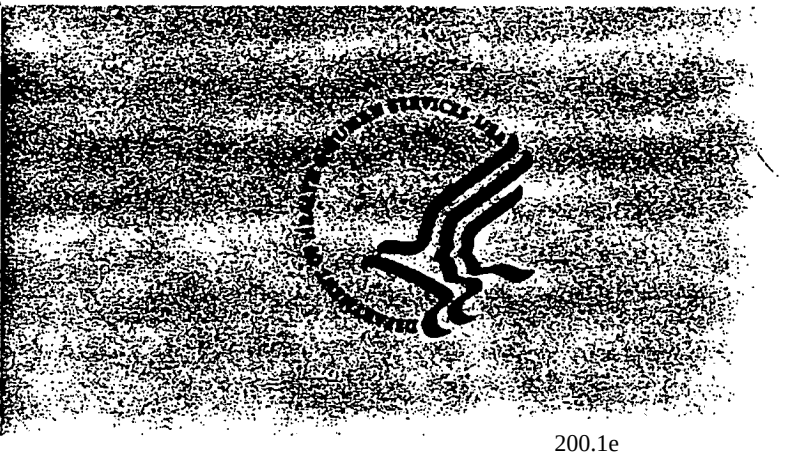
PRELIMINARY Public Health Assessment for

ST. LOUIS AIRPORT
HAZELWOOD INTERIM STORAGE/FUTURA COATINGS COMPANY
ST. LOUIS, ST. LOUIS COUNTY, MISSOURI
CERCLIS NO. MOD980633176
JANUARY 20, 1994



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AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY
DIVISION OF HEALTH ASSESSMENT AND CONSULTATION
ATLANTA, GEORGIA

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6), and in accordance with our implementing regulations 42 C.F.R. Part 90). In preparing this document ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services

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ATSDR and its Public Health Assessment

ATSDR is the Agency for Toxic Substances and Disease Registry, a federal public health agency. ATSDR is part of the Public Health Service in the U.S. Department of Health and Human Services. ATSDR is not a regulatory agency. Created by Superfund legislation in 1980, ATSDR's mission is to prevent or mitigate adverse human health effects and diminished quality of life resulting from exposure to hazardous substances in the environment.

The Superfund legislation directs ATSDR to undertake actions related to public health. One of these actions is to prepare public health assessments for all sites on or proposed for the Environmental Protection Agency's National Priorities List, including sites owned or operated by the federal government.

During ATSDR assessment process the author reviews available information on

- the levels (or concentrations) of the contaminants,
- how people are or might be exposed to the contaminants, and
- how exposure to the contaminants might affect people's health

to decide whether working or living nearby might affect peoples' health, and whether there are physical dangers to people, such as abandoned mine shafts, unsafe buildings, or other hazards.

Four types of information are used in an ATSDR assessment.

1) environmental data; information on the contaminants and how people could come in contact with them

2) demographic data; information on the ethnicity, socioeconomic status, age, and gender of people living around the site,

3) community health concerns; reports from the public about how the site affects their health or quality of life

4) health data; information on community-wide rates of illness, disease, and death compared with national and state rates

The sources of this information include the Environmental Protection Agency (EPA) and other federal agencies, state, and local environmental and health agencies, other institutions, organizations, or individuals, and people living around and working at the site and their representatives.

ATSDR health assessors visit the site to see what it is like, how it is used, whether people can walk onto the site, and who lives around the site. Throughout the assessment process, ATSDR health assessors meet with people working at and living around the site to discuss with them their health concerns or symptoms.

A team of ATSDR staff recommend actions based on the information available that will protect the health of the people living around the site. When actions are recommended, ATSDR works with other federal and state agencies to carry out those actions.

A public health action plan is part of the assessment. This plan describes the actions ATSDR and others will take at and around the site to prevent or stop exposure to site contaminants that could harm peoples' health. ATSDR may recommend public health actions that include these:

- restricting access to the site,
- monitoring,
- surveillance, registries, or health studies,
- environmental health education, and
- applied substance-specific research.

ATSDR shares its initial release of the assessment with EPA, other federal departments and agencies, and the state health department to ensure that it is clear, complete, and accurate. After addressing the comments on that release, ATSDR releases the assessment to the general public. ATSDR notifies the public through the media that the assessment is available at nearby libraries, the city hall, or another convenient place. Based on comments from the public, ATSDR may revise the assessment. ATSDR then releases the final assessment. That release includes in an appendix ATSDR's written response to the public's comments.

If conditions change at the site, or if new information or data become available after the assessment is completed, ATSDR will review the new information and determine what, if any, other public health action is needed.

For more information about ATSDR's assessment process and related programs please write to:

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Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry
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Atlanta, Georgia 30333

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uranium, thorium, radium, and radon were de
still being used to store radioactive materials.
Registry considers the St. Louis Airport site t
Although there are emissions of radon and the
soils and the emission of radiation resulting fro
currently considered a health hazard. At presen
site is indistinguishable from background levels.
may have been present at levels of health conce

Citizens have concerns regarding cases of cancer
five hazardous waste sites. These citizens request
investigate cancer occurrences in the area of the sit
review and cancer inquiry by the Missouri Departm
Implication section. ATSDR's detailed response to
the public comment period appear in the Appendix

ATSDR made the following recommendations in ord
surrounding the sites: 1) characterize groundwater, su
chemical contamination on and off site, 2) characteriz
radiological contaminants; 3) implement dust controls
Activities Recommendation Panel recommended this
community health education follow up. The Public H
actions have been taken and which actions are planne
agencies. Included in these actions is that ATSDR w
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periodically conduct follow-up assessments of the can
Avenue areas of St. Louis.

BACKGROUND

A. Site Description and History

The St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company site is in St. Louis County, Missouri. The site, which is composed of three smaller storage areas, was combined by the U.S. Environmental Protection Agency (EPA) into the present National Priorities List (NPL) site. These areas were the St. Louis Airport Storage Site (SLAPS), the Hazelwood Interim Storage Site (HISS) and the Futura Coatings Company site (FUTURA) (Figure 1). The HISS and FUTURA areas share common facilities. These three facilities were grouped together because of similarities of contaminants; proximity to each other; contaminated haul roads, including portions of Hazelwood Avenue, Pershall Road, and McDonnell Boulevard, between the areas; and air release of radon-222 (Rn-222). The sites also show the possibility of similar threats to public health (Mitre, 1988). The areas are also listed on the Department of Energy (DOE) Formerly Utilized Sites Remedial Action Program (FUSRAP).

The SLAPS is the largest of the three areas, covering 21.7 acres, and is approximately 15 miles northwest of downtown St. Louis. To the south is Banshee Road and a Norfolk and Western Railroad line, to the west is Coldwater Creek, and to the north and east is McDonnell Boulevard. Next to the SLAPS is the St. Louis International Airport on the south. The Berkeley Khoury League Park is to the north, and the McDonnell Douglas Corporation is to the west and southwest. The SLAPS slopes to the west toward the creek, which is about 20 feet below the site and 500 feet above mean sea level (Figure 2).

The HISS and FUTURA areas, which cover about 11 acres, are approximately 0.5 mile from SLAPS and approximately 2 miles northeast of the St. Louis Airport control tower. They are bounded on the north by Latty Avenue; on the east by the city of Berkeley; on the south by Hazelwood, the Norfolk and Western Railroad, and a tributary of the Coldwater Creek; and on the west by Coldwater Creek (Figure 3). The associated off-site locations collectively known as the Latty Avenue Vicinity Properties. Businesses located along Latty Avenue are adjacent to the HIS and Futura sites are shown in Figure 4.

