MISSOURI COALITION FOR THE ENVIRONMENT
6267 Delmar Blvd. 2-E • St.Louis MO 63130 • 314-727-0600 Fax: 314-727-1665 • moenviron@moenviron.org • www.moenviron.org

December 29, 2006

Debbie Kring, Community Involvement Coordinator
U.S. Environmental Protection Agency, Region 7
901 North Fifth St.
Kansas City, KS 66101
VIA Email: kring.debbie@epa.gov, wall.daniel@epa.gov

RE: West Lake Landfill Superfund Site

Dear Ms. Kring:

Thank you for the opportunity to comment on the Proposed Plan for the radioactive wastes in the West Lake Landfill Superfund site in Bridgeton, Missouri, near Earth City. I submit this letter on behalf of the members, staff, and Board of the Missouri Coalition for the Environment. This is in addition to comments previously submitted by others and those made at the hearing in October.

I respectfully request an extension of the public comment period given the size and scope of the situation at West Lake. I understand that the EPA has refused to meet with our elected officials and our representatives of our public city and county health departments until after the close of this comment period. I cannot understand the reasoning and I strongly disagree. I would hope that those trusted with the health and well being of this area would have ample opportunity to have their concerns addressed before opportunity closes for them to provide meaningful input. Further, the enormous volume of data and information that merits review also underscores the need for an extension of this comment period. I personally have only reviewed the few documents provided by your office. However, the soil, groundwater and other studies from which those documents were drafted were not provided. I would like to request them at this time regardless of whether or not the comment period is extended.

The importance of addressing the high level radioactive residues at the West Lake Landfill cannot be understated. Just like the rest of the radioactive wastes from the Mallinckrodt Chemical Works – the so-called K-65 wastes – the materials that were dumped in the West Lake Landfill pose long-term human health hazards. In fact, the radiotoxic materials in the landfill will remain hazardous into the future for longer than our records of human civilization reach into the past.

Today, our laws clearly prohibit disposal of radioactive residues such as these in an unlined pit in the floodplain. The Environmental Protection Agency's Proposed Plan to leave the waste in the floodplain should be abandoned for the same reasons such an unsuitable disposal location would be prohibited today. In 1996, Roger Pryor, Executive Director of the Missouri Coalition for the

Environment, said, "Just because the wastes happen to be there – because of naivete or ignorance – does not absolve today's decision makers of their responsibility to act prudently. Leaving it there is the same decision as putting it there."

This unwise, inadequate, and incomplete plan should be abandoned. A more comprehensive, responsible, and sufficient plan be developed in its place.

These Are Not Uranium Mill Tailings

The wastes dumped at West Lake will remain radiologically hazardous over thousands of years. The high-level residues at West Lake originated from non-native ores of impressive richness. A portion of these wastes were also dumped at Niagara Falls Storage Site in New York. A scientific study group at the Niagara Falls site described the wastes in a report about their site: "For example, the Uranium concentration in the original Belgian Congo ores from which the K-65 residues were derived ranged from 35-60 percent U_3O_8 [uranium oxide], whereas the concentration of uranium ores in sandstone deposits such as are found on the Colorado Plateau is from 0.2 to 0.4 percent U_3O_8. [uranium oxide]"[1] Because the ores were not U.S. ores, they are not comparable to our uranium mill tailings for which the regulations were written.

We question the application of standards designed for mill tailings to these high-level residues. A 1988 Nuclear Regulatory Commission study of the West Lake site describes the problem: "The analyses of soil samples indicate that the naturally occurring U-238 to Th-230 to Ra-226 equilibrium has been altered and that the ratio of Ra-226 to U-238 is on the order of 2:1 to 10:1; the ratio of Th-230 to Ra-226 generally ranges from 4:1 to about 40:1. These ratios are in accord with the history of the radionuclide deposits in the West Lake Landfill, i.e. that they came from the processing of uranium ores. The indicator radionuclides for assessment of the radiological impacts of the material are therefore U-238, Th-230, and Ra-226."[2]

The West Lake Waste is Hot and Getting Hotter

Because of the enrichment in these unique and rich ores, the hot waste is getting hotter. In the future, radiological hazards of the site will only increase. The 1988 Nuclear Regulatory Commission (NRC) study noted this difficult problem: "Assuming the ratio of activities of 100:1 used above, the Ra-226 activity will increase by a factor of five over the next 100 years, by a factor of nine 200 years from now, and by a *factor of thirty-five 1000 years from now*.[emphasis added]."[3] It goes on: "...even a small concentration of Ra-226 in 1988 implies such a large

---

[1] "Safety of the High-Level Uranium Ore Residues at the Niagara Falls Storage Site, Lewiston, New York, Committee on Remediation of Buried and Tank Wastes, Board on Radioactive Wastes Management, Commission on Geosciences, Environment, and Resources, National Research Council," Washington, D.C. 1995, pg. 10.

