What are PFAS and Why Should We Care?

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Brian Carnevale: I'm your host Brian Carnevale and today I am joined by Joe Picciotti of Harris Beach and Vince Dick of Halle and Aldrich, an Engineering and Environmental Consulting Company. Joe is an attorney in the Harris Beach Rochester office and part of our Environmental Law and Commercial Real Estate Practice Groups, Vince is a senior Vice President at Haley & Aldrich where he is responsible for developing and implementing environmental permitting programs. Joe and Vince are going to take us into the world of PFAS, types of manmade chemicals that are prevalent in the environment. PFAS are subject to regulation by Federal and State agencies and it's important to know when to address these emerging contaminants on a project sight as well as how to address them in the most efficient and cost effective way. Vince why don't you touch on, for the audience, what are PFAS, and why are they so ubiquitous in the environment?

Vince Dick: So first off I'm going to give you a forewarning that once you hear what they are and how they've been used, it's going to become clear through our discussion of why they're really a unique challenge for society in general but especially for industries, property owners and attorneys and environmental professionals, and how to handle the liability that starts to get attached to this. So PFAS first is, I'm going to use some alphabet soup, the broad category set of compounds, PFAS are Per- and polyfluoroalkyl substances, PFAS, and actually is a very broad category that includes thousands of individual compounds that all fit within that PFAS category. Not all of them are the same in every product where they've been used or every process where they've been used, but as time goes on and they are discharged to the environment, they tend to persist and the categories that persist beyond that really fit into 2 sub-categories, PFOA or perfluorooctanoic acid and PFOS which is perflurooctane sulfonate acid. But basically both of them and all PFAS are a chain of carbons and with fluorines attached to them, typically hydrogen and then maybe an alkyl group or something that gives them their properties. If you think of them like a worm, with one head that's soluble in water and then a long tail that's not soluble in water, it's those properties of differing solubility and the stability of the compound that gives it the properties that make it, have made it valuable in different products that we use. Especially its ability to resist breakdown and its ability to resist heat without breaking down.

Brian: So that's what they are, now walk us through, where do we find them?

Vince: Take your pick they originated in the 1950s and because of their ability to resist heat and use in products, but in particular in the 1960s, the military, especially the Navy, found that use of them was very valuable in firefighting foams. Essentially, they help separate oxygen from the flammable material and were very good at suppressing fires, and they along with 3M eventually patented it and it led to the development and then use in all kinds of firefighting locations and applications. It helped them save lives and it was implemented after there was a significant fire aboard the USS Forrestal in 1967. Those same properties then started to lead to its use in other applications where those properties of being able to resist heat, so on and so you find it today in any nonstick compound: Teflon, ski wax, things that you don't want to stick, even your dental floss, if you used it this morning you may have used dental floss that included PFAS in its manufacture. But because it's been present in so many substances, it also ends up becoming present in lots of parts of the environment.

Brian: So, Vince, I imagine where we're going with this is that there's some level of PFAS in the environment that carry a level of danger.

Vince: The jury is still out on that. What first started raising warnings was, you know, any compound, many compounds are evaluated for safety and public and there are things that go along with that like toxicity studies and so on. If you go back to the 1980s and the ability to test for it, it started being found in individuals blood chemistry, and very widely in blood chemistry and early studies and this has persisted with more recent ones find that it accumulates with age, someone who stays exposed to the same amount of exposure whether they're eating it in a food product, because nonstick wraps go on food, things like that, the more that exposure persists the buildup of PFAS compounds occurs over time. So an older individual and a younger individual with the same exposure will have more in the older individual's blood than the younger individual's blood. There have been some studies that have linked PFAS exposure to chronic diseases, but cause and effect, the jury is still out. At least by the studies that we look at, and I'll qualify this that I'm a geologist, I look at the health of rocks, soil, and water as opposed to the health of individuals, and I rely on others for that but the persistence of the compounds, and its build up in individuals and the possible link to chronic diseases has compelled all agencies to look at it very seriously.

Brian: That was going to be my next question, what agencies do regulate this environment and what are those regulators doing to address PFAS? What would an acceptable level look like? Can you frame that up for us Joe?