In 1946, the area was acquired by the Manhattan Engineering District of the U.S. Army and used to store uranium wastes generated by the Mallinckrodt operation in St. Louis. Wastes stored at these sites also included scrap metals, drums, covered piles, and unstabilized piles of waste generated during uranium-processing activities. At the SLAPS, the uranium-processing wastes were stored on open ground and once covered two-thirds of the area to an estimated height of 20 feet. In 1957, contaminated scrap metal and miscellaneous radioactive wastes were buried on the west portion of the SLAPS (USDOE, 1986a). In 1966, after the Continental Mining and Milling Company (CMM) purchased the property, the wastes were

transferred from the SLAPS to the HISS. In 1967, CMM sold the property and wastes to the Commercial Discount Corporation of Chicago. The waste was then dried and shipped to the Cotter Corporation in Colorado. In December 1969, the Cotter Corporation purchased the remaining wastes at the HISS and shipped some material to Colorado. By late 1970, approximately 19,000 tons of uranium-processing waste (raffinate) and barium sulfate remained at the site. By 1973, most of the wastes were transferred to the Latty Avenue areas and the residual processing wastes had been removed to the Cotter Corporation in Canon City, Colorado.

Besides the wastes still present at the NPL site, additional wastes were moved to either the Weldon Springs Quarry NPL site, also in Missouri, or to the West Lake Landfill in St. Louis County. During the latter part of the 1960's, the SLAPS land was transferred to the St. Louis Airport Authority, which partially remediated a portion of the area. The remediation included demolishing existing buildings and burying the wastes on-site. The area was covered with about 3 feet of clean fill during 1969. In 1977, the responsibility for the property, but not ownership, was returned to the DOE that was formed from the breakup of the Atomic Energy Commission (USDOE, 1986b).

Further remediation of the HISS and FUTURA area in 1977 generated 13,000 cubic yards of contaminated material that were placed in a pile at the HISS area. Later, in 1979, the Nuclear Regulatory Commission (NRC) released the property for unrestricted use. In 1982, the HISS and FUTURA areas were placed on the DOE FUSRAP list. Also in 1982, ditches surrounding the SLAPS were sampled by Bechtel National, Inc. The results of this sampling delineated the limits of the uranium-238 (U-238) and radium-226 (Ra-226) contamination.

During 1984, additional remediation at Latty Avenue locations generated another 14,000 cubic yards that were stored in a supplementary pile at HISS (Bechtel, 1987a). Also during this time, a vehicle decontamination area was constructed, the area was fenced, and the waste piles were consolidated.

In 1985, the DOE was authorized to reacquire the SLAPS site (Public Law 98-360) and use it as a permanent disposal site for the waste existing on the site at that time. Also, contaminated soils from ditches surrounding the site and wastes stored at HISS were to be stored at the site. Erosion along the SLAPS was reduced by installing rock-filled structures along the western edge of the site. At Latty Avenue locations, monitoring wells were installed. The DOE also directed the Oak Ridge National Laboratories (ORNL) to survey the haul roads between these storage areas. On the basis of this survey, the major contaminant detected was thorium-230, (Th-230) and the portions of the haul roads to be remediated were determined. These areas included portions of Hazelwood Avenue, Pershall Road, and McDonnell Boulevard.

In 1986, the roads leading to these areas were improved and during this action, additional contaminated soils were removed from the area. Also, boreholes were drilled at the SLAPS to define the nature and extent of the contamination (USDOE, 1986a,b).

The total amount of the wastes believed to have been stored at the SLAPS is 125,150 tons, of which 241 tons were believed to be uranium, either naturally occurring (U-nat) or uranium-238 (U-238). Of this amount, the wastes perhaps consisted of 106,500 tons of raffinate, 10,200 tons of leached or unleached barium sulfate, 4,000 tons of dolomite and magnesium fluoride, 3,500 tons of scrap metal, 600 tons of U-containing sand and other contaminated materials in 2,400 drums, and 350 tons of miscellaneous wastes (Mitre, 1988).

In late 1989, the Army Corps of Engineers (COE) requested that DOE survey an additional portion of Coldwater Creek. The information garnered from this survey was used in preparing the COE's Coldwater Creek flood control project.

B. Site Visit

The Agency for Toxic Substances and Disease Registry (ATSDR) conducted a site visit on February 5, 1990. Participating in this visit were an ATSDR health physicist, a representative from the State of Missouri Department of Health, representatives from DOE and its contractor, Bechtel National, Inc., and a representative from EPA. During the site visit, a tour of the NPL site and off-site environs was given as well as a historical perspective of the operations resulting in the formation of the SLAPS.

C. Demographics, Land Use, and Natural Resource Use

The SLAPS site is located approximately 10 miles northwest of downtown St. Louis in the suburban town of Hazelwood. Lambert Airport is immediately south of the site. The three areas comprising the NPL site are in a commercial and industrial area. The McDonnell Douglas Corporation is within 0.5 mile of the site and employs approximately 33,000 people. Runways from the St. Louis Airport terminate near the SLAPS boundary on the southwest edge of the site. The community closest to any one of the three areas is Hazelwood, Missouri, at a distance of less than 0.3 mile from HISS.

The six census tracts which lie within roughly 1 mile of the site had a total 1990 population of 26,657; this represents a decline of nearly 14 percent from the 1980 population of approximately 31,000. The tract containing the site had a population of 4,093 in 1990.

The 1990 population of the six tracts was 52.6 percent female and 47.4 percent male. The 1990 racial makeup of this area was 68 percent white, 31 percent black, and only 1 percent other races; however, the population of the tract containing the site was over 84 percent

black. Less than 1 percent were of Hispanic origin. Approximately 14 percent of all persons were under 10 years of age, while just over 12 percent were age 65 or older.

There were 10,399 occupied units in the six tracts for an average of 2.56 persons per household. In the tract containing the site there were 1,273 occupied housing units for 3.22 persons per household. Median value of owner occupied housing units ranged from $38,400 to $87,500 for the six tracts, $47,100 for the tract with the site; this figure is suggestive of a lower income neighborhood. Nearly 70 percent of occupied housing units were owner occupied.

A recreational area, Berkeley Khoury League Park, is to the north of the SLAPS and is contaminated with radioactive wastes previously stored at this site.

Coldwater Creek forms a site boundary and is not used for any recreational activities in the vicinity of SLAPS. However, since the creek is about 19 miles in length, it is conceivable that some neighborhood may use it for recreational purposes and that some parks with recreational activities may occur along the creek. The nearest well is believed to be about 1.5 miles north of the SLAPS; however, no data are available to suggest if this well serves as a source of drinking water. There are no agricultural activities near the areas (Mitre, 1988).

D. Health Outcome Data

Health outcome databases document health effects that occur in populations. Those data, which come from sources such as state tumor registry databases, birth defects databases, vital statistics records, or other records, may provide information about the general health of the community living near a site. Other more specific records, such as hospital and medical records and records from site-specific health studies, may be used. Demographic data provide information on population characteristics are used to analyze health outcome data.

The Missouri Department of Health (MDOH), State Center for Health Statistics, analyzes and consults on health related information collected from several sources. The Center's Bureau of Health Data Analysis has available statistical information, hospital discharge data, and the Multi-Source Birth Defect Registry. The Multi-Source Birth Defect Registry consists of birth outcome data from the following sources: birth, death, hospital discharge Crippled Children's Services, and Neonatal Intensive Care Unit records.

Missouri Cancer Registry (MCR) database is a repository for all newly diagnosed cancer reported to MCR. MCR data is available from 1984 when the law mandated reporting of new cancer cases. This data is not population-based.

The Missouri Department of Health, Division of Chronic Prevention and Health Promotion, Bureau of Smoking, Tobacco, and Cancer has a cancer inquiry process. This process is

designed to ensure that excess cancer reported to the Bureau of Smoking, Tobacco, and Cancer are reviewed systematically in the preliminary review phase and are presented to the Cancer Inquiry Committee. The committee can recommend either the study be discontinued or the inquiry be expanded into an investigation phase.

COMMUNITY HEALTH CONCERNS

This site has posed many concerns for the health and safety of the residents in St. Louis. In 1987, the ATSDR released a health consultation, but could not adequately address the site then because of limited data. In that same year, a private citizen's letter to the U.S. Senators and Representatives of the region expressed concerns about the high concentrations of radioactive materials detected in soils, sediments, and the Coldwater Creek environs.