[2] "Radioactive Material in the West Lake Landfill, Summary Report, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards," NUREG-1308, Rev. 1, 1988, pg. 11.

[3] Ibid. pg. 13.

concentration later that it will be necessary to employ more difficult measurement techniques to confirm that the cleanup has been satisfactory."[4] With such abundant presence of its progenitors, it is erroneous to use Ra-226 alone as the controlling radionuclide for remedial action determinations. Previous reports on the West Lake site note the fact that radiological hazards at the site are growing (and dispersing, I add). We must acknowledge and address this.

The 1988 NRC report states about West Lake, "Under these conditions, onsite disposal, if possible, will likely require moving the material to a carefully designed and constructed "disposal cell"...Any possibility of disposal on site will depend on adequate isolation of the waste from the environment, especially for protection of the groundwater."[5] The Proposed Plan does not adequately achieve this isolation, nor does it protect groundwater.

Consider the Other Radionuclides

For example, radioactive Lead-210 is one of the daughter products from the Uranium-238 in the West Lake residues. Lead-210 is present, according to the Remedial Investigation, in the soil, the surface water, and the groundwater at West Lake. Specifically, it is in the soil at 10 ft. deep at 1,300 picocuries per gram at sampling site WL-234 on the western edge of Area 2; it is at the surface at 950 picocuries per gram at sampling site WL-124 in Area 1; it is at the surface at 1,370 picocuries per gram at sampling site WL-201 in Area 2. Lead-210, with its 22-year half-life, will eventually become the highly toxic, and recently newsworthy, Polonium-210. The K-65 wastes sent to Fernald, Ohio from Mallinckrodt included 281,000 picocuries/gram of Polonium-210, according to the "Fernald K-65 (Silos 1 & 2) Residues Fact Sheet," published by the Fernald Closure Project in 2006 (pg. 2). One gram of Polonium-210 = 5,000 Curies or 185 trillion alpha particles/second. The IAEA has undertaken a new review of the health risks of Polonium exposure since it has proven lethal to former Russian spies when ingested in very small quantities. Keeping the progenitors of such poisons out of our drinking water is a reasonable expectation of any remediation efforts at West Lake.

Protactinium-231 is another rare but extremely radiotoxic radionuclide that exists at West Lake only because its source ore- the Belgian Congo ores – were used at Mallinckrodt. How appropriate is it to rely on dilution when minute quantities of substances like these have dire health effects?

The Radionuclides Are in The Groundwater

The 1988 Nuclear Regulatory Commission study of West Lake concluded that the radionuclides are in the groundwater, a fact that was confirmed by Dan Wall during the public hearing in October 2006, though all sources describe contamination as "low-level." The Remedial

---

[4] "Radioactive Material in the West Lake Landfill, Summary Report, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards," NUREG-1308, Rev. 1, 1988, pg. 14.
[5] loc. cit.

Investigation (RI) for this Proposed Plan confirms that the groundwater is impacted. The RI analysis inadequately considers the reality noted above that the levels of key contaminants will increase over time and therefore their presence in groundwater and that of their progenitors deserve special attention.

The RI also confirms that there is water within the landfill in the form of perched water or saturated zones of 'flowing sands'. The RI notes "Continuous groundwater was first encountered immediately below the base of the landfill debris." (pg. 78). Alluvial material ranges from 5-80 ft. thick in Area 1 and to 100 ft. thick in Area 2 (pg. 78). Perched water was found "at depths ranging from five to 30 ft. below ground surface." (pg. 78). The presence of cattails growing on surface depressions and a seep on the western edge of Area 2 also confirms that the site is wet inside and out. The 1988 NRC report notes that "the water table is generally within 10 feet of the ground surface but at some points is even shallower."[6] The RI concludes that the seep is not a pathway for contaminant migration, however, it draws this conclusion based on one, single sample taken during a pretty dry year. The RI dismisses many single samples throughout this report that it deems "high", but in this case, it relies on a single sample to conclude that the seep is not a path for contaminant migration. How can that conclusion be drawn from one sample taken on one day? Would it be more prudent to assume that the seep is a pathway, particularly since samples of water and sediments in the weirs show contamination?

Unfortunately, West Lake is in an alluvial floodplain and it is predictably wet with active groundwater flows. This fact cannot be ignored, though the RI endeavors to do so.