Joe Picciotti: Sure. I will just add one thing to what Vince said in terms of the concerns, and Vince is a scientist and that's his background, there is an active plaintiff

bar in this area, several of the larger concerns, and you know their names, have paid significant judgments in the millions and hundreds of millions of dollars, I believe, in some cases in settlements and otherwise after verdicts for a determination, or determinations that there were health effects and the health effects that have been identified include: liver disease issues, reproductive problems, the data is, as Vince indicated is far from categorical in terms of its conclusions, but there are concerns about cancer effects as well. So I would just add that there's a plaintiffs bar out there that certainly has indicated that there are all kinds of issues. So, you know, we're here in New York, the New State Department of Environmental Conservation has been, is charged with addressing hazardous substances and contaminants in chemicals of concern. It has issued various guidance documents as to how to address PFAS and PFOA, if we're calling it that. For example, they've issued a document as late as January 2020 where they discuss how to assess these contaminants. At the federal level the United States Environmental Protection Agency is also looking into these things. I'm saying that generally because neither the State of New York nor the Federal Government through the EPA have identified a maximum contaminate level for PFOA or PFAS. My understanding is that some of the states may be may be doing that as we speak, but at this point New York does not have that nor does the Federal Government. The other issue worth identifying here is that New York is, we are seeing PFAS appear in all kinds soils and ground water and in water supplies and that's caused all kinds of issues and concerns and so New York is also attempting to deal with it from the standpoint of not just contaminate levels at cleanup sites but what level would be safe in water supplies and that has been a real problem because there is concern even though the jury is somewhat still out on the health effects there has been all kinds of concerns raised, so we're talking about from a regulatory perspective both the EC and EPA are looking at regulating the parts per trillion level which at some point tests the level of the ability to be able to collect the data. EPA at one point in the I think their February update was talking about assessing PFAS in groundwater and other media at 70 or 77 parts per trillion. New York is talking about a 10 parts per trillion. New York is also looking at, which is really to some degree unprecedented, and is really a concern everyone is concerned about the health impacts but from a regulatory perspective, that is a concern from the regulated community. The other thing that New York is doing is they are requiring those people who are doing cleanups already under a New York State superfund program or otherwise, to go back and test for PFAS or PFOA. That has caused some consternation among the regulated community because you have these sites that have been subject to consent orders or subject to a settlement of some kind, where a specific testing regimen and sampling regimen was prescribed and clean up was prescribed and now DEC has come back and said "Gee, we want you to test for PFAS and PFOA." The concern there is that because there is no maximum containment level that has been identified, that folks who are testing for it don't know what the ramifications are, and DEC has not made

that general data available. They basically said we're testing for it and we want you to sample for it to give us an idea of what the universe looks like in terms of impact from this material but, as Vince discussed, it's ubiquitous. The fact that PFAS element is found in brown water or soils or leeching associated with a site, doesn't mean that that was where that material was generated or originated. So that's a real concern for the regulated community.

Brian: Vince, anything to add to Joe's response?

Vince: So the 70 part per trillion limit. First, appreciate how small that number is that's, think of less than a drop of water in a pool of water to get an idea of how little that fraction, a part per trillion is relative to the total.

Joe: And when you say pool Vince is that – that's like a swimming pool, right?

Vince: Oh yes, yes. Yeah we're not talking about your kiddie pool.

So EPA issued the 70 part per trillion as a health advisory level for chronic lifetime exposure, and take into account that it's issued as an advisory, it's not an enforceable number. Now EPA is modifying its approach to that, but once that put a stake in the ground at 70 parts per trillion, then over time beginning in 2016 period and on, states started looking at that as a benchmark off of which to pivot. Start looking at things like Joe mentioned, an MCL, or Maximum Containment Limit. That's the value that typically would be tested for in groundwater, or surface water, an environmental medium. So, states then started establishing either advisory levels or standards off of that for testing at sites where industries might be subjected to it, property owners might be subjected to it, and at least as of today, there are 8 or 9 states that have established individual standards that are lower than that EPA 70 parts per trillion, New York being one of them. There's about double that for states that are working on standards and then there's a couple of states that have established a standard that is the same as that health advisory level.