In 1988, the St. Louis Board of Aldermen passed a resolution stating their reluctance "that a permanent radioactive waste site near the airport would be in the best interest to area citizens or the local environment." The Board additionally remained opposed to releasing the title from the city to DOE for the purposes of site expansion (Resolution 146) unless specific conditions were met. In 1990, the Board of Aldermen voted to offer 81 acres near the airport to the DOE (St. Louis Post-Dispatch, February 5, 1990).

Citizens in this area of Hazelwood requested the Missouri Department of Health to investigate these cancer occurrences in the area and at other FUSRAP sites in the St. Louis area. In 1988 a citizen requested a health study of persons living near five sites in St Louis area. In 1989 a concerned citizen contacted the Missouri Department of Health regarding several cases of cancer reportedly found among the residents in the homes closest to the HISS.

On April 29, 1991, ATSDR issued a news release announcing the availability of the health assessment for this site. The Public Comment Period, in which citizens could obtain and comment on the health assessment, ran from May 15 to June 13, 1991. The announcement, a newspaper article concerning the study, and comments received by ATSDR are given in Appendix B. Personal identifiers, except for governmental agencies or national interest groups, were deleted from the material in the appendix. The agency response to the comments are given in Appendix C.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

A. On-Site Contamination

Environmental monitoring locations for the SLAPS, HISS, and FUTURA areas are shown in Figures 5 and 6. Results of on-site sampling performed by the NRC, ORNL, and a DOE contractor found significant levels of radioactive materials in the groundwater, soils, and air. The contaminants detected were U-238, U-nat, Th-230 and Th-232, Ra-226, and radon (isotope not specified). The levels detected were in excess of the regional isotope background (bkg) values for the St. Louis area as determined by the DOE. Although there is no surface water at the NPL site that could be contaminated, Coldwater Creek forms a boundary of the site (Figure 1) and contaminated surface runoff has entered the creek (Mitre, 1988).

Groundwater

Monitoring wells were located along the periphery of the site. Sampling results of these on-site groundwater monitoring locations at the SLAPS from 1981 to 1982 showed elevated levels of U-238. The yearly average during this time was approximately 439 picocuries per liter (pCi/L) (one picocurie equals 10^{-12} curies), with the highest well averaging an excess of 1,851 pCi/L during this time. Radium-226 and Th-230 were also detected in the groundwater. These monitoring results showed average concentrations for Ra-226 and Th-230 of 0.64 pCi/L and 0.8 pCi/L, respectively. The highest concentrations detected showed levels of 1 pCi/L for Ra-226 and 1.8 pCi/L for Th-230.

In 1988, groundwater monitoring at SLAPS showed the concentrations of total uranium ranged from background (bkg) to over 5,500 pCi/L, for Ra-226 the concentrations ranged from bkg to about 1 pCi/L, and for Th-230 the concentrations ranged from bkg to over 50 pCi/L at on-site locations (Bechtel, 1989a). At HISS, groundwater samples from the site showed uranium concentrations ranging from bkg to 87 pCi/L, Th-230 from bkg to 64 pCi/L, and Ra-226 from bkg to 3.7 pCi/L (Tables 1, 2).

Surface Water

Surface water sampling in Coldwater Creek by the SLAPS showed the maximum concentration of total uranium, including background, was 4 pCi/L. The concentrations of Th-230 and Ra-226 were at or below bkg (Bechtel, 1989a). Surface water measurements for radionuclides at the HISS showed the presence of total uranium ranging from bkg to 5 pCi/L, Th-230 ranging from 0.1 to 0.9 pCi/L, and Ra-226 ranging from 0.1 to 0.3 pCi/L (Tables 1, 2).

Sediment

Sediment sampling at the SLAPS for total uranium, Th-230, and Ra-226 showed maximum concentrations of 1.7 pCi/g, 4.1 pCi/g, and bkg, respectively (Bechtel, 1989a) (Table 1). Sediment sampling at the HISS for total uranium, Th-230, and Ra-226 showed average concentrations of 1.7 pCi/g, 4.8 pCi/g, and 1.2 pCi/g, respectively (Table 2) (Bechtel, 1989b).

Air

Airborne contamination at these areas consists of both gamma radiation and Rn-222. The amount, or intensity, of gamma rays depends on the type of radioactive material at the site, its concentration and depth from the surface, and physical distribution in the soil. This intensity results in an exposure rate. Measurements of the gamma ray exposure rate were made with a pressurized ionization chamber. The Rn-222 concentration is dependent on the amount of Ra-226 present, since Rn-222 is the first decay product produced during decay of the Ra-226. Airborne measurements for Rn-222 were the average of 25 stations determined by alpha track detectors. The bkg station was 5 miles from the areas.

At the SLAPS, the gamma exposure rate has been measured at 9 to 261 x 10^{-6} roentgens per hour (R/hr, a roentgen is a unit of radiation exposure), with an average of 84 x 10^{-6} R/hr taken along the northern boundary (Bechtel, 1987c). In 1988, gamma radiation measurements showed a radiation exposure rate ranging from 17 to 2,229 x 10^{-3} R/yr above a bkg average of 73x10^{-3} R/yr (Bechtel, 1989a).

At the HISS area, the exposure rate was 13 to 55 x 10^{-6} R/hr, with an average of 24 x 10^{-6} R/hr. The exposure rate at the FUTURA site was 8 to 27 x 10^{-6} R/hr outside existing structures. The bkg in the St. Louis area was 8 x 10^{-6} R/hr. Gamma radiation readings at the site during 1988 ranged from 13 to 55 x 10^{-6} R/hr with an average exposure rate of 24 x 10^{-6} R/hr with the bkg in the St. Louis area of 8 x 10^{-6} R/hr.

Rn-222 measurements at the SLAPS site, including the bkg of 0.3 pCi/L, ranged from bkg to 6.8 pCi/L with a maximum average of 3.4 pCi/L. Results from the HISS ranged from bkg to 3.4 pCi/L with a maximum average of 1.8 pCi/L. Because gas emanation is dependent on atmospheric temperature and pressure, there were seasonal variations in the measurements. Ra-222 at the SLAPS for 1988 ranged from 0.3 to 4.6 pCi/L, including a bkg reading ranging from 0.3 to 0.6 pCi/L. Background sampling locations were located a minimum of 0.5 mile from the site. The average Rn-222 concentration at the site from 1984 to 1988 has ranged from 0.1 pCi/L to 3.6 pCi/L (Bechtel, 1989a). The DOE limit for FUSRAP sites is 3 pCi/L.

Ra-222 at the HISS for 1988 ranged from 0.3 to 2.4 pCi/L, including a bkg reading ranging from 0.3 to 1.0 pCi/L. Background sampling locations were located a minimum of 5 miles

from the site. The average Rn-222 concentration at the site from 1984 to 1988 has ranged from 0.2 pCi/L to 2.2 pCi/L (Bechtel, 1989b).

Soils

In a limited characterization for nonradioactive materials present at the SLAPS area, no elevated levels of total organic halogens were detected in soils. This would suggest a lack of or very small amounts of halogenated organic compounds such as pesticides, polychlorinated biphenyls, or solvents. However, three samples suggested the presence of total organic carbon, present at a level of 1 percent. The analysis of soils for heavy metals suggested the presence, above bkg, of selenium (93 ppm), beryllium (190 ppm), nickel (5,800 ppm), copper (2,300 ppm), cobalt (4,600 ppm), tin (4,400 ppm), molybdenum (150 ppm), magnesium (19,000 ppm), thallium (33 ppm), lead (580 ppm), antimony (2,300 ppm), and cadmium (3.5 ppm) (Bechtel, 1987c). The depths at which these samples were collected were not given. Of these heavy metals, selenium and lead appear to pose a potential health risk.

The concentrations of radioactive materials at the SLAPS include uranium (1,600 pCi/g), Th-230 (2,600 pCi/g), Th-232 (63 pCi/g), and Ra-226 (5,600 pCi/g) (Table 1) (Bechtel, 1987c).

The radionuclides detected at the HISS as determined by actual soil analysis included U-238 (800 pCi/g), Th-232 (0.7-5 pCi/g), Th-230 (790 pCi/g), and Ra-226 (700 pCi/g) (Table 2) (Bechtel, 1987a). The average depth of the contamination was 3 feet with the deepest contamination of 6 feet at one location within the site (Bechtel, 1987a).