The Groundwater is Moving

Groundwater moves. It moves more or less depending on a wide range of factors but it does not stay in place. In this case, it moves toward the Missouri River. Some of it moves toward the adjacent landfill because of pumping activities there relating to leachate collection. The Remedial Investigation does not address what effects pumping activities at Earth City may have on the groundwater. Nor does the Remedial Investigation address the impacts that a cessation of pumping at those adjacent locations will have on the groundwater and the interplay between the groundwater, the high-level residues leaching into the groundwater at West Lake, and the environment downstream. When pumping ceases, groundwater may re-establish its natural flow toward the River, increasing the speed, volume and groundwater levels at West Lake. This may affect migration of radionuclides toward the Missouri River. The RI fails to examine this likely situation, even though it is likely to occur within a relatively short 100-year time frame.

The RI acknowledges that the groundwater flow is influenced by the water level in the Earth City flood control channel on the western edge of Area 2 (pg. 82). This is evidence of the relationship between surface water and groundwater in alluvial floodplains. They are one water – not discrete and separate.

---

[6] Radioactive Material in the West Lake Landfill, Summary Report, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards," NUREG-1308, Rev. 1, 1988, pg. 6.

The RI mentions that soil borings into the alluvial materials just below the landfill encountered "flowing sands" (p. 22). Flowing sands are caused by either water or wind. In this case, they exist because they are moving with the groundwater. The implications of these flowing sands are not examined in the report. However, "flowing sands" sometimes create atypical groundwater movement that might increase the unpredictability of groundwater flow. They do indicate that the transport of some radionuclides through groundwater is likely at West Lake. If the sands are moving, the West Lake wastes described as 'sands' are also moving.

The RI estimates the groundwater flow at .003 ft. per day to 0.4 ft. per day. It estimates an *average* of 0.1 ft. per day. It estimates 1,000 to 100,000 gallons of water per day flow through the alluvium under the site. (pg. 84). These groundwater flow estimates are not based on studies at the site. However, it is illustrative to apply them. The high-level residues at West Lake have been at that site for 33 years. Assuming the estimated groundwater flow rate is correct, the groundwater from West Lake has moved as little as 839.5 ft. in 23 years or as much as 3,358 ft. – more than ½ a mile. In 69 years the groundwater may travel nearly two miles – enough to endanger 17 wells. In subsequent decades the 5 drinking water wells between two and three miles away might encounter West Lake groundwater. However, even these broad estimates fail to consider the hydrogeologic impacts of such events as the Great Flood of '93 which contributed greatly to the volume of groundwater in the area and possibly to its velocity as well. With the '93 flood, the groundwater from West Lake may have traveled farther. The difficulty of detecting and removing radionuclides from water suggests we should opt to prevent contamination of water sources in the first place – "an ounce of prevention". The Plan fails to take that approach.

The Remedial Investigation and the Proposed Plan fail to consider the role that colloid particles play in speeding radionuclide migration through water. A study by American and French researchers describes the process of radionuclides hitching a ride on colloids to move more quickly through groundwater in a process called colloidal transport. You must not leave the high level residues in the unlined pit in the alluvial floodplain without full consideration of colloidal transport of the radionuclides. To ignore this expedited mobility is irresponsible. The belief that radionuclides are not transported through water is not supported by the science. A majority of the K-65 wastes that were dumped at West Lake are classified as "slimes". The Niagara Falls repot notes: "The K-65 residues are present with two distinct types of materials. Approximately 73 percent is characterized as 'slimes' (particle size less than 37 micrometers), and the remainder is sand. Most of the ^{226}Ra is in the slimes fraction. (U.S. Department of Energy, 1986, Table 3.6, p. 3-15)"[7] In the silty soil at West Lake, the potential for colloid formation exists, but the Plan has not sufficiently evaluated it.

[7] "Safety of the High-Level Uranium Ore Residues at the Niagara Falls Storage Site, Lewiston, New York, Committee on Remediation of Buried and Tank Wastes, Board on Radioactive Wastes Management, Commission on Geosciences, Environment, and Resources, National Research Council," Washington, D.C. 1995, pg.40.

The Waste is Not Just in Water

The wastes are not mixed with water alone but with a chemical soup of landfill leachate that includes non-radioactive hazardous chemicals, such as the hydrocarbon solvents benzene and chlorobenzene. The Feasibility Study admits that "the RI [Remedial Investigation] was not designed to develop conclusions about the potential of contaminants to leach to groundwater over time."[8] The 1988 NRC study concluded that, "based on monitoring-well sample analyses, some low-level contamination of the groundwater is occurring, indicating that the groundwater in the vicinity is not adequately protected by the present disposition of the wastes."[9] The contaminants at West Lake include solvents and petroleum hydrocarbons and other industrial chemicals. The Plan relies on the assumption of low solubility of radionuclides in water. First, that assumption is erroneous since the solubility of radionuclides varies – and new studies show that some are more soluble than previously believed. Second, the issue of the solubility of radionuclides in solvents and petroleum hydrocarbons is likely to be different than in water. The Plan fails to examine this issue, but it is key to fully understanding contaminant migration.

