

BEFORE THE POLLUTION CONTROL BOARD
OF THE STATE OF ILLINOIS

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STATE OF ILLINOIS
Pollution Control Board

IN THE MATTER OF:


REVISIONS TO RADIUM WATER)
QUALITY STANDARDS: PROPOSED) R04-21
NEW 35 ILL. ADMIN. CODE 302.307) Rulemaking - Water
AND AMENDMENTS TO 35 ILL. ADMIN.)
CODE 302.207 AND 302.525)

NOTICE OF FILING

To: See Attached Service List

Please take notice that on October 8, 2004, we filed with the Office of the Clerk of the Illinois Pollution Control Board, an original and ten copies of the attached **Testimony Of Dr. Brian D. Anderson And Angela Aye Tin On Behalf Of Water Remediation Technology, LLC** a copy of which is served upon you.

WRT Environmental [Illinois] LLC

By: 

One of Its Attorneys

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TESTIMONY OF DR. BRIAN D. ANDERSON AND ANGELA AYE TIN
ON BEHALF OF WATER REMEDIATION TECHNOLOGY, LLC¹

My name is Angela Aye Tin, and I am currently an environmental consultant for Environmental Planning Solutions, Inc., in Springfield, Illinois. I was formerly a senior policy analyst with the Illinois Environmental Protection Agency and was employed there for 22 years. I worked in the Bureaus of Water, Land and Air pollution and held both technical and management positions. Previous to this position, I was with the Southern Illinois University School of Medicine and was responsible for a Gas Chromatography, High Pressure Liquid Chromatography and Gas Chromatography Mass Spectrometry Lab. We performed contract analysis work for the Illinois EPA. I hold a Masters Degree in Cell Biology from the University of Illinois Springfield, and a Bachelor's Degree in Physiology from Southern Illinois University Carbondale.

My name is Dr. Brian D. Anderson. I am currently the Chairman of the Department of Biology and Physical Sciences at Lincoln Land Community College in Springfield, Illinois. I was formerly the Director of the Office of Resource Conservation of the Illinois Department of Natural Resources, the Director of the Office of Scientific Research and Analysis of the Illinois Department of Natural Resources, The Conservation 2000 Coordinator for the Illinois Department of Natural Resources, Director of the Illinois Nature Preserves Commission, and Natural Heritage Database Coordinator for the Kentucky Nature Preserves Commission. I hold a Ph.D. in Biology from the University of Louisville, a Master's Degree in Zoology from DePauw University, and a Bachelor's Degree in Biology from Kalamazoo College.

This testimony will comment upon the Illinois Environmental Protection Agency's report that, "Illinois EPA conducted a literature search for radium impacts to aquatic life and found no papers or other information on this subject (Mosher, 2004)." It will also submit information that is contrary to the testimony of IEPA (Agency) staff that "there is no data for radium to indicate what the threshold concentration would be to protect aquatic life" and contradicts the conclusion that elimination of the general water

¹ This testimony is intended to be presented at the hearing to be held in this matter on October 21. Due to scheduling constraints, it may be presented entirely by either Dr Anderson or Ms Tin. They have collaborated in its preparation.

quality standard for radium is justified because "The Agency's proposal to remove the General Use and Lake Michigan standards, and establish a Public and Food Processing Water Supply standard at the federal MCL for radium 226 and 228 is protective of all uses that may be impacted by radium (Mosher, 2004)."

In the first matter, Dr. Anderson conducted a literature search using abstract services available via the Internet to any resident of the Lincoln Land Community College District (all or parts of 9 counties surrounding and including Sangamon County). He searched the FirstSearch and EBSCOhost abstracts, searching only for the keyword "radium" in the title of the journal article. Five hundred and fifty three (553) citations were returned which met the search parameters. Of these, 37 dealt with the release to, transport within, or impacts upon, ecological systems. Of those, 12 specifically reference the uptake of radium by non-human organisms in their titles. He supplemented this information with internet searches using search parameters including the word "radium" which returned results which included fact sheets and toxicity profiles from several of the Agency's sister state and federal agencies. It would appear the Agency's literature search was overly narrow and totally ignored the literature on the biological effects of radiation generally from radioisotopes. Since biological damage is caused by the radiation, rather than chemical activity at the molecular level, all such information is relevant to an assessment of the effects of radium on biota.

