



## What the National Academy of Sciences and Other Researchers Say About Coal Ash Hazards

2006 National Academy of Sciences Found Coal Ash is Toxic to Humans and the Environment<sup>1</sup>:

- **Coal ash threatens health and the environment.** “[T]he committee concludes that the presence of high contaminant levels in many CCR leachates may create human health and ecological concerns.” (page 3)
- **Coal ash disposal has already caused harm.** “In some landfill settings, groundwater has been degraded to the point that drinking water standards were exceeded off-site. In other landfills and surface impoundments, contamination of surface waters has resulted in considerable environmental impacts; in the most extreme cases, *multiple species have experienced local extinctions.*” (page 86, emphasis added)
- **Wildlife absorb coal ash toxins.** “As a consequence of CCR disposal in surface impoundments, contaminants have been found to accumulate in the tissues of organisms utilizing the impoundments or downstream habitats. . . . *Uptake of some contaminants can be high, exceeding the concentrations known to be toxic to many organisms.* . . . [B]enthic invertebrates collected from streams and wetlands downstream from CCR surface impoundments have *concentrations of arsenic, cadmium, and selenium that can exceed the concentrations in uncontaminated sites by orders of magnitude.* (Cherry et al., 1997b; Brieger et al., 1992; Rowe, 1998; Lohner and Reash, 1999; Reash et al., 1999; Hopkins et al., 2004).” (page 74, emphasis added)
- **Exposure to coal ash sterilizes organisms.** “Most importantly, reproductive failure has repeatedly been observed in organisms exposed to CCRs or CCR effluent (Lemly, 1996; Sidebar 4.3).” (page 75)
- **The TCLP test underestimates leaching.** “Current characterization practice relies heavily on laboratory leaching tests, in particular the TCLP, to evaluate the potential hazards of CCR placement. . . . These tests . . . may *greatly underestimate the actual leaching that will occur.*” (page 127, emphasis added)
- **NAS recommends enforceable federal standards:** “[T]he committee recommends that enforceable federal standards be established for the disposal of CCRs.” (pages 10, 11, 153, 154)

2010 Duke University Scientists’ Review of the TVA Kingston Spill Shows Coal Ash Threatens Species<sup>2</sup>:

- **TVA spill coal ash is toxic.** “[L]eachable coal ash contaminants (LCACs), particularly arsenic, selenium, boron, strontium, and barium, have different effects on the quality of impacted environments. . . . [E]levated levels were found in surface water.” (page 1)
- **TVA spill coal ash endangers species.** “[T]he presence of [arsenic, boron, strontium, and barium] in high concentrations in the pore water presents a potential direct threat to infaunal species that live in the subsurface, particularly due to the high toxicity of the [arsenic]<sup>III</sup> species (9, 49). . . .” (page 17)

<sup>1</sup> National Research Council, National Academy of Sciences, *Managing Coal Combustion Waste in Mines* (2006), [http://www.catf.us/resources/filings/power\\_plant\\_waste/NAS\\_Coal\\_Ash\\_Full\\_Report.pdf](http://www.catf.us/resources/filings/power_plant_waste/NAS_Coal_Ash_Full_Report.pdf).

<sup>2</sup> Laura Ruhl et al, “The Environmental Impacts of the Coal Ash Spill in Kingston, Tennessee: An Eighteen-Month Survey,” *Environmental Science and Technology* (Nov. 24, 2010).



- **TCLP underestimates coal ash pollutant leaching.** “In the case of coal ash waste, our results indicate that the TCLP test would greatly underestimate leachate concentrations of [arsenic] for anaerobic disposal conditions, thus would underestimate the potential impact of coal ash leachate in many situations.” (pages 17–18)

2010 Testing Shows the TCLP Test Greatly Underestimates the Toxicity of Coal Ash<sup>3</sup>:

- **New tests show coal ash pollutant leaching is well above hazardous waste thresholds.** The new Leaching Environmental Assessment Framework test reveals leach rates orders of magnitude higher than the rates suggested by previous tests such as the TCLP test. Fly ash leaches toxic and other coal ash pollutants, including antimony, arsenic, boron, cadmium, chromium, molybdenum, and selenium, at levels that greatly exceed MCLs (the “TC” row presents the hazardous waste threshold or “toxicity characteristic”):

Leach results for  $5.4 \leq \text{pH} \leq 12.4$  and at “own pH” from evaluation of thirty-four fly ashes.

	Hg	Sb	As	Ba	B	Cd	Cr	Co	Pb	Mo	Se	Tl
Total in Material (mg/kg)	0.01 - 1.5	3 - 14	17 - 510	590 - 7,000	NA	0.3 - 1.8	66 - 210	16 - 66	24 - 120	6.9 - 77	1.1 - 210	0.72 - 13
Leach results (µg/L)	<0.01 - 0.50	<0.3 - 11,000	0.32 - 18,000	50 - 670,000	210 - 270,000	<0.1 - 320	<0.3 - 7,300	<0.3 - 500	<0.2 - 35	<0.5 - 130,000	5.7 - 29,000	<0.3 - 790
TC (µg/L)	200		5,000	100,000		1,000	5,000		5,000		1,000	
MCL (µg/L)	2	6	10	2,000	7,000 DWEL	5	100		15	200 DWEL	50	2

Note: The shade is used to indicate where there could be a potential concern for a metal when comparing the leach results to the MCL, DWEL, or TC. Note that MCL and DWEL values represent well concentrations; leachate dilution and attenuation processes that would occur in groundwater before leachate reaches a well are not accounted for, and so MCL and DWEL values are compared to leaching concentrations here to provide context for the test results and initial screening.

2010 Risk Assessment Performed by the EPA under the Bush and Obama Administrations Shows Dire Cancer Risk:

- **People who live near an unlined surface impoundment have an extremely high cancer risk.** EPA found that *people living near some unlined coal ash ponds can have a 1 in 50 risk of cancer* from arsenic leaching into their water – which is 2,000 times *higher* than EPA’s goal for cancer risk.<sup>4</sup> The same study found that simply converting to dry disposal and using a composite liner would reduce that risk almost to zero.

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<sup>3</sup> Susan A. Thorneloe et al., *Evaluating the Fate of Metals in Air Pollution Control Residues from Coal-Fired Power Plants*, 44 *Envtl. Sci. Technol.* 7,351 (Aug. 31, 2010), available at <http://pubs.acs.org/doi/pdfplus/10.1021/es1016558>; U.S. EPA, Office of Research & Development, *Characterization of Coal Combustion Residues from Electric Utilities—Leaching and Characterization Data* (EPA/600/R-09/151) (Dec. 2009), available at <http://www.epa.gov/nrmrl/pubs/600r09151/600r09151.html>.

<sup>4</sup> Office of Solid Waste & Emergency Response, EPA, *Human and Ecological Risk Assessment of Coal Combustion Wastes 2-4* (draft) (Apr. 2010). EPA’s “unacceptable” cancer threshold is no more than 1 in 100,000 additional cancers.