

**Minutes of the Technical Awareness Group Meeting**  
for the PFAS in Landfill Leachate Research  
Supported by the Hinkley Center for Solid and Hazardous Waste Management

**Meeting held, August 21, 2019, 2 to 4 pm**  
University of Miami, McArthur Engineering Building, Room 306  
Meeting Participation was Also through Virtual Connection

**Attendees:**

*In person*

Fangmei Zhang, Miami-Dade Department of Environmental Resources Management  
Hekai Zhang, University of Miami  
Helena Solo-Gabriele, University of Miami  
John Schert, Hinkley Center for Solid and Hazardous Waste Management  
Lee Casey, SCS Environmental Consultants and Contractors  
Liz Foeller, Waste Management Inc.  
Malak Anshassi, University of Florida  
Mario Porcelli, Miami-Dade County, Department of Solid Waste Management  
Timothy Townsend, University of Florida  
Viraj da Silva, SCS Environmental Consultants and Contractors  
Weiland Uchdorf, Miami-Dade County Department of Solid Waste Management  
Yalan Liu, University of Florida  
Yanett Rodriguez, Miami-Dade County Department of Solid Waste Management  
Yutao Chen, University of Miami

*Via computer webinar*

Amede Dimonnay, Broward County Environmental Engineering and Permitting Division  
Ashley Danley-Thomson, Florida Gulf Coast University  
Bob Curtis, SCS Engineers  
Bryan White, Manatee County  
Caroline Devitt, SCS Engineers  
Cory Dilmore Environmental Administrator, Florida DEP  
Eric Charest, Indian River County Department of Utility Services  
Gail DeRuzzo, Battelle  
Hilary Thornton, EPA Project Manager in EPA Region 4  
Jamey Wilkes, Clay County Dept. of Environmental Services  
Jean-Rene Thelusmond, North Carolina State University  
John Merrill, Geosyntec Consultants  
Kavitha Dasu, Battelle  
Kevin Vann, CDM Smith  
Kyle Clavier, University of Florida  
Larry Ruiz, Hillsborough County Solid Waste  
Linda Monroy, Lee County  
Lois Rose, Sarasota County Solid Waste  
Lynn Zender, Zender Environmental Health and Research Group  
Mark Culbreth, Environmental Consulting & Technology  
Morton Barlaz, North Carolina State University  
Nicole Robey, University of Florida  
Page Jordan, Oak Ridge Institute for Science and Education  
Rebecca Rodriguez, Lee County

Richard Meyers, Davie and Broward County  
 Robert Curtis  
 Robert Graessel, Miami Dade County Dept of Solid Waste Management  
 Sam Levin, s2li Consultants  
 Sean Peterson, Zender Environmental Health and Research Group  
 Shaopeng Xu, University of Florida  
 Teresa Boeshaghi, Florida Department of Environmental Protection  
 Terry Cerullo, Florida Department of Environmental Protection  
 Thomas Mulligan, Brevard County Solid Waste Management Department  
 Thomas Smallwood, University of Florida  
 Tim Bahr, Florida Department of Environmental Protection  
 Wes Henderson, Hinkley Center for Solid and Hazardous Waste Management

*Additional logins*

dbroten  
 dlw  
 utlsw12  
 Farrell\_JA  
 7274698811  
 8502458790

**Meeting Agenda**

**(click on item to go to recording for the presentation, questions and answers are written below)**

1. Welcome and introductions
2. PFAS Background Helena Solo-Gabriele
3. Prior Hinkley Study Helena Solo-Gabriele
4. Question and Answers #1 (see below)
5. Future/Current Hinkley Study
  - a. Sample collection strategy Hekai Zhang
  - b. Total PFAS versus landfill type and treatment Yutao Chen  
 Questions and Answers #2 (see below)
  - c. Landfill physical chemical parameters Yalan Liu  
 Questions and Answers #3 (see below)
  - d. Project future plans Helena Solo-Gabriele
6. Future EPA Star Grant Tim Townsend
7. Question and Answers #4 (see below)
8. Adjourn

**Questions and Answer #1** (after Helena’s presentation):

1. Q: What caused the EPA to issue their guidance?

R: We presume that it has to do with the health impacts that are now known in terms of blood levels in humans.

Q: In these political times it is counter-intuitive. [Is it possible to get a blood test?]

R: Agreed, we are not exactly sure what is causing the EPA to take note. It likely raised to do with raised awareness.

R (audience): There were studies that showed the health effects from the Dupont factory in Ohio. People nearby were getting sick. A group of 70,000 issued a lawsuit and won. Minnesota also filed suit, arguing that waste from major PFAS manufacturer 3M Co. contaminated water and land. These events let EPA pay more attention on PFAS problems. The attorney of the Ohio suite was Robert Bilott. The New York Times published an article about this attorney that further increased awareness. [This article was found at: <https://www.nytimes.com/2016/01/10/magazine/the-lawyer-who-became-duponts-worst-nightmare.html>]

2. Q: Graphic of temperature versus PFAS, is there information available about the residence time of the waste within the stream and on the grates.

R: This question was not asked but we can go back and ask the landfill operators.

Q: What is the incineration temperature for 100% destruction of PFAS in solid waste?

R (from audience): 1000 degree Celsius.

Q: What is the process to destroy PFAS via incineration? How does this process work?

R (audience): Some research shows that incineration might be a possible method to remove PFAS. Actually, incineration converts some PFAS to other species of PFAS. But it still can decrease the PFAS concentration in some aspects.