The Radioactive Contamination Has Already Moved Off-Site

The RI data indicate that several sampling locations beyond the site's fence line have contaminants from the high-level residues. Sampling site WL-244 which is beyond the site's fence line indicates Thorium-230 levels at 20.8 pCi/g and detectable amounts of the dangerous U-235 daughter Actinium-227. Other sites beyond the fenceline that show contamination impacts are WL-228 (subsurface), WL-104 (subsurface), WL-103 (subsurface), and WL-207 (subsurface). Adjacent properties are also contaminated from erosion at the surface. This is described in the next session.

A History of Assumptions That Proved Wrong

One of many disturbing features of this site is the seeming lack of controls at the site over its 33-year history. The 1988 NRC report discusses an alarming occurrence. The radiological investigations in which technicians were taking gamma radiation readings, had begun in November 1980. When they returned to complete their work in May and July of 1981, they found that in Area 1 "approximately 4 feet of sanitary fill [garbage] had been added to the entire area and an equal amount of construction fill was added to most of Area 2."[10] These activities occurred in a landfill the Missouri Department of Natural Resources had "closed" in 1974. **Why was additional waste added to a "closed" landfill?** The technicians noted in the report that surface radiation readings were significantly lower in the May and July sampling events after the addition of more wastes. Whatever protections the addition of wastes provided, it did not prevent the contamination from spreading.

---

[8] "Feasibility Study West Lake Landfill OU-1," Engineering Management Support, Inc., 5-8-2006, pg. 21.
[9] "Radioactive Material in the West Lake Landfill Summary Report," U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, NUREG-1308, Rev. 1, June 1988. pg. 15.
[10] Ibid. pg. 8.

State and Federal Agencies Are Not Paying Attention

In what was an unheeded warning, the 1988 NRC report also noted that the radioactive wastes were at the surface of the berm in Area 2 with "no protective cover of soil to prevent the spread of contamination and attenuate radiation."[11] In the subsequent decade (which included the 1993 flood and the 1995 storm), the lack of protective cover resulted in erosion and contaminants washing off-site. This threat was predicted but ignored by state and federal agencies. The Feasibility Study mentions an instance of "large scale erosion" at Area 2 that deposited contamination onto adjacent properties (the Crossroads property and Buffer Zone.) "In November 1999, the vegetation and surface soil were scraped from the Buffer Zone property and a portion of the adjacent Crossroad property...by AAA Trailer, a neighboring property owner..." and "piled in a berm along the southern boundary of the buffer property."[12] The consultant relied on the grass and weeds growing on the site to prevent additional erosion and transport of contamination. As the consulting firm was conducting the soil sampling activities in 2000, it concluded that vegetation had been re-established on the off-site piles and was "determined to be sufficient to prevent windblown or rainwater runoff of these materials. Consequently, no additional interim measures were implemented."[13] Unfortunately, the lack of any interim measures lead to another failure. Before publication of the Feasibility Study in 2006, its authors discovered that AAA Trailer had again moved the piles in 2003.[14] I have not yet seen information on the current status of these off-site piles.

These events raise the concern that the Proposed Plan's reliance on the presence of vegetation to limit wind and water migration of contaminants may be ill conceived. Since no public health or environmental agency is paying attention, there is nothing preventing AAA Trailer or anyone else from bulldozing the materials again. Should vegetation be removed by natural disasters or by human activities, the Plan fails to describe a "Plan B." There is no guarantee that vegetation that is there now will be there in 5 years or 10 or 1,000. The site failed to keep vegetation in place during the short period of the drafting of this Plan! How much less can we rely on vegetation alone over time without extraordinary measures and oversight?

Institutional Controls Are Meaningless Over Eons

The Proposed Plan relies heavily on zoning and land title limitations. While it is nice to imagine that our government will still be here in the far distant future, the truth is that our nation is still decades short of our 300th birthday. And land title records are hard to come by even within that time frame. While there are land title records in northern Italy that date to 700 A.D., it would be difficult to claim that level of preservation for records on this continent. A separate issue entirely is how much influence such ancient records hold over current land uses. North

---

[11] "Radioactive Material in the West Lake Landfill Summary Report," U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, NUREG-1308, Rev. 1, June 1988. pg. 15.
[12] "Feasibility Study West Lake Landfill OU-1," Engineering Management Support, Inc., 5-8-2006, p. 141.
[13] Ibid. pg. 13.
[14] loc. cit.