The interesting thing about the distribution is, you can look at it a couple of ways, you can look at it from a resource standpoint in states that are particularly aggressive in managing their resources, New England states, New York State, California, and so on, they are the ones who have either already established or they're working on a standard that may be lower than that health advisory level. States that are especially dependent on groundwater, and so you have to deviate from a political approach from this, so states like Texas, New Mexico, Colorado, which are very dependent on groundwater, they're taking more aggressive approaches than other states that you might sort of put in the same sort of red category of administration and aggressiveness toward environmental regulation. And then others are up in the upper Midwest around the upper Great Lakes where again resources

are particularly important and you have larger population centers that are dependent on combinations of surface and groundwater. So the pattern kind of fits if you look at it that way.

Brian: I'll pose this to both of you, what are the ramifications of finding this material, and ultimately who is responsible for that cleanup?

Joe: I'll start and then have Vince pick up. In terms of finding a PFAS compound if you will, on a site, in general the law at a federal level and in most states is if you find it and it's on your site, then you have to address it if it's above a level of concern. We've talked about the fact that what makes this such a difficult issue for everyone is that there are very few regulations that deal with this. There are standards and criteria that are being developed but under environmental law, in short, if it's on your property whether you caused the material to be there or not in the first instance, the owner has the responsibility to address that in terms of investigation and any remediation, and again what makes it so difficult for PFAS and PFOA is that it's so ubiquitous and the potential for that generation of that material being away from the site on which it's found is high. There are also issues about who's responsible where it's part of a generation of PFAS or PFOA is part of a process, and my understanding in looking at the data is that these materials are still being used in some states and there is are efforts, obviously active efforts, I shouldn't say obviously, but they're active efforts to stop the manufacturing of it altogether. What happens there, in terms of responsibility, and that is a broader question really going to Tort Law and cause and effect but that's another entire issue beyond the environmental issue of, if it's on your property you have to deal with it, if you're manufacturing it and you're otherwise following the rules but that manufacturer causes environmental impacts or you know even worse, health impacts, who's responsible? Well generally speaking you're going to follow tort principles for that and you know that's why for example we've seen some of these large well known manufacturers have to pay so much in settlements because either juries or findings in settlement were that those compounds caused health impacts in particular. Vince what's your view on all of this?

Vince: I'll just pile on that answer. Because of the ubiquitousness of the materials, you can find PFAS just about anywhere you look, whether it's in products, processes with manufacturing, even if they don't use it specifically as an ingredient, it can be present in minute concentrations in other ingredients, and if you just simply go out, and a few states have, gone out and just done widespread sampling in order to understand what is a background level, if you will. It's been found lots of places. A couple of examples, Vermont did a statewide soil study, literally dozens and dozens of samples across the state and found PFAS present in nearly every soil sample in a consistent

concentration, indicating that it's presence, there would have to be non-point sources of it that are effecting widespread areas.

Joe: So I have to ask Vince, this is Q&A, you're not prepared for this but, at what levels? I mean were they finding it in the parts per trillion?

Vince: Since the detection limit that is possible and is required by most regulatory agencies that's what they shot for.

Joe: And were they finding it hundreds of parts per trillion? Tens of parts per trillion?

Vince: It varied over time but there was a very consistent pattern across the state, nearly every sample. You commented about New York state, New York state has been in a sort of a survey mode but the way they've gone about it is anybody where there is a regulatory link between the state and an individual party, whether that's an industry, property owner, hazardous waste site owner, voluntary clean-up site owner brownfield site, they've compelled that party to go out and do some sampling, even if it's just a couple of wells or a couple of data points. Other parties who are users, so firefighting entities whether it's at a large industrial facility, or whether it's a municipal firefighting entity who have firefighting foams to use in certain fires they've been compelled to report to the state and to do sampling. So, depending on who you are, in some cases you're forced to go to it, and in other cases states have taken it on as a broad survey just to understand it in the environment.

