught position due to their use of PFAS-containing aqueous film-forming foam (AFFF). The Federal Aviation Administration (FAA) currently requires airports to use AFFF, though a switch to fluorine-free foams (FFFs) appears to be right around the corner.² While many airport operators are sophisticated in their understanding of PFAS issues and have in place PFAS management and risk planning practices, others have decided to wait for regulatory guidance before proceeding. Adequately addressing PFAS impacts is certainly daunting due to the technical complexities of PFAS testing and remediation and because the regulatory landscape

¹ This article does not, and is not intended to, constitute legal advice. Please contact your attorney to obtain advice with respect to any particular legal matter.

² The Department of Defense (DOD) released its draft performance standards for a FFF and conducted an industry comment period that ended in June 2022. When DOD adopts a standard for FFF, FAA intends to adopt the same standard for its civil airports. This would mean no more FAA-mandated PFAS discharges in AFFF, and Part 139 airports will all be transitioning to the fluorine-free foam.

is rapidly changing. But PFAS is not the first emerging contaminant that the public and industry have had to address, nor is it likely to be the last, and sound approaches that worked for previous emerging contaminants can provide a model for PFAS. Ultimately, PFAS risk management is a challenge that airport operators must recognize and meet.

This article proposes concrete PFAS risk management strategies for airport operators and covers some common PFAS risk management quandaries they may face. An effective PFAS plan requires understanding the risks involved, developing a strategy to combat and minimize those risks, and carefully implementing that strategy. This effort will inevitably require expert input from technical professionals and perhaps additional experts as well. There remains much uncertainty about the future of PFAS management and regulation at airports, but airport operators should not wait to implement common-sense strategies that will help mitigate costs, delays, legal liability, and reputational risks.

Why Are Airports Vulnerable?

Airport operators are uniquely vulnerable to PFAS risks due to their historic and ongoing use of AFFF to fight fuel fires. The FAA requires airport operators certificated under Part 139 to maintain certain levels and types of AFFF for aircraft rescue and firefighting (ARFF) vehicles and operations, and that such AFFF meet DOD military specifications for performance, which for decades has meant – and continues to mean – that AFFF must contain PFOA and PFOS, two PFAS compounds. Until recently, FAA further required that ARFF from firefighting apparatuses be tested at least once per year by discharging AFFF. In effect, airport operators have been required for decades to release PFAS-containing AFFF for routine testing and in response to fuel fires. FAA has not yet identified a PFAS-free alternative to AFFF that meets the military specification, so airport operators are, in practice, still required to use AFFF despite the known health risks of PFAS.

PFAS may be found within the footprint of an airport from the direct discharge of AFFF during emergency response, fire training, equipment testing and accidental release. Tenants operating on airport property may release PFAS during use of hangar fire suppression systems. Less well-known sources may also exist at airports, including materials that are used in airport maintenance, stored at an airport, or transit through the airport. PFAS are water soluble; surface water or groundwater contaminated with PFAS can cause PFAS impacts downstream or downgradient. Soil or water impacted by PFAS releases that, as a result of airport construction activity, are relocated on airport property, buried onsite, or disposed of off-site can act as continuing sources of PFAS contamination to the environment. All of these can result in negative impacts to soil, groundwater, and surface waters both onsite and offsite. If the groundwater or surface waters are sources of drinking water, domestic water supplies may also be impacted.

If impacts to off-site receptors are identified, airport operators may face scrutiny and legal exposure. While there may be other sources of PFAS in any given area (manufacturing plants, landfills, etc.), airports are highly visible and known sources of PFAS. Now, more than ever, airports are extremely vulnerable to regulatory or legal action regarding their PFAS impacts on

human health and the environment, both on and off airport property.³ In addition, firefighting equipment contaminated with PFAS will also require remediation once AFFF alternatives are identified.

This increased PFAS risk can have negative impacts on airports from a risk management perspective, such as:

- **Operational:** Numerous airport operations, including capital or maintenance projects, may be slowed or complicated by the need to carefully manage any PFAS-impacted media, such as soil or groundwater generated by the project. Treatment and disposal standards are currently unclear and the options that do exist are expensive. Additionally, costs to replace or decontaminate fire suppression equipment, dispose of AFFF product, and upgrade fire training facilities can be significant.
- **Regulatory:** State standards and regulations for PFAS vary widely, so airport operators should know or consult with their legal counsel about local laws and how they apply to airport operations, including permitting, reporting, remediation, and waste management requirements. Federal requirements are about to increase, and it appears likely airports may face CERCLA liability for past and future releases of PFAS and the attendant investigation, design, remediation, and Operation and Maintenance costs (which may be significantly higher than for other contaminants given the difficult nature of PFAS). EPA is also considering PFAS obligations under the Clean Water Act and the Resource Conservation and Recovery Act, which could subject airports to additional regulatory oversight, and permitting, as well as corrective action requirements. Some states are already investigating airports as potential PFAS sources, and others will inevitably follow suit. As the potential grows for airport operators to face regulatory action, they will need to ensure compliance with all current standards and best practices, assess historical PFAS contamination, and consider how to put themselves on the most advantageous grounds possible for interaction with regulators.
- **Reputational:** As high-profile institutions in their communities with known discharges of AFFF, airport operators could come under fire from local citizens for PFAS impacts, whether blame is warranted or not. Airport operators should recognize that public concern about PFAS may bring scrutiny of airport operations, and honor that concern and protect the airport operator's interests by knowing what contamination exists, having a plan to address it, and by being able to explain the risks (or lack thereof) to human health and the environment to the public. For instance, if residents near an airport demand expensive provision of alternative drinking water supplies, an airport operator is in a much better position to respond if it knows whether on-airport PFAS have impacted groundwater, the direction of groundwater flow, and whether nearby drinking water wells are in use.

³ Note that the potential impacts of PFAS from AFFF on firefighters is a related and important topic, but it is beyond the scope of this article.

- **Litigation:** States and the federal government may pursue enforcement actions against airport operators for releases of PFAS and the resulting impacts, both on- and off-site. Airport workers may sue alleging harmful impacts from exposure to AFFF on the job. State common law and environmental statutes and federal environmental statutes give private litigants grounds to allege airport operators have caused human health/or ecological impacts, violated environmental statutes, or committed torts (e.g., trespass, nuisance, or negligence). The possibility for litigation will increase greatly when PFOA and PFOS are designated as hazardous substances under CERCLA (EPA just released its proposed rule for the designation on August 26, 2022) unless some sort of Congressional carve-out or exemption for airport operators materializes (which appears unlikely at this time).

Given the potential for serious impacts that can in many ways distract from their core missions and cause significant financial issues, airport operators must develop a strategy to manage, and to the maximum extent possible minimize, the PFAS risks identified above.

Assemble the Right Team

Before kicking off a PFAS strategy, airport operators should assemble the right team. Necessary skills include technical, legal, and communications expertise. Airport operators may have existing staff with some of these skills, such as legal or public relations expertise. However, outside technical experts (environmental consultants) will almost certainly be necessary to adequately address PFAS problems that arise, and other experts may be helpful or necessary depending on the circumstances.

In hiring an environmental consultant to assist with PFAS management, airport operators should consider retaining someone who has specific expertise with PFAS investigation and remediation. A consultant should understand the human health and ecological risk issues associated with PFAS and how to identify and evaluate exposure pathways. A firm competent in remedial investigation is not necessarily competent in feasibility study, risk assessment, remedial design and construction. Knowing these differences will help with the selection of the right team for the applicable situation. Just because PFAS exists at an airport does not automatically mean an unacceptable risk exists. To continue with the example above, if an airport operator determines PFAS from the airport may be impacting groundwater, the risk to human health may be negligible if no one is drinking that water.

In some cases, additional professional assistance beyond environmental consultants can be critical. A public relations expert may be necessary to develop and implement an effective communications strategy. Such a strategy should include accurate communication to the public about the risks of PFAS, both what is known and what remains unclear. In some cases, public perception of PFAS risk far outweighs the actual known risk, or may not recognize that a pathway to human exposure is not present. Outside legal counsel familiar with the PFAS regulatory landscape, applicable state common law tort claims, and environmental laws will be vital if any enforcement action is threatened or taken against an airport operator related to PFAS, the airport operator is the target of any litigation, or the airport operator decides to litigate against others responsible for its PFAS contamination. Other subject matter experts (for instance, someone knowledgeable in military

fire-fighting operations, or a specialist in PFAS-containing products) may be useful in piecing together details of PFAS history at a given site.

An airport operator's leadership team should be part of the PFAS management team or, at minimum, should be well-informed about all efforts and require all airport staff to cooperate.