American Native Americans may be in the best position to comment on whether historic land deals are honored. Population and development pressures just here in the St. Louis area threaten historic sites, traditional cropland, and wilderness. It is likely that these pressures will not subside in the future.

The Air We Breathe

One of the issues that seems to be missing from the RI and the FS is air deposition of contaminants. Given the site's history – with waste exposed at the surface during transportation and landfill activities – the likelihood of air deposition of these long-lived radioactive materials is a certainty. This reality has been overlooked. The selection of adjacent areas to use in determining "natural" background levels is suspect given the possibility of air deposition and offsite migration of surface and groundwater – particularly during the 1993 flood. Had studies been conducted in 1972 before the waste was dumped, the data would be more reliable. But they were done 25 years after the waste had been blowing, washing, and floating around in the area.

The Proposed Plan discusses the National Emissions Standards for Hazardous Air Pollutants on pg. 23. It seems to say both that the NESHAP standards for radon-222 do apply and do not apply. Please explain this seeming contradiction.

Inadequate Alternatives Analysis

The Proposed Plan does not fully consider the range of alternatives. For example, it does not consider any methods or technologies to stabilize the waste, intercept groundwater, or collect and treat groundwater. The 1982 NRC report even considered some groundwater intercept approaches that were ignored in this Proposed Plan. Alternatives 1-6 for OU-1 all fail to acknowledge the fact that groundwater flows under and through the site. This gross oversight makes it cheaper and easier for those parties with financial and legal responsibilities for this site, but fails to protect the environment and the public.

The Proposed Plan seeks to justify the use of "containment" as a presumptive remedy for CERCLA landfills. However, it fails to recognize that the high-level residues at West Lake are by no means "typical" of those found at CERCLA landfills, nor can capping at a site in an alluvial floodplain with abundant groundwater be construed as "containment." The site has no bottom, except for the steady flow of groundwater headed to the Missouri River. Is it the EPA's hope that the radionuclides would be carried off-site and then be carried downstream by the Missouri River? The preferred alternative makes this widespread dispersal a certainty. We find this approach morally, scientifically, and legally flawed.

Why not consider excavating all the high-level radioactive wastes at West Lake? This alternative was not considered. In a world where it is possible to send probes to distant galaxies, tunnel under oceans to build highways, and reconstruct delicate human nerve systems, it is not beyond imagination to safely excavate this site. Why not consider stabilizing it and storing it in an engineered and monitored cell at a location away from water and away from people? This

alternative was not considered. Why not consider excavating the hot spots, consolidating and stabilizing them and storing them in an engineered and monitored cell? This alternative was not considered. Why not consider applying the highest standard to this site that is located in a populated area upstream from drinking water intakes for a large population? Surely we should take responsibility for the West Lake nuclear weapons wastes before all memory of their creation is erased!

Further, the cost analysis of the alternatives that were considered is inadequate. Only out-of-pocket expenses are reflected in the analysis. However, in the broader view, the costs include far more than those direct expenses. What is the cost of replacing the drinking water sources for those 12 families that have nearby wells? What is the cost of the birth defects or cancers that they may experience? What is the cost of the genetic damage their children and grandchildren may experience? And should the radionuclides migrate as far as the drinking water intakes for north county and the City of St. Louis, what is the cost of addressing that catastrophe – or the harms tht it would cause? And these scenarios are just related to the mundane daily movement of groundwater. They do not take into account the possibility of natural disasters such as a flood, levee failure, or earthquake. Are there costs associated with lost property values at Earth City – the industrial and office park that lies between the high-level residues and the river?

The Niagara Falls study group concluded, "The adverse impact of death from doses to resident intruders at the Niagara Falls Storage Site could only be prevented if controls are maintained for many thousands of years or if a different method of long-term management is implemented."[15] (U.S. DOE Record of Decision, 1986, p. 4-7). We face the same challenge here at West Lake in the Missouri River floodplain. This Plan has failed to meet that challenge.

The Evaluation of Alternatives is Flawed

The evaluation of the proposed alternatives is flawed and lacking because the alternatives themselves are inadequate. The Potentially Responsible Parties (PRPs-those with legal responsibility for the site) seek to tie the agency's hands by keeping their consideration of the issues within a narrow and unrealistic box. Of the 9 evaluation criteria listed – 1) Overall Protection of Human Health and the Environment; 2) Compliance with Applicable or Relevant and Appropriate Requirements; 3) Long-term Effectiveness and Permanence; 4) Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment; 5) Short-Term Effectiveness; 6) Implementability; 7) Cost; 8) State Acceptance; and 9) Community Acceptance, this Plan allows just one – cost – to be the controlling factor. It appears the PRPs are driven by their shareholders' interests. The EPA, however, is not limited by private shareholder interests and must consider the full range of costs and impacts of abandoning the high-level radioactive wastes in place, and ignoring their impacts on groundwater and air.