Contrary to the Agency's testimony before the Board, the available scientific information that was found establishes that:

- Radium produces alpha, beta and gamma radiation like all other radioisotopes (there are 40 radioisotopes like radium which are known to occur naturally).
- There is 50 years of data identifying the various negative impacts of radiation upon a spectrum of animals and plants.
- It isn't necessary to do species specific studies on whether radium can harm a particular species inhabiting in Illinois. All radiation can have harmful effects upon living cells.
- Risk increases directly with increases in exposure to radiation, no matter the source.
- No increase in radiation above background levels is without risk, i.e., there is no "safe" level, only levels with minimal increases in risk (Illinois Department of Public Health, 2004).
- Radium is a known carcinogen (Illinois Department of Public Health 2004). It is bioaccumulative and bioconcentrating (Agency for Toxic Substances and Disease Registry, 1990).

- Radium is closely related chemically to calcium. It moves easily through the environment and it can become very concentrated in calcium-rich tissues like bones and mollusk shells.
- Radium also concentrates in sediments and sewage sludge, potentially creating “hot spots” in stream sediments below discharges and contaminating sewage treatment facilities.
- In Florida (Technical Report to the Southwest Florida Water Management District, 2000) in lakes that are recharged with groundwater containing low levels of radium 226 (levels less than 5 Pico Curies/liter):
 - The sediments (20.4 Pico Curies/gram radium 226) are over 3.5 times the EPA clean up standard of 5 Pico Curies/gram over background. Typically, the increase of radium in the sediments is 10 times over background.
 - Freshwater mussel flesh contains 200 Pico Curies/gram Radium 226. A level that would require that the flesh be sent to a low level radioactive waste site.
 - Elevated levels of radium have been found in fish bone and flesh.
 - The concentration of radium in newly deposited sediment is increasing dramatically as new sediments are being deposited. (See attached charts, University of Florida, 2004)
 - At Elliot Lake, Canada in a lake that has only 2 Pico Curies/liter radium 226 below a Uranium Mine, elevated Radium has been found in cattails and in muskrats that eat the cattails (Clulow, 1996).

Clearly it has been shown that the biological mechanisms and pathways of exposure exist to allow radium to present a risk to aquatic life if discharged at concentrated levels into the environment. It is particularly problematic when bio-accumulation of radium in mussels occurs. The Illinois mussel fauna is already under severe pressure with 27 species of mussels listed as endangered or threatened species in the state (Endangered Species Protection Board, 1999). The Illinois Department of Natural Resources possesses site specific information for all known occurrences of listed species and the IEPA has a statutory obligation under the Illinois Endangered Species Protection Act to consult with IDNR on potential impacts to listed species associated with any proposed action. Further, predation on mussels by fish, waterfowl, otters, raccoons, and muskrats is well documented. Some species like raccoon, common red horse, and many species of diving ducks (including commercially valuable, hunted species like the ring-necked duck, or “bluebill”) selectively feed on mussels and could

both be in direct danger of receiving concentrated exposures and subsequently, serving as pathways to other predators and scavengers, like bald eagles or other raptors.

On another front, the land application of waste treatment sludge that exhibits high concentrations of radium opens up the possibility of many terrestrial pathways for exposure, including bio-accumulation in indigenous vegetation or in planted crops, or uptake by birds, snakes, turtles, or shrews when eat earthworms.

With regard to the levels of radium that would pose a threat to aquatic life, considerable scientific consideration has also been given this question. The U.S. Department of Energy (DOE) Biota Dose Advisory Committee has developed a standardized methodology that calculates that Radium levels over 3.75 Pico Curies/liter in water of combined radium 226 and radium 228 is above the threshold to protect aquatic and riparian wildlife populations (Biota Dose Advisory Committee, 2000). DOE Standard 1153-2002, "*A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota,*" was specifically developed to identify threshold levels of specific radioisotopes below which impacts to biota have not been observed.