Conduct a Baseline Analysis

Airport operators should ensure they have a strong baseline understanding of the PFAS lay of the land at their airport. This endeavor could take different forms depending on the severity of the perceived risk. A baseline analysis requires that airport operators undertake the following:

- Ensure Current Compliance
 - Identify current usage of PFAS and ensure that it complies with FAA requirements and best practices and all other applicable laws. For instance, the FAA no longer mandates the release of AFFF during routine testing, so this practice should be discontinued.
 - Ensure proper training occurs for those working with AFFF. Have protocols in place that clearly describe when a fluorinated foam is needed for fire suppression and when it is not (i.e., emergency versus testing). Develop clear procedures for containing the foam, wastewater collection, storage and disposal.
 - Employ best management practices in all instances for the proper containment and disposal of any AFFF-impacted media. Impacts to storm drainage networks or other areas where stormwater can exit the airport property should be avoided.
 - Put in place adequate release reporting and response protocols for responding to situations where PFAS has been discharged.
 - Use proper health and safety protocols to avoid or minimize worker exposure issues such as dust inhalation during construction/ demolition activities.

- Understand Historical Usage of AFFF
 - Establish or continue to maintain good historical records of AFFF usage including foam type, brand, and quantities used/stored.
 - Retain or obtain evidence about historical releases, if possible, including what was released, where, if/how it was contained or remediated, where any waste materials were placed, and any other relevant information. Consider interviews with retired airport fire department or operations staff to gain information.
 - Document dates, duration, and quantity of AFFF used for fire and equipment training, as well as the location of these events, including the spray zone. Include both current and known former fire training areas.

- Preliminary Investigation & Analysis
 - Identify areas of known or suspected PFAS release or disposal, including areas of emergency response, training releases, accidental AFFF release, and tenant uses, potential AFFF disposal areas, landfills, areas where biosolids may have been used and areas where construction/other materials may have been buried. Document as

- much information as possible including dates, times, durations, and type of materials released or disposed.
- Identify other potential source areas within the vicinity of the airport such as adjacent military facilities, landfills, fuel storage areas (with fire suppression systems) and industrial areas.
 - Identify the location of storm drains, drainage swales, and other areas where stormwater is stored, conveyed or discharged, as the potential for PFAS entering the storm water management system is high.
 - Identify sensitive receptors within or adjacent to the airport property, such as wetlands or known threatened or endangered species. If there is a reason to suspect PFAS contamination in a given area, sampling should be conducted to determine if contamination exists and, if possible, to delineate its full nature and extent.
 - Identify what receptors are present that may ultimately be impacted by any PFAS contamination, such as drinking water sources, agriculture, specific ecological resources, etc. Airport operators should have an idea of whether drinking water wells are downgradient of any potential release areas.
 - Consider adding any sampling results to an any existing airport GIS database.

Tips for Investigation and Analysis

Airport operators that decide to conduct PFAS investigation and analysis inevitably have many questions about how to proceed. This is especially true given the high level of technical, regulatory, and toxicological uncertainty with PFAS compounds. The following are some considerations to keep in mind when working with environmental consultants on PFAS, and which may help to minimize the cost:

- Investigation is generally an order of magnitude less costly than remediation. Proposing to skip a sample here or there to save on costs will not save in the long run if it leads to a missed opportunity to conduct a more targeted remedial effort.
- Understanding what data are necessary for regulatory reporting and proper remedial design is critical – and how those benchmarks may change in the near future. If an airport operator has already been required to perform sampling of soil and/or groundwater, adding sample locations, PFAS concentrations and depth of impacted soils brings the airport operator one step closer to developing a robust risk management approach.
- Development of a Conceptual Site Model (CSM) can greatly aid PFAS risk assessment and management efforts. The CSM is designed to help identify and control exposure pathways. There are many levels of sophistication of a CSM and the base case does not necessarily require analytical data; such information can be added if or when it becomes available. A CSM can be used to identify potential migration routes and receptor locations for PFAS impacted groundwater and surface water, potential receptors on and off site, such as potentially completed pathways to drinking water wells or intakes within a reasonable proximity to the airport. The CSM needs to consider surrounding industry and land uses as potential additional sources for PFAS. If geologic, hydrogeologic, and/or PFAS data exists for an airport, this will make the CSM more useful.