---

[15] "Safety of the High-Level Uranium Ore Residues at the Niagara Falls Storage Site, Lewiston, New York, Committee on Remediation of Buried and Tank Wastes, Board on Radioactive Wastes Management, Commission on Geosciences, Environment, and Resources, National Research Council," Washington, D.C. 1995, pg. 29.

The Plan Does Not Fully Consider Human Health Risks

Radioactive high-level residues such as these in an unlined pit in an alluvial floodplain will certainly migrate off-site, if they have not already. Given the billions of years the wastes remain radiotoxic, it is certain that the groundwater will be contaminated and then the Missouri River itself. The Plan fails to consider the long-term effects of exposure to contaminated drinking water or irrigation water. What are the effects on wildlife or anglers who consume fish from contaminated waters? The Plan ignores groundwater entirely, and even admits **that "residential use and groundwater consumption were not evaluated..."** (Remedial Investigation, p. 5). This broad conclusion despite the fact that there are 12 drinking water wells between one and two miles of the site and four wells in that same area used for irrigation.

Even within its limited risk assessment, which focuses on a worker exposure scenario, it ignores important health risks. It focuses on cancer. However, equally devastating to a human are the birth defects that may be imparted to his or her offspring from exposure to radioactive materials. Babies lost to miscarriages, born without eyes, or with gross deformities, or missing limbs are not injuries to be taken lightly. Less obvious too is the genetic damage that can be transmitted to offspring from similar exposures. This Plan ignores these impacts entirely.

The Proposed Plan Fails to Apply Appropriate Legal and Scientific Standards

The Proposed Plan and the RI are mishmashes of patchwork regulations that fail to achieve the overall objective of protecting public health, the environment, and limiting risks. The PRPs in this case want to apply RCRA Subtitle D regulations for sanitary waste landfills. **West Lake is not a landfill with just regular household garbage.** Is it true that RCRA risk assessments are conducted only for a period ending 70 years after facility closure? If this is the case, how can a RCRA solution be appropriate for a site like West Lake where its contents will remain hazardous for billions of years?

Removal Can Be Achieved

In fact, it is being achieved at the other sites where this waste was dumped including: the Downtown St. Louis Mallinckrodt site, the Airport, and the Latty Avenue site in Hazelwood. (See FUSRAP work: www.mvs.usace.army.mil/eng-con/expertise/fusrap.html). The same concerns about fugitive dust that apply to West Lake are also relevant at the other Mallinckrodt sites and yet have not prevented the Corps of Engineers from removing the wastes. The need to use dust-controlling technologies like inflatable, pressurized buildings, special equipment, extraordinary oversight, and top-notch training of workers to clean up this site is essential. By all means let's do it right, but let's protect our grandchildren's community from this mess.

There is No Better Time to Remove the Waste

Leaving the waste in the floodplain, as the Environmental Protection Agency has indicated it would prefer to do, is a completely unacceptable and immoral alternative. This Plan allows

hundreds of thousands of gallons of groundwater to pass under and through radioactive nuclear weapons waste on its way to drinking water intakes. It invites disaster. The radionuclides that have not already migrated into the groundwater will migrate in the groundwater over time, and will affect people who drink the contaminated water from the Missouri River or the alluvial aquifer downstream, the fish that swim in the River, and the people who eat the fish. Those who will feel the impacts most acutely will be the unborn, the young, the old, and the weak. The risk assessments, which focus on worker exposure scenarios, fail to account for the impacts of radiation exposures to sensitive populations.

The problems at West Lake get worse with each decade that passes. Dealing properly with the 9,000 tons of radioactive barium sulfate when it was still at Latty Avenue would have prevented the widespread contamination that has multiplied into hundreds of thousands of cubic yards of contamination at West Lake. The more we wait while allowing the waste to be spread, dispersed, and moved, the more it will cost us. Whatever it costs to address the problem completely and correctly now, will be costs that we avoid in the future. We can bank on it.

Get a Better Plan

The Proposed Plan as it has been presented is inadequate, erroneous, and unwise. It should be rejected. As I stated at the public hearing September 14th, I support Alternative 7 which was omitted from the Proposed Plan. Alternative 7 is to safely and carefully remove the radioactive waste from the Missouri River floodplain and dispose of it in an area away from water and away from people - preferably in a federally licensed nuclear weapons waste disposal facility where the waste will be isolated and monitored.

