

# Comments on Proposed Disposal of Coal Combustion Ash in Subtitle D Landfill in Clay Mines

Report to  
Therese Vick, Blue Ridge Environmental Defense League  
Glendale Springs, NC 28629

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## **Introduction**

This letter is sent in response to your request for a letter for inclusion in your comment notebook concerning potential public health, water quality, and other impacts of the proposed disposal of electric generation coal combustion ash in former clay mines in North Carolina.

Based on press articles I have seen on this matter, a key issue is the ability of US EPA Subtitle D permitted landfills liners to protect public health and the environment for as long as the coal combustion ash will be a threat. Since we have not had support to conduct a detailed review of this proposed disposal of coal combustion ash at each location where this disposal is proposed to take place, this letter is limited in scope to general comments on these issues based on my more than 30 years of experience in investigating the potential and existing impacts of solid wastes landfills that are design to meet Subtitle D landfill requirements.

## **Background to Comments**

Dr. G. Fred Lee, PhD, PE, BCEES, F. ASCE and Dr. Anne Jones-Lee, PhD are president and vice president, respectively, of G. Fred Lee & Associates, a private consulting firm of which we are the two principals. Information on our firm is available on our website [www.gfredlee.com](http://www.gfredlee.com) which also provides a summary of areas of our expertise and professional experience.

Dr. Lee earned a BA degree in environmental health science from San Jose State University in 1955, which included course work on landfill impacts; Master of Science in Public Health from University of North Carolina Chapel Hill in 1957; and a PhD in Environmental Engineering with minors in public health and aquatic chemistry from Harvard University in 1960. For 30 years he held university graduate level teaching and research positions at several major US universities where he conducted more than \$5 million in water quality research and developed about 500 professional papers/reports. Dr. Jones-Lee earned a BS degree in biology from Southern Methodist University in 1973 and a PhD degree Environmental Science from the University of Texas, Dallas in 1978. For 11 years she held graduate level university teaching and research positions at several US universities, including Associate Professor of Environmental Engineering with tenure at the New Jersey Institute of Technology in Newark, NJ.

In addition to our university appointments, we were part-time private consultants to governmental agencies, municipalities, environmental groups, and citizens' groups. In 1989 we refocused our professional work to full-time private consulting and professional service. Attached is a summary of a number of consulting projects we have undertaken that have pertinence to these comments [see [www.gfredlee.com](http://www.gfredlee.com)]. As discussed most of those listed are devoted to investigating and evaluating potential impacts of landfills on public health and groundwater quality with particular emphasis on significant deficiencies in the US EPA Subtitle D and C regulations governing solid and hazardous waste landfills for affording protection for as long as wastes are a threat. We have developed over 90 professional papers/reports on these issues, most of which are available on our website [[www.gfredlee.com](http://www.gfredlee.com)] in the Landfill Impacts section. Of particular note for these general comments is our "Flawed Technology" review: Lee, G. F. and Jones-Lee, A., "Flawed Technology of Subtitle D Landfilling of Municipal Solid Waste," Report of G. Fred Lee & Associates, El Macero, CA, December (2004). Last updated Jan (2015). [www.gfredlee.com/Landfills/SubtitleDFlawedTechnPap.pdf](http://www.gfredlee.com/Landfills/SubtitleDFlawedTechnPap.pdf)

That review provides detailed discussion, drawn from our expertise and experience and with references to the professional literature, on aspects of Subtitle D landfilling approaches that affect their ability to provide protection of public health and groundwater quality for as long as the wastes are a threat. Particular focus is on the ability of Subtitle D liners to prevent the release of hazardous and otherwise deleterious chemicals when contacted by water that breaches the cover, and also of other containment and monitoring systems included in such landfills, so as to protect public health and groundwater/environmental quality for as long as the wastes in the landfill are a threat.

Our writings on efficacy of landfill liners for containment of waste components in landfills evolved from our US EPA-sponsored landfill liner research and university projects on long-term liner integrity. HDPE plastic-sheeting liners used in landfill liners is a low-cost liner material that, if properly installed and protected from puncture during waste deposition, can provide limited-duration containment of waste-derived components. However the integrity of key liner properties deteriorate over time and cause the liner to eventually fail to prevent penetration by waste-derived leachate and subsequent pollution of groundwaters underlying or hydraulically connected to the landfill area. As discussed in our "Flawed Technology" review, the US EPA reviewers of landfill liner integrity concluded that HDPE liners will eventually fail to prevent waste-derived chemicals from penetrating the liner and causing groundwater pollution. As we discussed, there is a variety of factors that affect the length of time a landfill liner will be sufficiently effective in collecting leachate generated in the landfill; integrity could hold for a few years, decades, or a hundred year. However, there is no doubt the eventually the liner will fail to prevent pollution of groundwater with waste-derived leachable components. Since landowners in the vicinity of a landfill should be entitled to groundwater free of hazardous and deleterious chemicals forever, wastes with leachable components such as coal combustion ash should not be permitted to be deposited in landfills that do not provide protection of the groundwater resources forever.