Vermont is one I mentioned, with respect to soil New Hampshire is another that's done it with respect to surface water and you can guess what their findings were. If you go to the absolute upper reaches of the major water sheds within the state, you will find samples where there are non-detects, but you don't have to go very far down stream where you start getting contribution from other tributary stream and they start picking up concentrations and they get higher to where they get down to the main 3 river systems within New Hampshire where they exit the state, and we were part of this study, we did a lot of the sampling, you find the PFAS in all the down gradient water sheds and it doesn't correlate with specific industry and so on nearby.

Joe: So closer to the ocean, or closer to the -

Vince: That's right! Stop eating lobster stop – no I'm kidding about all of that. These are still relatively low levels, but very persistent very widespread detection. So, it leads then to the challenge that we have, attorneys, environmental professionals and property owners, if a state has established a standard, and the background concentration that can be reliably produced in a set of soil samples around a state or a set of surface water samples in a

state are greater than that standard already, what does it mean with respect to enforcement - and you need to go back and help a client that we may have it's important to understand that science and then be able to demonstrate it.

Even if we make that point, then it's a matter of what's still not known in the regulatory standpoint of what the agencies will do about it

Joe: And Vince just pointed out a critical issue, which is in general when you're dealing with environmental cleanups and investigation when, and it's often difficult to do, but it can be done, you can demonstrate to the regulator, A, pick something kind of common, crazy, arsenic, is not an unusual element to find in soils in some part of Upstate New York. And the regulator may say, well I want you to clean up the arsenic from this soil because it's considered a heavy metal as I understand it, and there's concerns about it. The response in many cases, or in some cases, might be: well gee, if you look at the background level of arsenic you're asking me to clean up something that's either naturally occurring or it's been so ubiquitous (for the word we keep using here) that it would be unfair and it really wouldn't be a benefit to the environment to do, to address it. Well here with PFAS and PFOA particularly given what Vince has just said about where we're finding it in all these areas in, you know, streams and tributaries that really brings that point to a head in terms of how to deal with that from a regulatory perspective and what clients would have to do to try to address concerns that are brought to its attention by a regulator and when they do the sampling they come up with it, you know, what do we do now? What's a safe level, what is the regulator going to look for and, you know, what arguments are the clients going to make, or what data is the client going to make available to the regulator to say, "Gee, this material is already in all of this environmental media and it certainly wasn't anything that we caused or directed."

Brian: So when the regulators do decide that treatment is necessary, Vince, what are the strategies and the technologies in play that are available to address treatment of PFAS in the environment?

Vince: That's a big, "it depends," answer for a variety of reasons. So, first of all treatment depends on, what is it in? Are you treating soil? Are you treating surface water? Are you treating ground water? Are you treating air? The same properties that help keep PFAS from degrading in their use in a product are the same properties that make it difficult to break it down. When you're trying to treat a medium. You have to typically rely on aggressive chemical attack or aggressive heat, things like that that can break down the compound that was originally manufactured not to break down. So there are a variety of approaches that have been used, there are many conventional ones that have been used in the past, particularly where if you take this in sort of a priority fashion, where the regulators have gone is first, where are PFAS present in materials that people could be exposed to? So water supplies have

taken priority. So for example, while use of PFAS in products in the U.S., especially in firefighting foams, has diminished significantly since about 2010. The manufacture and use in firefighting foams especially in military circumstances has persisted both in the U.S., but also more broadly in the world. And so, for example, there are several communities in Australia where the Australian Department of Defense has routinely used firefighting foams in firefighting practice. They want their firefighters to know how to handle something and so they send them out on a weekly or monthly basis and they'll stage a fire and they use these foams and they'll do it at the edge of a runway and they'll do it on a regular basis and all that stuff just runs off with rain water. The communities nearby are reliant on the groundwater to which that rain water contributes and so there are several public water supplies in Australia that have been found to be contaminated with PFAS at significant levels and it's caused a significant issue in Australia where the Department of Defense has taken responsibility for cleaning up those water supplies now.

So, there are a variety of things that have been tried, conventional stuff like granule activated carbon, reverse osmosis, chemical oxidation, things that are relatively easy to get, but they're very expensive to keep operating and very hard to scale up to the kind of scale that you need to treat millions of gallons of water for a community. What they've settled on is use of synthetic resin, which is actually, you know, sand size beads that are specifically formulated to capture particular classes of compounds. Those have been very effective and they can be reused over and over and over again. It's not inexpensive.