Q/comment: Compared to dioxins it may have similar temperature destruction effects.

3. Q: What is the research team pursuing in terms of future PFAS work. Is there work towards evaluating PFAS in air?

R: Currently we are focused on leachates, although sample collection in air would be very important.

4. Q: Is there any method, like biological treatment process, in the landfill can reduce the PFAS levels?

R: Aeration is one of the common methods use in the leachate treatment process, usually for ammonia removal. The process can change the precursors of PFAS to other types of PFAS, but it cannot reduce total PFAS concentration very well. The PFAS level seems similar before and after aeration.

5. Q: For the measurement methods of EPA used to estimate PFAS, did they used method 537 or others?

R: We went to the lab to watch how the PFAS concentrations are measured in the leachate samples. EPA has an SOP available for the measurement methods and we will share this after the meeting.

6. Q: Some experiments show that PAC (powdered activated carbon) is a method which can reduce the PFAS level in leachate, do you have any research on PAC?

R: [Answered later during the presentation] In samples from seven on-site leachate treatment systems, only one landfill used PAC in the treatment. Based on the PFAS results, it seems that PAC was not very effective to treat PAC. We take samples before, during and after the PAC treatment, and their PFAS concentration looked almost the same.

## Question and Answers #2 (after Hekai's and Yutao's presentation)

1. Q: Different plastics were manufactured during different time periods. There may be an opportunity to sample different cells of different ages to get an estimate of the release from different plastics. Also, why was there an interest to analyze for metals?  
R: The metals were analyzed because we were also evaluating treatment processes and we were interested in understanding whether metals are removed through treatment.  
Q: Slides show huge differences in various samples. For example AH21 and AH22. Do those samples have anything to do with each other?  
R: These samples came from different cells at the same landfill. There is huge variation.  
R: There is also variation in ash landfills. Some ash landfills co-dispose MSW. Landfills that were purely ash had lower levels of total PFAS. Those that co-disposed ash and MSW showed higher levels of total PFAS.  
Q/Comment: So the question is about the variability that we're observing from the different cells. Are you talking with the landfill operators to better understand the age of the waste and the characteristics of that waste?  
R: What we do when we set up our sample collection plan..... We do have two interviews with the solid waste operator to get a better sense of where we can collect samples and properties of the landfill that would be useful, such as the age, and waste type. We document as best we can. After we have the results, we may need to do a second round of interviews with the solid waste landfill operators with the result in front of us, to better understand possible reasons for the variability. For example the question about AH21 and AH22 would be useful to discuss with the landfill operator.
  
2. Q: It would be of use to evaluate the fate of the solid waste residue. Is there a way to bind the PFAS. If the concentrate from RO is re-introduced to the landfill, without binding, the PFAS will be treated over and over.  
R: Excellent point.

### **Question and Answers #3 (after Yalan's presentation)**

1. Q: What's the form of arsenic in the gas condensate ?  
R: The gas condensate are mixed with leachate, it's hard to tell which part of the liquid comes from the gas and which comes from the leachate.  
R: In terms of the arsenic species, we did not measure it but it may be a volatile form.  
R/comment: The best place to get the gas condensates is at the knock out stations. Also, the true gas condensates are the wells with the pumps. Some of the gas condensates sampled included the well with the pump. We've also collected the samples at the flare stations.  
Comment: Collection of true gas samples is tricky and may need to request some help.  
R: Some have significant expertise in this area.
  
2. Q: In looking at the PFAS graph versus the total organic carbon, do you separate by waste type samples and distinguish ash from municipal solid waste and construction demolition waste?  
R: We did the analysis. We didn't find a very clear difference between those different types. It's probably because there's a lot of variabilities for so many samples. And we didn't show the results here. But we still need to do additional work to further tease out the results.

### **Question and Answers #4 (after Tim Townsend's presentation)**

1. Q: How long did the CCA work take place?  
R: CCA is still going on, but it has been 2 decades to date.  
Q: How long do you predict the PFAS work to go on?

R: Very long probably after we retire.

2. Q: From a perspective from a municipal official they are going to want to know how to get rid of it. What is the solution?

R: Is there something that can be added to it to bind it up so it does not come out once in the landfill.

Comment: Another option is to burn it. May also be able to measure a surrogate as a way to address given the large number of compounds. Whether it is on activated carbon, ion exchange resins, or if put back into the landfill from the RO system, ideally it should be destroyed. Areas for productive research for the Hinkley Center include evaluating the size of the problem in Florida and the impact to groundwater.

3. Q: What is the concentration in the groundwater samples and can it be influenced by adjacent areas?

R: The groundwater samples can be influenced by the location at the landfill, for example, whether the well is upgradient and downgradient. Also it might be influenced by the adjacent landfill cells. For the most part, the groundwater samples were much lower in total PFAS concentrations relative to the leachates. We are interested in looking at practices at the landfill (e.g., spraying leachate) to see if there is an influence. Collecting groundwater is not easy. Some operators do not allow. Others indicate that we are to go through their consultants and only their consultants can provide the sample. Others allow us to collect a groundwater sample.

4. Comment: Would be useful to put on the web site a fair overview of concentrations in people and then provide guidance on how to get tested.

Comment: The solid waste trade magazine articles may be useful to post.

5. Q: The question is about sampling at POTW (Publicly owned treatment works)

R: Currently, we focus on specifically analysis on landfill. Some other states already do the studies on POTWs.

R (audience): There are states such as CA, NC, and others that have guidelines for POTWs and drinking water.