Soil measurements collected at the FUTURA area indicated the presence of uranium (2,500 pCi/g), Th-230 (2,000 pCi/g), Th-232 (26 pCi/g), and Ra-226 (2,300 pCi/g) (Bechtel, 1987b).

Currently, biota measurements have not been collected on-site.

B. Off-Site Contamination

Off-site areas associated with this site include Coldwater Creek and the road systems used to haul radioactive materials to the SLAPS area and from the SLAPS to the HISS and FUTURA areas. Additional off-site locations include the Berkeley Khoury League Park (Figure 2); properties next to the site, collectively known as the Latty Avenue Properties (Figure 4); the Norfolk and Western Railroad property; and portions of property near the SLAPS location including ditches, Banshee Road, and portions of land owned by the St. Louis Airport Authority.

Soil

Sediments and soils from Coldwater Creek were collected before 1989 by Bechtel. These samples were analyzed for the presence of radioactive materials. The results of sediment sampling show the presence of U-238 (4.8 pCi/g), Th-232 (1.5 pCi/g), Th-230 (110 pCi/g), and Ra-226 (3.1 pCi/g). Of these values, only Th-230 was above the DOE guidelines for FUSRAP locations. Surface soils from along the creek bank suggested the presence of U-238 (78 pCi/g), Th-232 (5 pCi/g), Th-230 (5,100 pCi/g), and Ra-226 (71 pCi/g) (Bechtel, 1990).

During 1989, the COE requested that additional soil plug samples be collected along the banks of Coldwater Creek. These samples were collected beginning at the termination point of the Bechtel study and proceeded for an additional 4.8 miles along the banks at 500 foot intervals. The top 6 inches of the soil plug were also analyzed for U-238, Th-232, Th-230, and Ra-226. The results of these sampling activities showed the maximum concentrations (above background) of U-238, Th-232, Th-230, and Ra-226 were 12.9 pCi/g, 4 pCi/g, 27.7 pCi/g, and 2.4 pCi/g, respectively. Of these levels, Th-230 exceeded the DOE clean-up levels. It has not been determined if the concentration of uranium in this survey exceeds guidelines since the guidelines are still being formulated for the St. Louis area (FUSRAP, 1989).

The results of soil sampling from over 60 properties located along the haul roads have been reviewed and summarized. The maximum levels detected and the corresponding depths are given in Table 4 (Bechtel, 1990). The contamination was mostly confined to a depth of a foot over the haul roads. Along Latty Avenue, however, in one area, the contamination was found as deep as 7 feet. The survey along McDonnell Boulevard suggested the contamination in one location was at least 15 feet deep and over 1300 feet in length. In one isolated area near the intersection of Eva Avenue and McDonnell Boulevard, the contamination was found to a depth of 5 feet. Along Hazelwood Avenue, the contamination was spread from the intersection of Frost Road to Pershall Road. Contamination along Pershall Road was found at an average depth of 3 feet, with an isolated area contaminated to a depth of 13 feet (Bechtel, 1990).

The results of sampling supplied from the Latty Properties were for near surface (12 inches above the surface), borehole readings for gamma-emitting contamination, and soil sampling for radionuclides. These data are shown in Table 3 (Bechtel, 1988).

Results of sampling from the Berkeley Khoury League Park recreational area indicated that the concentrations, in soils, of U-238 were 10 pCi/g; Th-230, 20 pCi/g; and Ra-226, 2 pCi/g.

Railroad

The ditches running along the boundary of the SLAPS were sampled by measurements in boreholes for the presence of gamma-emitting radioactive materials and soil samples. The major contaminant in these areas was Th-230, present at a maximum concentration of 15,000

pCi/g. The U-238, Th-232, and Ra-226 concentrations were 94 pCi/g, 6 pCi/g, and 130 pCi/g, respectively. These maximum contaminant levels were found in surface soils (a maximum depth of 1 foot).

Banshee Road borders the SLAPS on the southern boundary. The sampling of this area included 48 boreholes and sampling of surface soils. Two areas showed elevated levels of Th-230 (34 pCi/g) with U-238 (<46 pCi/g), Th-232 (<7.1 pCi/g) and Ra-226 (<7.1 pCi/g) also present.

Airport Property

No off-site air sampling data for Rn-222 were supplied.

Results of general sampling of biota along ditches near the creek showed that Ra-226 ranged from 0.008 to 0.2 pCi/g, Th-232 ranged from 0.0004 to 0.003 pCi/g, and U-238 ranged from 0.02 to 0.16 pCi/g (Bechtel, 1983).

C. Quality Assurance and Quality Control

In preparing this preliminary health assessment, the ATSDR relies on the information provided in the referenced documents. The ATSDR assumes that adequate quality assurance and quality control measures were followed with regard to chain-of-custody, laboratory procedures, and data reporting. The validity of the analyses and conclusions drawn for this preliminary health assessment is determined by the availability and reliability of the referenced information.

In order to identify other possible facilities that could contribute to the release of contaminants into the environment near the SLAP site, ATSDR searched the most recent data contained in the Toxic Chemical Release Inventory (TRI). TRI is developed by the EPA from the chemical release (air, water, and soil) information provided by specified industries. In searching the data base by zip code, there were no reporting facilities in the same zip code as the SLAP site that released either radioactive materials or heavy metals to the environment.

D. Physical and Other Hazards

The three areas composing the NPL site are fenced and placarded as a radiation area. There are no physical hazards at these areas. The baseball field is not part of the NPL site, but the city of St. Louis has closed the field and placed signs stating the area is closed. The area is not fenced and access is not controlled.

PATHWAYS ANALYSES

A. Environmental Pathways (Fate and Transport)

The Coldwater Creek flows through or forms the boundary of the SLAPS areas. There is no known use of the creek for recreational purposes or as a water source near the site. The creek, 19 miles in length, originates about 3.5 miles south of SLAPS, flows for about 500 feet along the western boundary of the site, and then flows into the Missouri River about 15 miles northeast of the SLAPS area (FUSRAP, 1989). The river serves as the area's source of potable water, with the nearest water treatment facility on the Missouri River above the confluence of the creek with the river. The SLAPS was used without liners or a leachate collection system, and runoff has entered the creek. Surface water runoff ultimately flows into Coldwater Creek by direct overland flow or by drainage ditches into the creek that flows north-northeast into the Missouri River.

There are two groundwater systems at the SLAPS. The upper zone is composed of a wind deposit or an eolian layer and a lacustrine or lake deposit. The lower zone is composed of the lake deposit material only. Separating the upper and lower zone is a deposit of legislature silty clay (Bechtel, 1986). The underlying aquifer is alluvial and approximately 25 feet below the surface, is estimated to be 100 feet thick, and includes clay, silt, and gravel deposits. The depth to the water table ranges from 25 to 35 feet. The water from the system is saline, and wells produce low volumes of water. There is no known use of the aquifer within a 3-mile radius of the site.

Leaching from the soil to the groundwater has occurred. It is unknown if the groundwater, which is believed to flow toward Coldwater Creek, discharges into the creek.

The air pathway includes ionizing radiation, Rn-222, and the possible exposure from airborne dusts contaminated with radioactive substances or heavy metals. The ionizing radiation can easily penetrate air and nominal thickness materials with no or very little attenuation. Rn-222 is an inert, radioactive gas and migrates easily through air. The decay products of radon are particulate and can electrostatically attach to the dust particles.

There are no identified pathways for exposure from potentially contaminated biota. No commercial or private crops are grown in the area and no hunting or fishing is likely to occur in these areas.

B. Human Exposure Pathways

The surface water and groundwater near SLAPS are not used for water sources in the area, therefore, these pathways are not considered viable routes for exposure. Furthermore, the

EPA drinking water standards (40 CFR 141) for radioactive materials are not exceeded in Coldwater Creek.

The exposure to ionizing radiation in the areas, although elevated in some sites, is not of concern because of the small amount of time a member of the public would spend in the areas of higher radiation.