Please endeavor to craft a plan that offers genuine protections of public health, the groundwater, air, and water over a long, long time.

Please keep me informed about ongoing efforts at this site.

Yours truly,

Kathleen Logan Smith

Kathleen Logan Smith
Executive Director

Enclosures

West Lake Landfill Radioactive Contamination

Radionuclide	Sampling Location	Details	In Nature	NRC Reference	West Lake Soil	West Lake Groundwater	West Lake Surface Water or Runoff	West Lake Sediment	Source
*not all nuclides were tested in samples in all media									
Th-230	WL-106	Surface			9,700 pCi/g				RIR Table B-1
Thorium-230	WL-114	Surface			7850 pCi/g				RIR Table B-1
Daughter of U-238	WL-209	Surface		1	5 29,240 pCi/g				RIR Table B-2
Highly Toxic		5 ft. deep			38,280 pCi/g				RIR Table B-2
	WL-210	Surface			18,190 pCi/g				RIR Table B-2
		5 ft. deep			12,400 pCi/g				RIR Table B-2
	WL-230	5 ft. deep			26.8 pCi/g				RIR Table B-2
	WL-231	5 ft. deep			94.5 pCi/g				RIR Table B-2
	WL-233	27 ft. deep			427 pCi/g				RIR Table B-2
	WL-234	10 ft. deep			57,300 pCi/g				RIR Table B-2
	WL-243	Surface			265 pCi/g				RIR Table B-2
	Weir 2							215 pCi/g	RIR Table E-1
	Weir 5							770 pCi/g	RIR Table E-1 and Table D-1
	Weir 6							68.8 pCi/g	RIR Table E-1
	Weir 8						9,200 pCi/liter		RIR Table D1
	Weir 9						204 pCi/liter	1,160 pCi/g	RIR Table D1 and E1
Pb-210									
Lead-210	WL-234	10 ft. deep			1,300 pCi/g				RIR Table B-2
Daughter of U-238	WL-209	5 ft. deep			1,170 pCi/g				RIR Table B-2
Parent of Polonium 210	WL-210	Surface			1,370 pCi/g				RIR Table B-2
	WL-124	Surface			950 pCi/g				RIR Table B-1
	WL-114	Surface			206 pCi/g				RIR Table B-1
		2.5 ft. deep			740,000 cpm				
	Weir 8						9,200 pCi/liter		RIR Table D-1
	D-6	Deep Well				204 pCi/liter			RIR Table C-3
Ra-226	WL-209	Surface			3720 pCi/g				RIR Table B-2
Radium-226	D-14	Deep Well				96.7 pCi/liter			RIR Table C-3
Daughter of U-238									
Th-234	S-5	Shallow well				178 pCi/liter			RIR Table C-3
Thorium-234	I-68	Intermediate well				101 pCi/liter			RIR Table C-3
Daughter of U-238	D-12	Deep well				114 pCi/liter			RIR Table C-3

Pa-231 Protactinium-231 Daughter of U-235	WL-209	Surface	2030 pCi/g	RIR Table B-4
		5ft. Deep	1930 pCi/g	RIR Table B-4
	WL-210	Surface	838 pCi/g	RIR Table B-4
	WL-234	10 ft. deep	1050 pCi/g	RIR Table B-4
	WL-106	Surface	544 pCi/g	RIR Table B-3
	WL-114	Surface	156 pCi/g	RIR Table B-3
Ac-227 Actinium-227 Daughter of U-235	WL-209	Surface	1320 pCi/g	RIR Table B-4
	WL-210	Surface	732 pCi/g	RIR Table B-4
	WL-234	10 ft. deep	952 pCi/g	RIR Table B-4
	WL-106	Surface	305 pCi/g	RIR Table B-3
	WL-114	Surface	118 pCi/g	
Ra-223 Radium 223 Daughter of U-235	WL-234	10 ft. deep	891 pCi/g	RIR Table B-4
	WL-106	Surface	293 pCi/g	RIR Table B-3
	WL-114	Surface	113 pCi/g	RIR Table B-3

Downhole Gamma Readings

To interpret these data one needs to know the background counting rate of the gamma detector at sea level above a clean surface and also in a borehole in clean soil.