Joe: How does that work Vince, is that injected then? Then are the beads injected?

Vince: No, no, no. The water comes out, the water supply wells are operated, so the water comes out of the well head, it goes into a series of treatment vessels where the synthetic resin essentially captures it out, and it has a very high efficiency capture rate, well above 90% and when a set of vessels gets loaded to the point where they've captured all they can out of that water, the water stream is switched to a new set that hasn't yet been processed and it's run through those. So this water supply is continually fed with that treated water from which the PFAS compounds have been extracted. The first set of vessels that had extracted and built up all they could load, then they're essentially regenerated by forcing steam back through start strips the PFAS out and then you've got the concentrated compound that then can be sent and burned, treated, get rid of it and then those same vessels are used again.

Joe: Please tell me that this is a more efficient method than in the old 80s and 90s that we saw with millions of dollars, carbon stripping . . .

Vince: Yes, because carbon you can regenerate a few times and then you can't, you got to throw it away with that contaminate on it so you've – while you've concentrated the contaminate mass down to a smaller volume than it was in the original groundwater, you're still getting rid of a lot of material and you're doing it over, and over, and over again at a relatively low efficiency capture. And it depends on the compound, so remember, PFAS - there's thousands of compounds, there's thousands of different compounds within the broad PFAS category. Longer ones, versus shorter ones have different treatability depending on what you're treating it with. So how you treat it really depends on what class, or what classes of PFAS compounds you're going after.

Brian: And that's a good Segway because, I imagine the answer to this question is going to be another "it depends" but what should a public or private entity know about the cost of addressing and treating these chemicals.

Joe: And actually before we get there I was going to do one follow up with Vince on that and we'll follow from that, I believe, so you know what lawyers are going to say is "How do we fingerprint this stuff, and how do we and how can we – how can I demonstrate that it's not my client that contributed but something else, or perhaps like we talked about before, that it's in background of the media that we're talking about.

Vince: Right, no that's a great point because before you allow yourself to bear the cost of that liability you want to know, it's really my problem. The fortunate thing that we've been able to do is we've been able to do is start to identify a means of fingerprinting PFAS. So, I mentioned earlier that while there's thousands of compounds the ones that in PFAS broad umbrella of compounds - the ones that persist in the environment tend to be PFOA and PFOS categories of compounds, from those it's winnowed down to where regulatory focus on the ones that are most particularly or specifically detected routinely, are a category of about 40 of them, we've used for forensic purposes and to help clients essentially charting them in a way that's called a radar plot. So if you think of if you're asked to go sample wells on your property to, A, do you have PFAS? B, what are they? We'll analyze for the set of compounds that are normally included in the EPA approved methodology but there are 9 particular ones that in this case we picked out, that then we put on if you think of a radar screen in an aircraft control tower while they're around in this case we put those compounds at 9 points around the outside so you're representing a diagram with 9 equal sides and when you go from the center of that, which is 0 parts per trillion concentration out to the outer edges, you simply go in increasing concentration. Well, what's interesting is that once you've got a fingerprint from a source it'll, and you draw those concentrations for those 9 compounds, it'll show you a shape, and it tends to be lopsided in one direction or the other with points in a

certain direction because those are the compounds whether they're the PFAS or PFOA that make up that particular sample. From a particular source, those compounds even if the concentration changes, tend to represent the same shape. So you can go from a source location for that material, out to some distant well, and as long as it's the same source, the radar plot will have the same shape. If it flows down-gradient even if the overall concentration decreases, it represents that same shape. If you then apply it to a broader area and we've done this, where our client was asked to sample because it showed up in a public supply well, we got different shapes for the public supply well than our client's property, and when we started getting samples from other nearby properties wastewater treatment plant, nearby airport, a private well, a landfill, they each had different shapes with the exception of the wastewater treatment plant. So the original well that caused the agency to say you need to go investigate, that radar plot matched most closely with the wastewater treatment plant not our client's property. Now you would think that would get our client off the hook, it didn't, but it did get the agency to start looking more broadly and focusing some of the follow up effort to those other entities. So, to come back to your question, you want to know that you really are the source of the problem before you go into what can be significant cost to characterize the problem and then cost to remediate it if that's what you have to do eventually.