The concentrations of Ra-226 and Th-230 at on-site locations are above the EPA and DOE limits of 5 pCi/g from 0 to 15 cm and 15 pCi/g over any 15 cm of soil beneath the surface (40 CFR 190-192). Since these areas are now fenced and covered with clean fill, this exposure route is not of great concern. There is concern, however, with the soil concentrations at the off-site Latty Properties because access to these areas are not as restricted as that of the SLAPS, HISS, and FUTURA areas. Many of these properties are businesses with public access areas.

The release of Rn-222 from the soils into the air at the SLAPS exceeds the regulations of DOE for FUSRAP sites (3.0 pCi/L) and poses an inhalation hazard to on-site personnel. Atmospheric dispersion of Rn-222 from these sites is expected to reduce the levels of Rn-222 to approximately background levels (0.3 pCi/L) and no adverse health effects would be expected in those individuals occupying nearby homes and businesses. Radon, however, does become a potential health hazard when present in elevated levels inside inhabited structures such as homes and businesses. From the information reviewed for this public health assessment, ATSDR does not have any indication that material from the SLAPS was ever used for fill around foundations, potentially increasing the concentration of indoor radon.

The elevated levels of the heavy metals antimony, beryllium, cobalt, nickel, selenium, and lead at the SLAPS, although of some public health concern, are not considered an imminent threat since the contaminated area is fenced and there is no public access.

Inhalation or ingestion of airborne contaminants associated with dusts potentially generated either at the on-site locations or, to a lesser degree, from the off-site locations, can result in radiation exposure to the respiratory system and, to a lesser degree, exposure to the gastrointestinal tract.

Additional inhalation and ingestion of soil contaminants may have occurred during the use of the recreational fields when fugitive dusts were generated during athletic events. Because the haul roads associated with these sites are known to be contaminated with radioactive materials, exposure to human populations may have occurred during remediation of the roads in 1986 and during use of the roads by commercial and private vehicular traffic.

PUBLIC HEALTH IMPLICATIONS

A. Toxicological and Radiological Evaluation

The evaluation of toxicological and radiological properties of contaminants and their effects on human health depends on a variety of factors. First, a person must be exposed to a chemical by coming in contact with it, and with certain types of radiation, by being in the vicinity. Second, the type and severity of adverse health effects resulting from an exposure to a contaminant depends on the concentration, the frequency and/or duration of exposure, the route of exposure, if the exposure was to a single contaminant or a mixture of contaminants and if there were multiple exposures.

For chemicals, the route of exposure can include breathing, drinking, eating, or dermal (skin) contact with a substance that contains the contaminant. In the case of ionizing radiation, the energy can pass through solid matter. A combination of contaminants can result in synergistic actions, where the simultaneous action of the separate compounds together, have a greater total effect than the sum of their individual effects.

The opposite is also a possibility whereby the combination of contaminants can act antagonistically, with one contaminant acting in opposition to or counteracting another contaminant. A third situation could result with the contaminants having no effect on each other.

Once an exposure has occurred, characteristics such as age, sex, race, socioeconomic status, genetics, lifestyle, and health status of the exposed individual influence how the individual absorbs, distributes, metabolizes, and excretes the contaminant. All these factors and characteristics are considered when determining the health effects that may occur as a result of exposure to a contaminant.

The contaminants of concern at SLAPS are Rn-222 (radiological half-life of 3.8 days) and Th-230 (radiological half-life 75,400 years). Chemically, these contaminants pose no health threat. Because of the type of radiation these radionuclides emit–alpha particles and gamma rays–the greatest public health concern arises from inhalation or ingestion of the material.

Radon-222 (Rn-222):

Rn-222 measurements at the SLAPS site ranged from bkg to 6.8 pCi/L and at HISS, the Rn-222 ranged from bkg to 3.4 pCi/L. As previously stated, the DOE FUSRAP limit for Rn-222 emissions is 3 pCi/L. The EPA recommends that Rn-222 not exceed 4 pCi/L in residential areas. There were no reported measurements for off-site areas. However, the outdoor levels of Rn-222, although above average background levels are approximately equal to the concentration many homes across the nation.

Rn-222 has been shown to be carcinogenic when inhaled, producing lung cancers. Most of these studies have involved uranium miners because radon is present at high concentrations in these mines. Although the gas itself is inert, some will be absorbed into the blood from the lungs and transported through the body (ATSDR, 1989a). However, the radon decay products are charged particulates in nature and will electrostatically deposit on lung surfaces. As these products decay further, many emit alpha particles that are completely absorbed in the structures containing the radon decay products. These particles are the major health hazard from exposure to radon gas. The National Council on Radiation Protection and Measurements (NCRP) estimates the annual dose from radon to the bronchial epithelium is 190 millirads for males and 10 year old children and 170 millirads for females (a rad is an estimate of the radiation exposure actually absorbed by a body). The lifetime risk of developing lung cancer from the inhalation of radon at a concentration of a picocurie per cubic meter is estimated at 0.21 per 100,000 population. It is estimated that the annual exposure to radon alone exceeds the exposure to all other naturally occurring sources of radioactivity (NCRP, 1984).

Thorium-230 (Th-230):

The concentration of Th-230 in soils at these sites is in the picocurie range and 1 picocurie of Th-230 has a mass of 48×10^{-12} grams (picograms). This amount of thorium is not considered a chemical hazard. The Annual Limit on Intake for Th-230 is 15 pCi via inhalation. In soils, the maximum reported on-site concentration was 2,600 pCi/g; whereas the maximum reported off-site concentration was 15,000 pCi/g in the ditches associated with the railroad areas.

Mice exposed to milligram amounts of thorium per cubic meter for 18 weeks showed no compound-related mortality. Similar types of studies with rats, guinea pigs, rabbits, and dogs resulted in similar findings. There have been no studies with humans concerning systemic exposures to thorium alone. A statistically significant excess of deaths resulting from pancreatic cancer has been reported in former thorium workers exposed to 0.13 milligrams/cubic meter (ATSDR, 1989b). Based on the amount of thorium present at these areas, the greatest hazard is the internal exposure to alpha particles and other radiations emitted from Th-230. The committed whole body dose equivalents (the radiation dose delivered over a 50-year period following intake of a specific radioactive substance) for this radioisotope are approximately 0.32×10^{-3} rem per picocurie inhaled and 0.54×10^{-3} rem per picocurie ingested (USEPA, 1988).

Appendix A gives the DOE calculations for individuals using the recreational fields. The ATSDR has reviewed these calculations, and ATSDR's calculations were higher than those calculated by the DOE (ATSDR-15 mrem; DOE-6.5 mrem). ATSDR agrees with the initial calculation of the amount of contaminated dust inhaled. The difference in calculations appears to be in the amount of dust potentially ingested by a ball player. The DOE did not estimate the ingestion of soils by a person sliding into a base in the contaminated areas but

used a value of 100 milligrams of soil ingested. The ATSDR used a value of 1 gram of soil being ingested which would account for the increase in the committed dose.

B. Health Outcome Data Evaluation

The National Academy of Sciences BIER V report estimates the risk of excess cancer mortalities related to these types of radiation exposure at 5 excess deaths per 1000 exposed population (NAS, 1990).

In response to the 1988 request at five hazardous waste sites in the St. Louis area, the MDOH conducted a health statistics review of mortality and incidence data by census tract and zip code. The mortality data were obtained from death certificates submitted to the State Center for Health Statistics. Incidence data were obtained from the MCR. In reviewing the mortality and incidence data MDOH had not discovered any excess of cancer.

Following a 1989 report of excess cancer adjacent to HISS, the MDOH, Bureau of Smoking, Tobacco, and Cancer opened an investigation by collecting information on the reported cancer cases and interviewing residents, relatives of cancer victims, and cancer victims to determine if any other cancer cases had occurred near the site. In February 1989, based on confirmation of cancer cases reported and knowledge of radioactive contamination at the waste sites in the area, the MDOH Cancer Inquiry Committee recommended expanding the inquiry.