In conclusion, contrary to earlier IEPA testimony, this scientific literature, clearly documents the risk that radium presents to aquatic biota. We, therefore, recommend that the current general standard for radium 226 of 1 Pico Curie/liter remain in place (recognizing there is a concomitant contribution of radiation from radium 228), until such time that the Agency familiarizes themselves with the environmental risks posed by radium and DOE Standard 1153-2002 and formulates a more defensible proposal. In my opinion, if there is affordable technology available that avoids the need to reintroduce radium to the environment, it should be employed.

Thank you for your attention, I will be glad to answer any questions you may have.

References:

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Biota Dose Committee. 2000. *A graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota for use in DOE Compliance and Risk Assessment Activities*. DOE Standard: DOE-STD-1153-2002.

Clulow et al. 1996. *Radium-226 in Cattails, Typha latifolia, and Bone of Muskrat, Ondatra zethica (L.), From a Watershed with Uranium Tailings Near the City of Elliot Lake, Canada*. Environmental Pollution, Vol. 91, No. 1, pp 41-51.

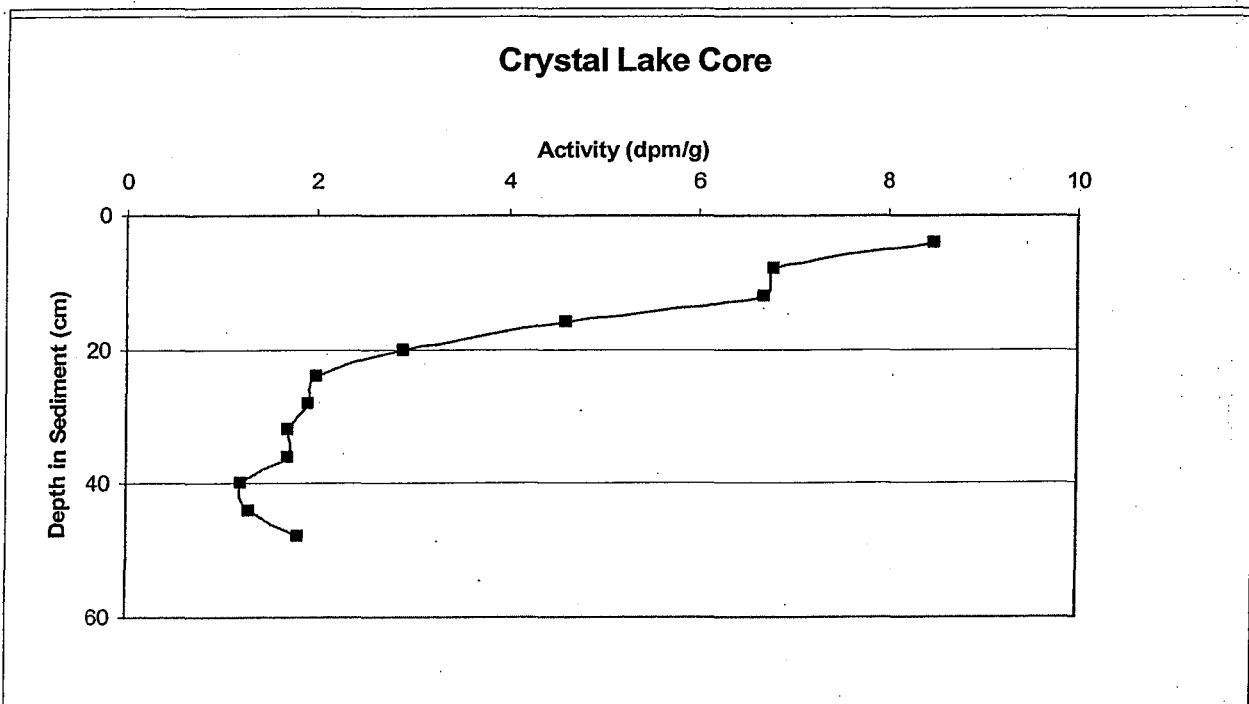