			10 counts per minute (cpm) at surface in MO	
Gamma radiation-no particular nuclide	PVC-111	3 ft. deep	2,288,000 cpm	RIR Table 6-9, Table 6-11
	PVC-38	10 ft.deep	1,298,000 cpm	RIR Table 6-7, Table 6-11
	PVC-4	1 ft. deep	1,290,000 cpm	RIR Table 6-9
	WL-233	22 ft. deep	89,000 cpm	RIR Table 6-9
	WL-234	7 ft. deep	1,104000 cpm	RIR Table 6-11
	WL-209	1 ft. deep	740,000 cpm	RIR Table 6-9
	WL-210	Surface	420,000 cpm	RIR Table 6-11
	WL-211	1 ft. deep	330,000 cpm	RIR Table 6-9
	PVC-7	2 ft. deep	1,385,000 cpm	RIR Table 6-9
	PVC-10	3 ft deep	753,000 cpm	RIR Table 6-9
		10 ft. deep	152,000 cpm	RIR Table 6-9

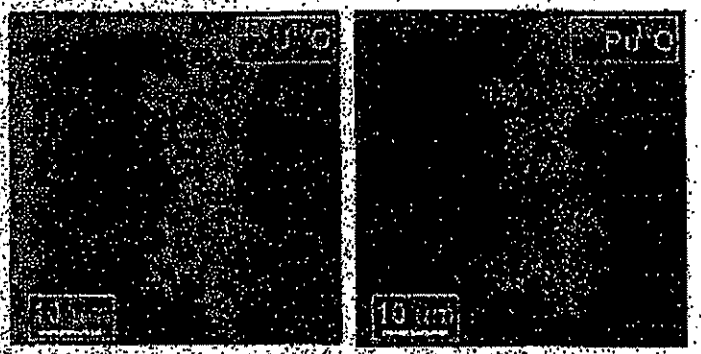
RSC | Advancing the Chemical Sciences
Chemistry World

Plutonium hitchhikers take the fast stream

26 October 2006

The radioactive element plutonium can travel through groundwater despite its low solubility: it hitches a ride on tiny colloid particles in the water.

Russian, American and French researchers have imaged plutonium clinging to mineral colloids around four kilometres away from a contaminated lake near a nuclear waste processing plant in Mayak, Russia.



Elemental maps of trace U and Pu on amorphous Fe hydroxide colloids from groundwater 3.2 km from the contaminated source, Lake Karachai, in Mayak, Russia. (The contrast of these maps has been enhanced to show the distribution clearly; intensity does not correspond to concentration of the different elements.)

© Rodney Ewing

The team's findings support earlier studies of radionuclide migration through water. A US group led by geochemist Annie Kersting reported in 1999 that plutonium, and other radioactive isotopes, might use colloids to travel unsuspected distances from underground nuclear testing sites in Nevada. It wasn't clear then exactly how this happened.

Now, says co-author Rodney Ewing, from the University of Michigan, US, researchers have identified the colloids responsible, at least at Mayak. They used high-resolution microscopy to identify iron oxide phases carrying plutonium from Lake Karachai, contaminated by a nuclear fuel reprocessing spill half a century ago.

The small colloids are ubiquitous to groundwater, Ewing explained. They form weak bonds with amorphous plutonium hydroxide, which has limited solubility in water. Ewing hopes the team's findings will settle some debates about the importance of colloids as a transport mechanism for plutonium and other actinide elements. Some scientists suggest that organic matter, dissolved in water, might also offer plutonium a useful taxi service.

Little can be done about plutonium's spread around Mayak and similarly contaminated sites. But plans to store nuclear waste underground may need to consider the possibility of colloidal transport.

European storage programmes in Finland and Sweden pack tight clay (bentonite) around copper and cast iron canisters holding nuclear waste. This provides a barrier to water and colloid transport of radionuclides, explained Charles McCombie, an advisor on international nuclear waste management programmes. In the UK, similar cement-like barriers would encapsulate steel or concrete containers, said John Dalton of Nirex, an independent organisation advising the government on nuclear waste storage.

But the US waste programme doesn't propose any clay barrier, said McCombie. The US plan is to store nuclear waste at Yucca Mountain, Nevada, in containers which would last for thousands of years, while water is diverted round storage tunnels.

Richard Van Noorden

References

A Novikov *et al*, *Science*, 2006, **314**, 638
A Kersting *et al*, *Nature*, 1999, **396**, 56

Comment: Out of sight, out of mind?
The recent recommendations from the Committee on Radioactive Waste Management should prompt a renewed research effort to tackle the problems of nuclear waste storage.

Bury radioactive waste, UK government told
Radioactive waste should be stored deep underground at sites where local communities have had the opportunity to participate in, and even withdraw from, the planning process.

Going underground
Many countries consider that the best way to dispose of nuclear waste in the long term is to bury it deep underground. Simon Morgan looks at how this could be done