The expanded inquiry included further interviews of residents and former residents, examination of medical records, and construction of chronology of deposition of radioactive materials, and chronologies of diagnosis dates and time residence of the cancer patients. Statistical tests used to evaluate the data were limited by incomplete information on the total number of residents who lived in the area during the last few decades, their ages, and how long they lived in the area, and by the small number of people and cancer cases on the street. Another problem in determining whether or not a cancer excess or a cancer cluster exist is the existence of several different kinds of cancer among the cases. A cancer cluster is used to describe a grouping of a number of cases of the same type of cancer that may be due to the same cause. Different types of cancer generally have different causes, it is usually unlikely that a grouping of different types of cancer would arise from the same cause. The MDOH was unable to confirm whether or not there is an excess number of cancers in the area and to determine the likelihood residence were exposed to types, quantities, and durations of radiation that would have induced the identified cancers.

Members of the Division of Health Studies, ATSDR, have met with MDOH and investigated these reports excess cancer. As a result of this investigation, ATSDR reviewed the MDOH health statistics review and cancer inquiry. ATSDR concluded that due to the lack of similarity with regard to site and histologic type, the reported cancer cases do not constitute a cancer cluster. In addition ATSDR concluded there is insufficient data to determine an increase incidence of cancer in the Hazelwood neighborhood or whether the identified cancers cases could be attributed to radiation exposure. Furthermore, the types of cancers in the

Hazelwood area are not normally associated with exposure to alpha emitters found at this site but with exposure to gamma radiation.

CONCLUSIONS

Based on the information revicwed, the ATSDR considers the St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company NPL site to be an indeterminate public health hazard. Emission of Rn-222 into the air and the presence of Th-230 in off-site soils are considered the primary contaminants of concern for their presence could result in humans inhaling and ingesting these contaminants.

RECOMMENDATIONS

A. Recommendations and HARP Statement

Site Characterization Recommendations

1. Characterize groundwater, surface water, sediment, and soil for chemical (non-radiological) contamination on and off site.

2. Characterize off-site surface soil and air for radiological contaminants, in particular Th-230 in soil and Rn-222 in the air. Collect surface soil and air samples from roads used to transport contaminated material to and from these sites prior to remediation and from the baseball field.

Cease/Reduce Exposure Recommendations

1. Implement dust control measures during remediation to reduce the generation of airborne dust which would reduce the likelihood of internal deposition of radioactive material.

Health Activities and Recommendation Panel (HARP) Statement

The public health assessment for St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company was reviewed by the HARP on January 16, 1992. Based on the recommendations of the panel, it is proposed that the following statement be included in the public health assessment.

> The data and information developed in the St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company public health assessment were evaluated by the ATSDR Health Activities and Recommendation Panel (HARP) for follow-up health

actions. Since human exposure to on-site contaminants may have occurred in the past, HARP has considered this site for follow-up health studies. After consultation with Regional EPA staff and State and local health and environmental officials, the Division of Health Studies, ATSDR, has determined that follow up public health actions or studies are appropriate for this site. Also since the citizens in the vicinity of the sites are concerned with their potential exposure and potential adverse health occurrence, HARP has considered this site for community health education follow up.

B. Public Health Actions

The public health action plan for the St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company NPL site describes actions planned by ATSDR, DOE, or other state or federal agencies following completion of the public health assessment. The purpose of the public health action plan is to ensure that this public health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting form exposure to hazardous in the environment. Included, is a commitment by ATSDR to follow up on this plan to ensure that is implemented. The public health actions to be implemented are as follow.

Public Health Action Taken

1. The Missouri Department of Health conducted a health statistics review of mortality and incidence data, a preliminary cancer inquiry, and a expanded cancer inquiry in the area of the sites.

2. The MDOH informed the residents in the area of the sites of their conclusions and recommendation of the MDOH health statistics review and cancer inquiries regarding the possibility of excess cancer.

3. ATSDR, Division of Health Studies, reviewed the MDOH health statistics review and cancer inquiries. Based on the data provided ATSDR could not demonstrate a cancer cluster, an increased incidence/prevalence of cancer, or any association between the residential area and cancer.

4. DOE conducted additional off-site soil sampling at SLAPS, ditches north and south of SLAPS, ball field area, Banchee Road, SLAPS vicinity properties, haul roads, HISS, and HISS/Futura vicinity properties. These samples were analyzed for radiological contaminants, and organic and metal contaminants using the Toxicity Characteristic Leaching Procedure (TCLP).

5. DOE conducted additional groundwater sampling at SLAPS, HISS, and vicinity properties. Samples were analyzed for radiological contaminants, volatile organic compounds, semi-volatile organic compounds, and metals.

Public Health Actions Planned

1. ATSDR, Division of Health Assessment and Consultation, will review the additional off-site soil and groundwater data collected by DOE and determined the public health implication.

2. The MDOH will periodically conduct follow-up assessments of cancer incidence in the area of the site.

PREPARER OF REPORT

Paul A. Charp, Ph.D.
Health Physicist
Federal Programs Branch
Division of Health Assessment and Consultation

ATSDR Regional Representative

David Parker
ATSDR Region VII

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LIST OF TABLES

TABLE 1. ENVIRONMENTAL SAMPLING DATA AS REPORTED IN 1988 FOR THE ST. LOUIS AIRPORT STORAGE SITE[1]

Contaminant	Groundwater	Surface Water	Sediment	Soils[2]
Uranium	5,500 pCi/L	0.4 pCi/L	1.7 pCi/g	1,600 pCi/g[3]
Th-232	ND[4]	ND	ND	63
Th-230	50	background	4.1	2,600
Ra-226	1	background	background	5,600

1 - The Maximum contaminant level for these radionuclides in drinking water is 5 pCi/L for radium and 15 pCi/L for gross alpha activity except for uranium.
2 - The concentration of thorium and radium in soils should not exceed 5 pCi/g above background over the first 15 cm of depth and 15 pCi/g averaged over 15 cm at depths greater than 15 cm (40 CFR 192). There are no standards for the concentration of uranium in soils.
3 - Value is for Uranium-238
4 - No Data

TABLE 2. ENVIRONMENTAL SAMPLING DATA AS REPORTED IN 1988 FOR THE HAZELWOOD INTERIM STORAGE SITE[1]

Contaminant	Groundwater	Surface Water	Sediment	Soil[2]
Uranium	87 pCi/L	5 pCi/L	1.7 pCi/g	800 pCi/g[3]
Th-232	ND[4]	ND	ND	5
Th-230	64	0.9	4.8	750
Ra-226	3.7	0.3	1.2	700

1 - The Maximum contaminant level for these radionuclides in drinking water is 5 pCi/L for radium and 15 pCi/L for gross alpha activity except for uranium.
2 - The concentration of thorium and radium in soils should not exceed 5 pCi/g above background over the first 15 cm of depth and 15 pCi/g averaged over 15 cm at depths greater than 15 cm (40 CFR 192). There are no standards for the concentration of uranium in soils.
3 - Value is for Uranium-238
4 - No Data

TABLE 3. OFF-SITE RADIONUCLIDE LEVELS AS REPORTED IN 1988 FROM THE LATTY PROPERTIES

Location	U-238	Th-232	Th-230	Ra-226
Wagner Electric Corporation	18 (1)	5 (1)	810 (0.5)	11 (0.5)
General Investment Fund	100 (0.5)	5 (5)	5,700 (0.5)	89 (0.5)
Crow-St. Louis	< 20 (8)	4 (8)	460 (0.5)	10 (0.5)
SLT Warehouse Company	< 39 (2)	5 (5)	15 (1)	4 (2)
Graham Engineering Corporation	< 30 (8)	7 (8)	12 (0.5)	4 (8)

Values are expressed in pCi/g soil with the value in parenthesis the depth, in feet, at which that level of contamination was found.