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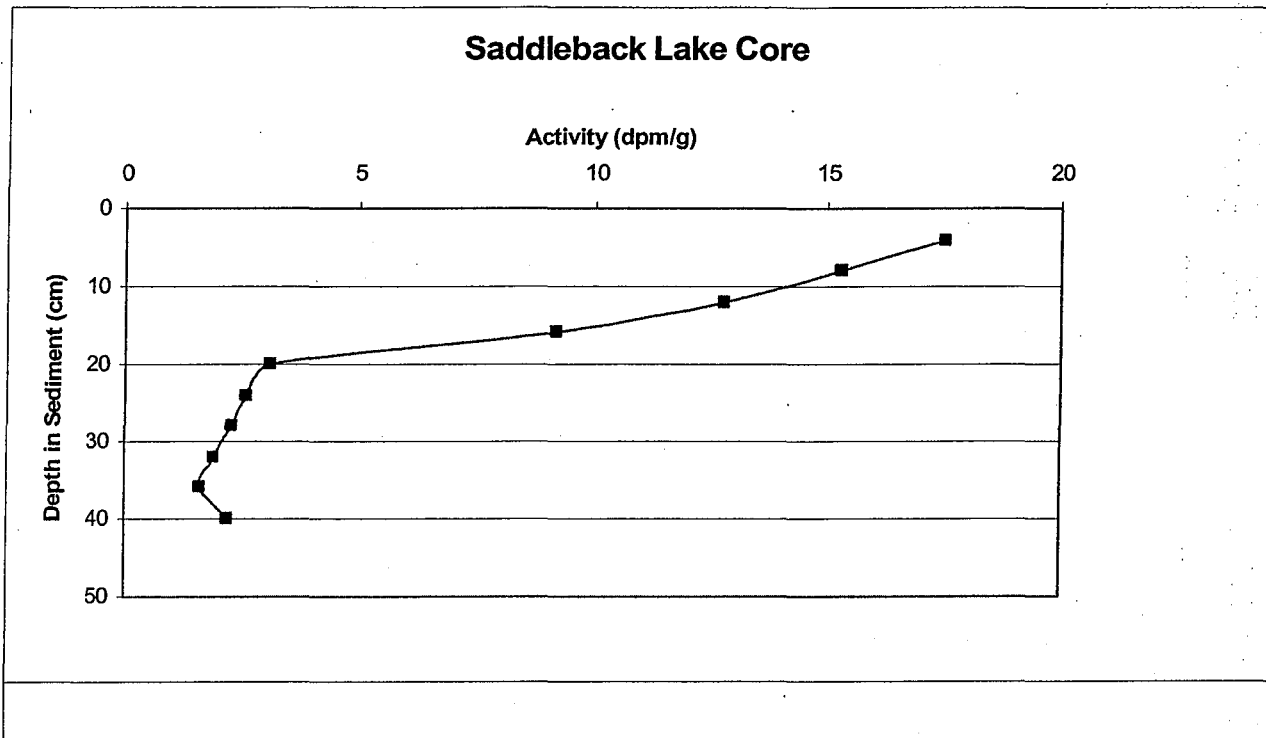
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University of Florida, 2004. *Paleolimnology of Four Groundwater-Augmented Florida Lakes (Charles, Crystal, Little Hobbs, Saddleback).* Prepared by: Department of Geological Sciences and Land Use and Environmental Change Institute, University of Florida.





Paleolimnology of Four Groundwater-Augmented Florida Lakes (Charles, Crystal, Little Hobbs, Saddleback) Department of Geological Sciences and Land Use and Environmental Change Institute, University of Florida – August 2004.

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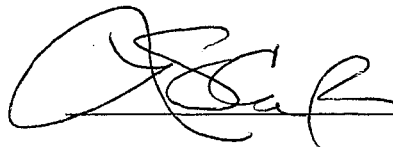
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CERTIFICATE OF SERVICE

The undersigned, an attorney, certify that I have served upon the individuals named on the attached Notice of Filing true and correct copies of the **Testimony Of Dr. Brian D. Anderson And Angela Aye Tin On Behalf Of Water Remediation Technology, LLC** and First Class Mail, postage prepaid on October 8, 2004.



A handwritten signature in black ink, appearing to be "J. A. [unclear]", is written over a horizontal line.

SERVICE LIST

R04-21

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