Joe: And presumably – it's like DNA right? So the DNA can, you know, although it's probably not the best analogy because DNA is very significant in terms of eliminating or proving the source if you will, or the issue, here though it certainly helps to eliminate potentially areas and does help to –

Vince: And it's not a perfect method, you certainly can get, just like you can get coalescing of two different contaminant sources and a groundwater plume or in a surface water discharge, which will then lead to a different shape, a cross-breed if you will in your DNA example, you can end up with a different radar plot if indeed you have two sources mixed with one another.

Brian: So I want to wrap things up with one last question. So, if I'm a listener impacted in this space and I'm hearing words or phrases like "ubiquitous chemicals" and "liability" and "significant cost" the next thing I want to know is, how can you guys help me with that? So when you look holistically at how Harris Beach and Haley Aldrich can help manage issues related to PFAS, walk me through that.

Joe: I'll start out and then I'll defer to Vince, because that's what I do when I'm advising clients generally with these kinds of issues. So, here's what I know after, and it really hurts to say this, 30 years or more of doing this, that is the worst thing a client can do under those circumstances, with or without counsel, is to start going out and grabbing data for data's sake. Certainly the regulators have an interest in that, and I understand that and we all understand that from a societal perspective. We all want to be healthy and

have healthy water and air and all of that, but when you are looking down the barrel of a request, which quickly becomes an order, from, you know, whether it's the DEC, Dept. of Environmental Conservation or the EPA, you need to seek counsel right away and you need to have a consultant like a Vince Dick and Haley & Aldrich that can help you deal with these issues because you're going to need to understand at the beginning, at the start of the process, what am I getting myself into, or my company into, if I just start sampling and I'm developing data without a plan. You need to have a plan and that's what a good consultant and what a Haley & Aldrich and a Vince Dick can do. The plan here or the plan in these circumstances would be, is there some way to use the methodology that Vince just talked about from the beginning to put you in the best position so that you can potentially identify other sources. If you have no choice but have to do testing, how can you go about that testing methodology in a way that gives you the best chance of potentially identifying other contributors or eliminating your property or your process as a source, that's what I would say about that.

Vince: This is not an individual thing. Any of these problems takes a team and strong and knowledgeable legal representation but it also takes knowledgeable application of science and in the end our job on the scientific side is to make sure that we're applying appropriate and objective science to the problem. If you can tell the story from beginning to end, whether you have a source of PFAS on your property and there may be responsibility that as a property owner you may bear somehow, or you don't have it, and it's coming from another source, our job is to develop the data to underpin that and to be able to describe it in a way that anybody can understand. If we can do that together, meaning the environmental professional and legal representation, then the better off our clients are doing to be. That sounds very simple, it's harder to do but in the end that's what our job is.

Joe: And I will only add to that and this is – Vince will laugh when I say this because I say it all the time.

Vince: I laugh at everything you say.

Joe: And that is, that's just because I talk funny, but the other thing about that is people don't understand that with a consulting perspective, you need to have a technical advocate. That having been said, that technical advocate needs to be well qualified and needs to have credibility with the regulator. If you're attempting, as Vince said, to tell a story that's not credible then you've lost. And the only way you gain credibility is, you know like a firm like Haley & Aldrich you've been down the road before, you've got a reputation and you can say to the regulator, hey I've got Haley & Aldrich involved because they know what they're doing and Vince and his folks can talk directly to the regulator, with counsel involved of course, to try to address the issue in the best way, and that's the only way to do this, you can't – lawyers talking to regulators and trying to persuade, you know, them to follow a different path

almost never works and even if it works in the first instance, you're always going to be back to having to deal with sampling and data. So it's really essential that folks who are looking down the barrel at this kind of an issue are employing knowledgeable counsel and reputable, credible consulting folks like Haley & Aldrich to help them with these issues.

Brian: Thank you for listening and to Joe and Vince for joining us. For more information, including how to get in touch with our 2 guests visit www.harrisbeach.com and www.haleyaldrich.com those addresses are in the show notes along with some helpful slides that complement our discussion.

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