In 2014 we were asked by the editor of *WasteAdvantage* magazine to develop a review article on landfill postclosure issues owing to our extensive professional writings on deficiencies in the US

EPA Subtitle D regulations for providing public health and environmental protection from chemicals in solid wastes that are permitted for disposal in Subtitle D landfills. Our overview of funding issues was published as:

Jones-Lee, A., and Lee, G. F., "Landfill Post-Closure and Post-Post-Closure Care Funding - Overview of Issues," WasteAdvantage Magazine 5(12):24-26 December (2014).  
[http://www.gfredlee.com/Landfills/Funding\\_Issues\\_WasteAdvantage.pdf](http://www.gfredlee.com/Landfills/Funding_Issues_WasteAdvantage.pdf)

We have also developed professional writings on evaluating the impact of proposed landfills that provide guidance on issues that need to be evaluated in permitting landfills including:

Lee, G. F., and Jones-Lee, A., "Guidance on the Evaluation of Potential Impacts of a Proposed Landfill," Report of G. Fred Lee & Associates, El Macero, CA (2015).  
<http://www.gfredlee.com/Landfills/EvaluationImpactLF.pdf>

Review of our guidance on developing landfills shows that we strongly support developing landfills for non-recyclable wastes that will be protective for as long as the wastes that are deposited in the landfill will be a threat.

### **Threat of Coal Combustion Ash**

Based on our academic backgrounds in engineering/science, public health, and water quality investigation/control, experience in conducting research, and the professional literature, coal combustion ash contains a wide variety of hazardous and other chemicals that pose a threat to human health, groundwater and surface water quality, and the environment. That threat will remain for as long as the wastes are present in the landfill, effectively forever.

Several years ago we developed the following review of potential impacts of landfills and postclosure costs:

Lee, G. F., and Jones-Lee, A., "Review of Potential Impacts of Landfills & Associated Postclosure Cost Issues," Report of G. Fred Lee & Associates, El Macero, CA, April (2012a).  
[http://www.gfredlee.com/Landfills/Postclosure\\_Cost\\_Issues.pdf](http://www.gfredlee.com/Landfills/Postclosure_Cost_Issues.pdf)

A section of that report beginning on page 13 addresses electric generation ash landfills. As discussed there, coal ash has been found to leach chemicals that are a threat to water quality. That section states:

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#### **Electric Generation Ash Landfills**

Some landfills receive that electric generating station combustion wastes (ash) that arise from burning coal. Considerable attention was paid to potential environmental pollution by coal ash residues following the failure of a large TVA coal ash pond several years ago near Kingston, TN. "Earth Justice" published a report entitled, "Coal Ash Pollution Contaminates Groundwater, Increases Cancer Risks," on September 4, 2007 that is available at: [<http://earthjustice.org/news/press/2007/coal-ash-pollution-contaminates-groundwater-increases-cancer-risks>]. It summarizes the results of a report issued by the US EPA entitled, "Human and Ecological Risk Assessment of Coal Combustion Wastes," Draft report prepared by RTI for U.S. Environmental Protection Agency, Office of Solid Waste, Research Triangle

Park, NC August 2007 [<http://earthjustice.org/sites/default/files/library/reports/epa-coal-combustion-waste-risk-assessment.pdf>]

That incident was also addressed in a report to Congress:

Luther, L., "Managing Coal Combustion Waste (CCW): Issues with Disposal and Use," Congressional Research Service report for Congress, January 12 (2010). [<http://www.fas.org/sgp/crs/misc/R40544.pdf>]

that provides a summary of potential impacts of coal combustion wastes. That report states,

*"...the primary concern regarding the management of CCW usually relates to the potential for hazardous constituents to leach into surface or groundwater, and hence contaminate drinking water, surface water, or living organisms. The presence of hazardous constituents in the waste does not, by itself, mean that they will contaminate the surrounding air, ground, groundwater, or surface water. There are many complex physical and biogeochemical factors that influence the degree to which heavy metals can dissolve and migrate offsite—such as the mass of toxins in the waste and the degree to which water is able to flow through it. The Environmental Protection Agency (EPA) has determined that arsenic and lead and other carcinogens have leached into groundwater and exceeded safe limits when CCW is disposed of in unlined disposal units."*

That report also states that the concerns about CCW management generally center around a number of issues including:

- *The waste likely contains certain hazardous constituents that EPA has determined pose a risk to human health and the environment. Those constituents include heavy metals such as arsenic, beryllium, boron, cadmium, chromium, lead, and mercury, and certain toxic organic materials such as dioxins and polycyclic aromatic hydrocarbon (PAH) compounds.*
- *Under certain conditions, hazardous constituents in CCW migrate and can contaminate groundwater or surface water, and hence living organisms. For example, EPA determined that the potential risk of human exposure to arsenic and other metals in CCW (via the groundwater-to-drinking-water pathway) increased significantly when CCW was disposed of in unlined landfills. That risk criterion was slightly higher for unlined surface impoundments."*

US EPA minimum-design, single-composite liner and conventional groundwater monitoring wells spaced hundreds of feet apart, in time the leachate generated in that landfill can be expected to pollute groundwater with hazardous and otherwise deleterious chemicals.

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### **Adequacy of Groundwater Monitoring Wells for Detecting Groundwater Pollution before Offsite Pollution Occurs**

A key issues that needs to be understood is that state landfill regulatory agencies, the US EPA, and US EPA Subtitle D landfilling regulations typically allow landfill developers to monitor for

groundwater pollution by employing vertical monitoring wells spaced hundreds of feet apart at the point of compliance for groundwater monitoring. This approach is offered as assurance that failure of liners to prevent leakage will be made known. That assurance is hollow for a variety of reasons. As discussed in our “Flawed Technology” review beginning on page 27, the typical groundwater monitoring well array for Subtitle D landfills is highly unlikely to detect polluted groundwater before offsite groundwater pollution occurs.

Overall, based on our expertise and professional experience, we strongly recommend that the state of North Carolina not proceed with permitting of coal combustion ash disposal in Subtitle D landfills in clay mines because such wastes will eventually lead to groundwater pollution by the waste-associated components.

If there are questions about these comments please contact me.

G. Fred Lee and Anne Jones-Lee