- Take care to ensure the technical experts design and conduct testing and analysis with a specific goal or goals in mind, rather than conducting open-ended investigations. This will keep the team focused on the task at hand, reduce time, and lower costs.
- Understand the remedial investigation through remedial construction and operation process. While subtle differences exist between regulatory programs, they are similar between states and between state and federal programs.
- There are no PFAS “silver bullets” to remediate PFAS in soil, sediment, or groundwater. Airport operators should be sure they understand the track record of success of any proposed remedy. The use of an innovative technology may be appropriate but there are often hidden costs such as the ability to achieve remedial action levels (99% reduction sounds good but means nothing if the technology does not achieve clean up goals) and regulatory acceptance of the technology (why pilot test a technology that is a nonstarter with the agency?).
- Focus efforts on risk-based corrective actions. U.S. Airports are generally under the long term ownership and control of governmental agencies, and can provide for effective institutional controls in the long term. Additionally, airport surfaces (concrete or asphalt) offer good protection against direct contact with PFAS soils, and may impede the spread of PFAS into groundwater. For example, address known source areas that are impacting groundwater, cut off completed exposure pathways (such as groundwater to potable wells), and include administrative controls such as property use limitations. Consider capping as an alternative where it makes sense to avoid unnecessary disposal or treatment costs.

The results of consultant’s investigation and analysis should be added to an airport risk management plan. They should also be socialized among the airport leadership team for their input and review.

Limiting Legal Liability

Hiring PFAS-specific legal assistance may be necessary, especially when an enforcement action appears imminent, significant off-site PFAS impacts exist, or a lawsuit has already been filed against an airport. Regardless, airport operators should take the following practical steps to limit their PFAS legal liability.

- Don’t Make It Worse
 - Until there is more regulatory certainty, consider a moratorium on offsite soil disposal to avoid spreading the contamination to a landfill. A moratorium may not be realistic for many airports, so if off-site disposal is necessary, it should be sent to hazardous waste (RCRA Subtitle C) landfills to limit potential future liability. Ensure proper disposal management procedures are followed and retain hazardous waste manifests.
 - Soils should be characterized before they are moved within an airport’s footprint. Airport operators should be cognizant of, or check with their legal counsel about, state requirements for testing, stockpiling/disposal and onsite re-use and should have soil management plans that comply with those requirements. In addition,

records should be kept on the quantity and locations the soils were taken from and where they were moved.

- If groundwater at the airport has been impacted, its use should be avoided for irrigation, consumption and maintenance.
 - Airport operators should know where PFAS containing materials are stored and used at the airport.
 - Tenants with AFFF fire suppression systems should be required to avoid discharges of PFAS to the maximum extent possible under the law (recognizing that some local fire codes may still require AFFF for some types of hangars). The airport should understand how and where the hangar fire suppression foams are discharged.
 - Airport operators should keep abreast of local and national PFAS legislation and proposed regulation, or employ legal counsel who is well informed on PFAS, to aid in overall planning, risk management, budgeting, and compliance.
- Communication & Transparency
 - Airport operators should ensure that protocols for communications with regulatory agencies and the public are in place before regulators require any remedial investigation process to begin.
 - Airport operators should disclose potential PFAS liability risk in Official Statements (and other bond and financial disclosure documents). If litigation has been threatened or initiated, this will require more detailed discussion, but for most airports, the use of PFAS in AFFF at the airport is simply an additional risk factor to be noted among many until there is greater clarity regarding all of the issues noted above. Airport operations should check with legal counsel to ensure their disclosures are legally sufficient but do not disclose more than is necessary.
 - Coordination with Regulators
 - Airport operators should consider themselves in a long-term relationship with environmental regulators and act in manner conducive to making that a productive relationship.
 - Airport operators should not admit liability and always reserve their rights.
 - Airport operators should consult with legal counsel in all responses to information requests and other interactions material to past or present PFAS management.
 - Consider Cost Recovery Early
 - CERCLA allows liable parties to seek costs from other liable parties. Airport operators should consider what other entities (airport tenants, manufacturing operations, landfills, non-airport firefighting, areas of biosolid use and military bases etc.) may be sources of PFAS and accumulate supporting information for that belief. Consult with an attorney experienced in cost-recovery to develop an appropriate strategy.

- Any remedial efforts conducted should be performed in substantial compliance with the National Contingency Plan and well documented to maximize the possibility that costs can be recovered later on under CERCLA.
- When developing sampling programs, airport operators should take care to select locations that can more easily demonstrate isolation of airport impacts from other sources and try to develop a chemical fingerprint that can distinguish airport-related PFAS from other sources.
- Airport operators should also review their historic insurance policies as many early (pre-1986) policies may cover costs related to releases of PFAS.

Common PFAS Scenarios for Airport Operators

The following are a few common PFAS-related scenarios airport operators face. The responses below are intended to provide a framework for thinking through the issues. However, appropriate advice can vary greatly depending on the factual circumstances of each airport. These responses are not legal advice with respect to any particular airport operator or scenario.

1. What do I do with soil moved around during construction that may or may be not be contaminated with PFAS?

Airport operators often do not have the luxury of waiting for PFAS regulatory certainty before moving forward with needed projects, including capital improvements or construction of new airside and landside assets. But they must take care to balance their development needs with environmental risks and potential future liability of potentially PFAS-impacted soils. It is best if an airport operator understands whether PFAS are present or not before moving or reusing soil, especially if there is a valid reason (such as known release of AFFF) to suspect PFAS are present in the soil. This allows for developing a sound soil management policy and planning for future disposition of the soil. For airports with available space, consider stockpiling construction-related soils following best management practices for your state. In addition, consider re-using soil as part of the construction project if feasible. For instance, if soil is not impacted, consider using it “contained” beneath a building or parking area. Note that such re-use should only occur if the airport has reason to believe PFAS are not present or future migration of PFAS may be inhibited. Sending PFAS-impacted soil off-site to non-hazardous waste landfills should be avoided, even if solid waste facilities are still accepting such soils because PFAS is “unregulated” within the state.

2. How do I account for PFAS costs in airport planning?

Airport operators should consider potential impacts from PFAS in the financial planning of capital projects and be on the lookout for opportunities to reduce PFAS-related costs. Infrastructure funding for airports includes addressing PFAS contaminants in soils within its scope, for example, soil encountered during a taxiway replacement. Including considerations such as how these soils will be managed, how and where the soils will be disposed of with associated costs in the financial planning of the project will help an airport plan ahead and secure funding to the extent possible. In addition, if an airport operator is required to conduct a remedial action for groundwater impacts to a municipal water supply, partnering with a local water purveyor for infrastructure funds targeted to PFAS may be a viable approach to defraying capital costs of a water treatment and/or conveyance system. Finally, when PFAS are designated as hazardous substances under CERCLA,

cost recovery may be available for airport operators if other entities contributed to PFAS impacts on airport property – but only if they conduct any remedial operations in a manner substantially consistent with the National Contingency Plan and if costs are appropriately documented. And airport operators should take stock of their past insurance policies in case those may apply. With smart planning, airport operators can set themselves up to defray or recover some of the costs associated with PFAS cleanup activities.

3. Should I sample for PFAS ?

The question of if and when to sample for PFAS is a risk management decision for airport operators. Factors they should consider include: regulatory obligations, if any, of the state in which the airport resides; the proximity of drinking water receptors or ecologically sensitive receptors; whether PFAS are likely to have impacted site groundwater; public pressure and awareness in the airport area; and how aggressively a state, county or city entity is searching for PFAS “sources.” Airport operators should ascertain how they may be viewed by the public, regulatory agencies, financial sectors, and courts (if subsequent litigation occurs) if they were aware of PFAS risks, but chose to do nothing. For many airport operators, the testing question arises most frequently in the context of management of construction-related soils and demolition debris that are part of new or ongoing capital or restoration projects. Disposal costs for soil and demolition materials are high if they contain PFAS constituents, since, as discussed above, PFAS-containing waste should no longer be sent to solid waste landfills. Sampling soils and construction debris (from fire training, runway, taxiways etc.) for PFAS constituents prior to developing cost estimates, initiating design, and receiving construction bids may seem like an unnecessary step with the potential to derail the whole endeavor. But it avoids “surprises” during project execution and associated schedule delays and cost escalation. Managing PFAS-impacted soil and other materials appropriately from the outset will reduce future liability since it will enable airport operators to properly dispose of impacted waste instead of spreading it around. “Not knowing” and sending off materials as “we always have done” will not prevent future liability (recall that CERCLA liability, which is expected to soon apply to PFAS releases, is retroactive, strict, and generally joint and several). Airport operators should also consider requiring that laboratory testing be performed on any soils brought to the airport as backfill, to demonstrate the absence of PFAS constituents.

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As with other emerging contaminants faced in the past, as the risks posed by PFAS and tools to mitigate those risks are increasingly understood, the airport industry and others will adapt, both by adopting protective and cost-effective remediation technologies and by putting into practice sound PFAS management strategies. But airport sponsors should not wait to take action. Now is the time to integrate PFAS risk management into airport planning. A robust PFAS risk management approach – as well as hiring appropriate outside technical, legal, and other support – can help airport operators to minimize liability and address PFAS issues pro-actively and cost-effectively.