TABLE 4. MAXIMUM CONTAMINATION LEVELS AS REPORTED IN 1990 ALONG THE HAUL ROADS ASSOCIATED WITH THE SLAP NPL SITE

Location	U-238	Th-232	Th-230	Ra-226
Latty Avenue	48.2 (1.5)	9.5 (2)	1,413	39.9 (1.5)
McDonnell Boulevard	59 (0.5)	9 (8)	2,900 (0.5)	64 (0.5)
Hazelwood Avenue	72 (0.5)	9 (2)	4,810 (0.5)	42 (0.5)
Pershall Road	73 (0.5)	8 (1)	4,900 (0.5)	92 (0.5)

Values are expressed in pCi/g soil with the value in parenthesis the depth, in feet, at which that level of contamination was found.

LIST OF FIGURES

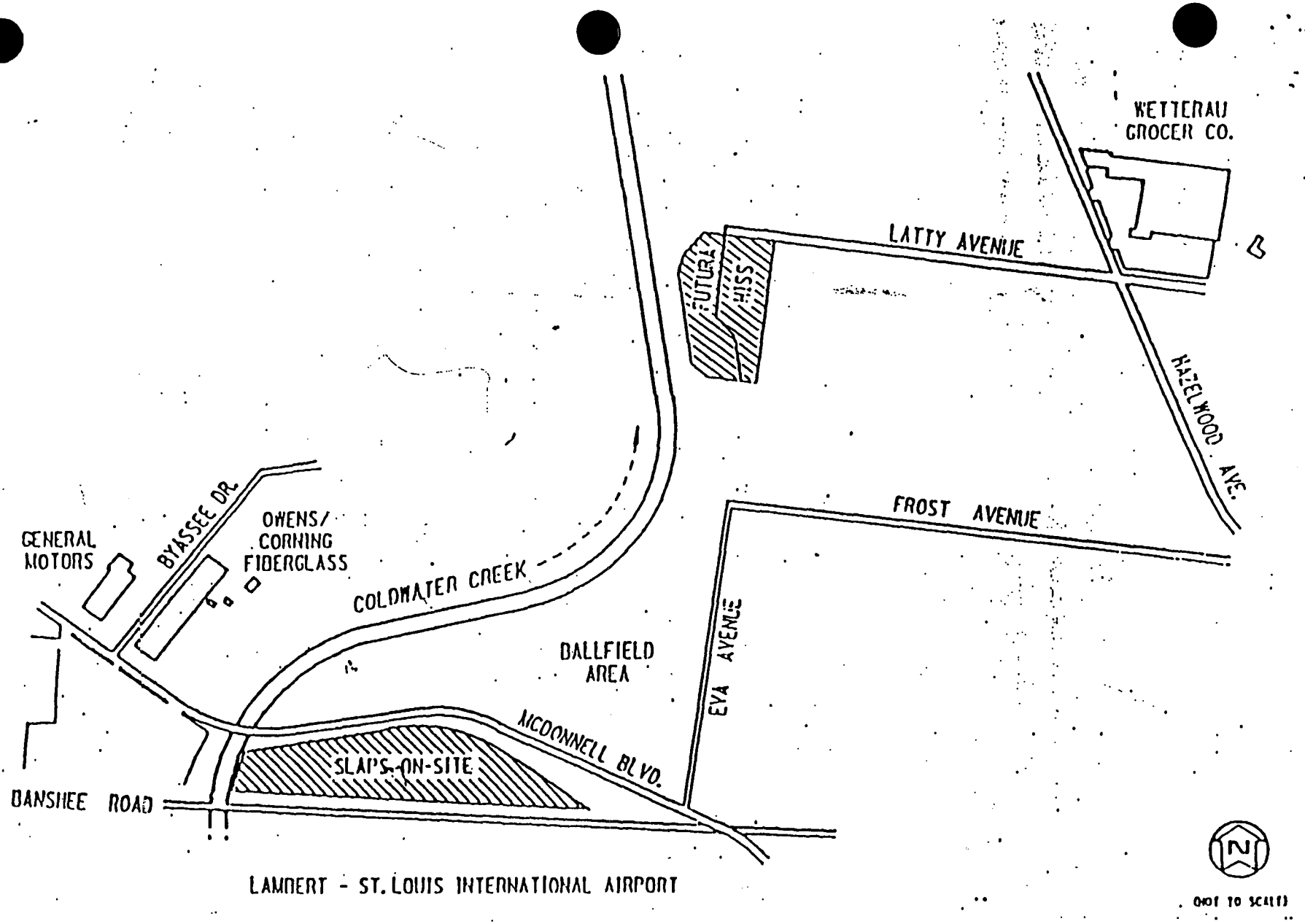

Figure 1. Location of the SLAP, HIS, and Futura sites

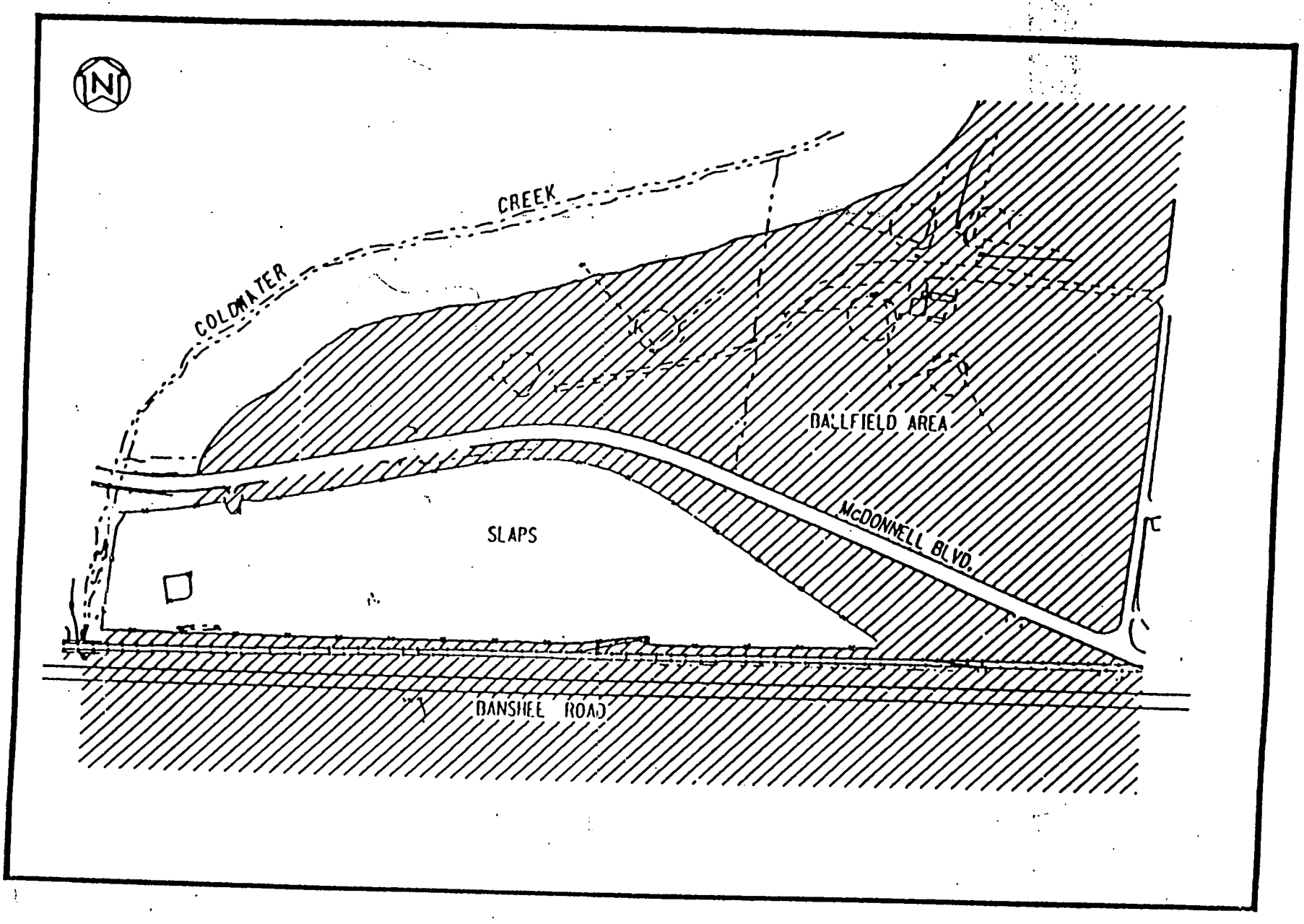

Figure 2. Location of the SLAP vicinity properties

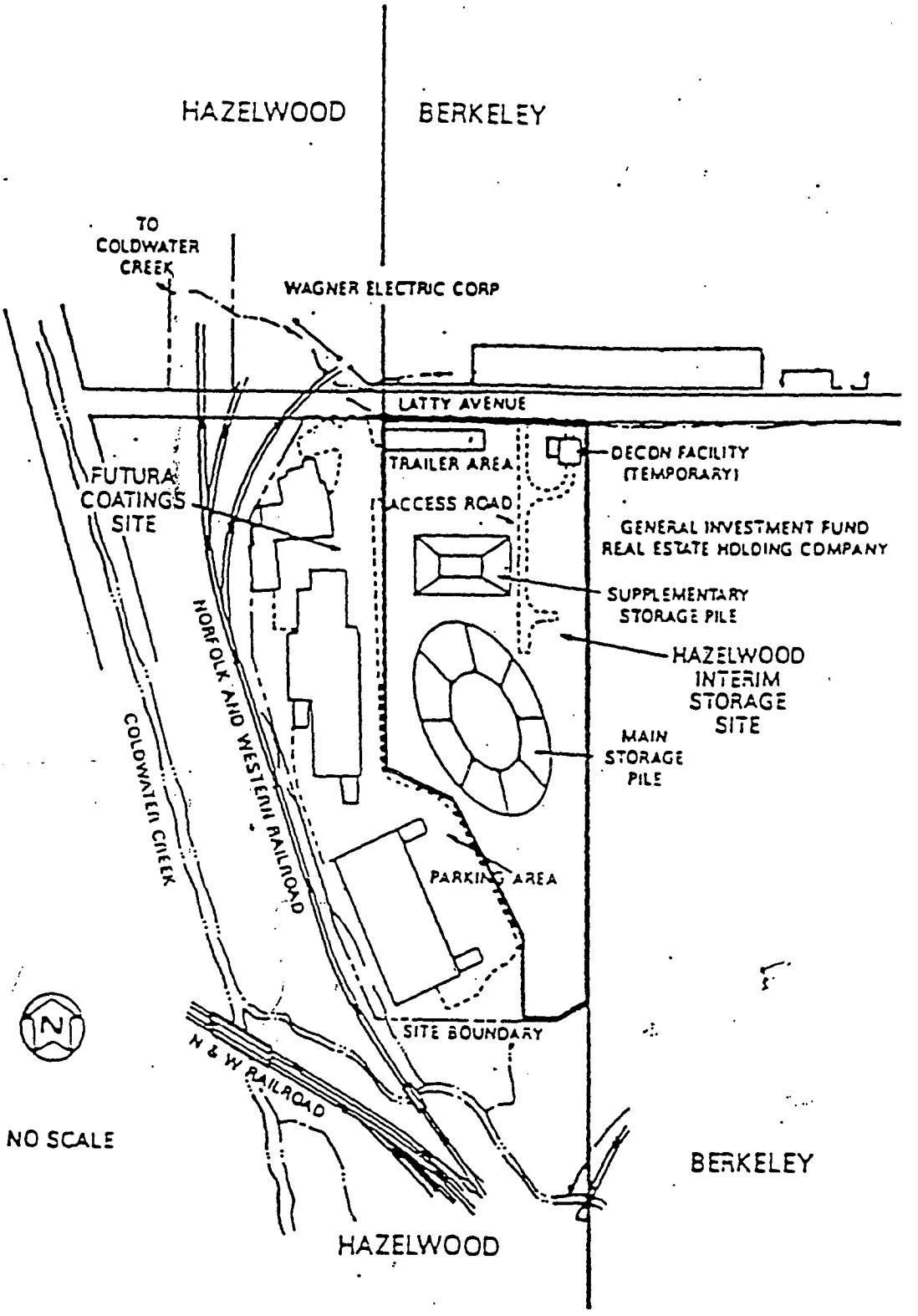

Figure 3. Boundaries of the HIS and Futura sites

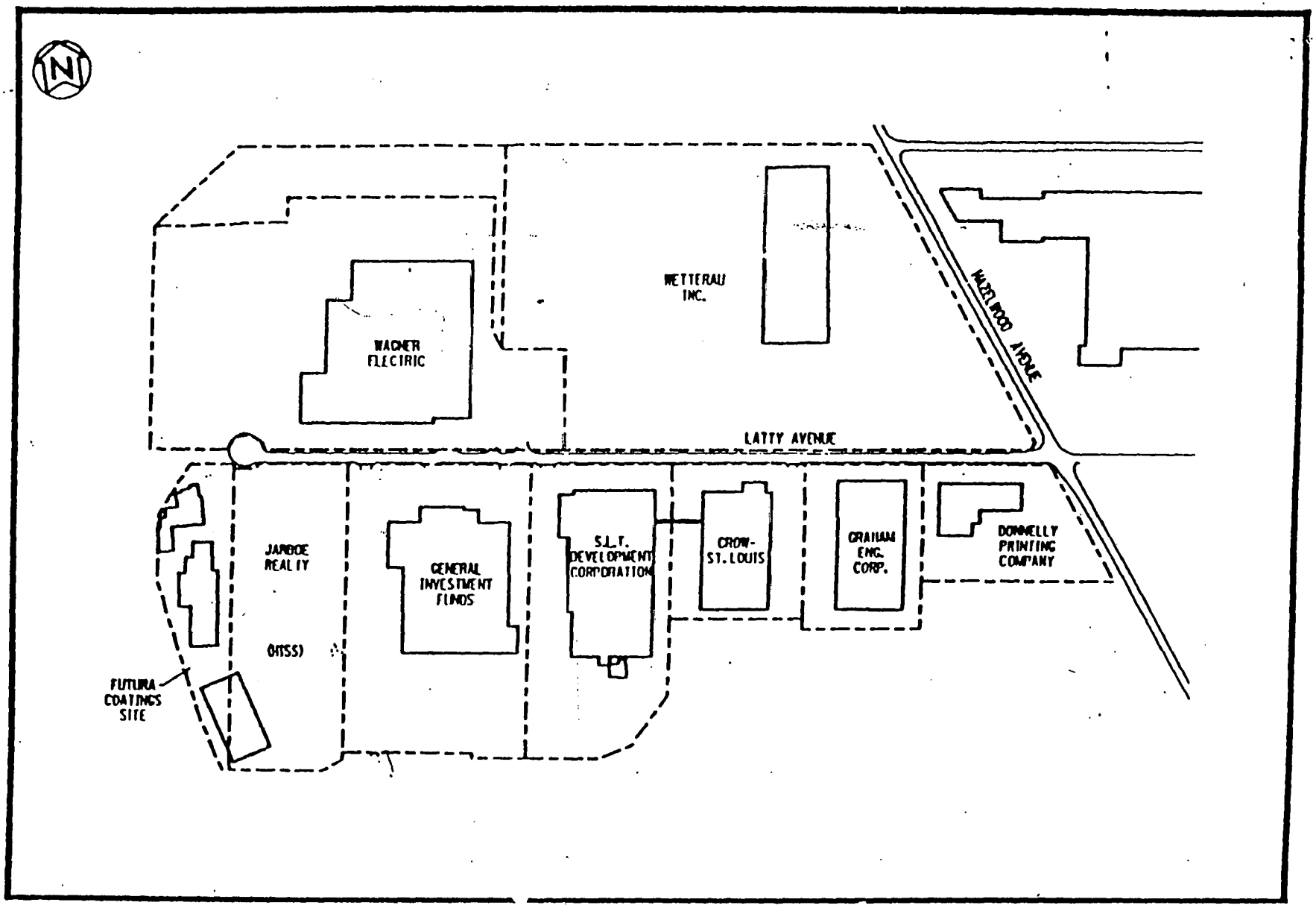

Figure 4. Location of the Latty Avenue vicinity properties

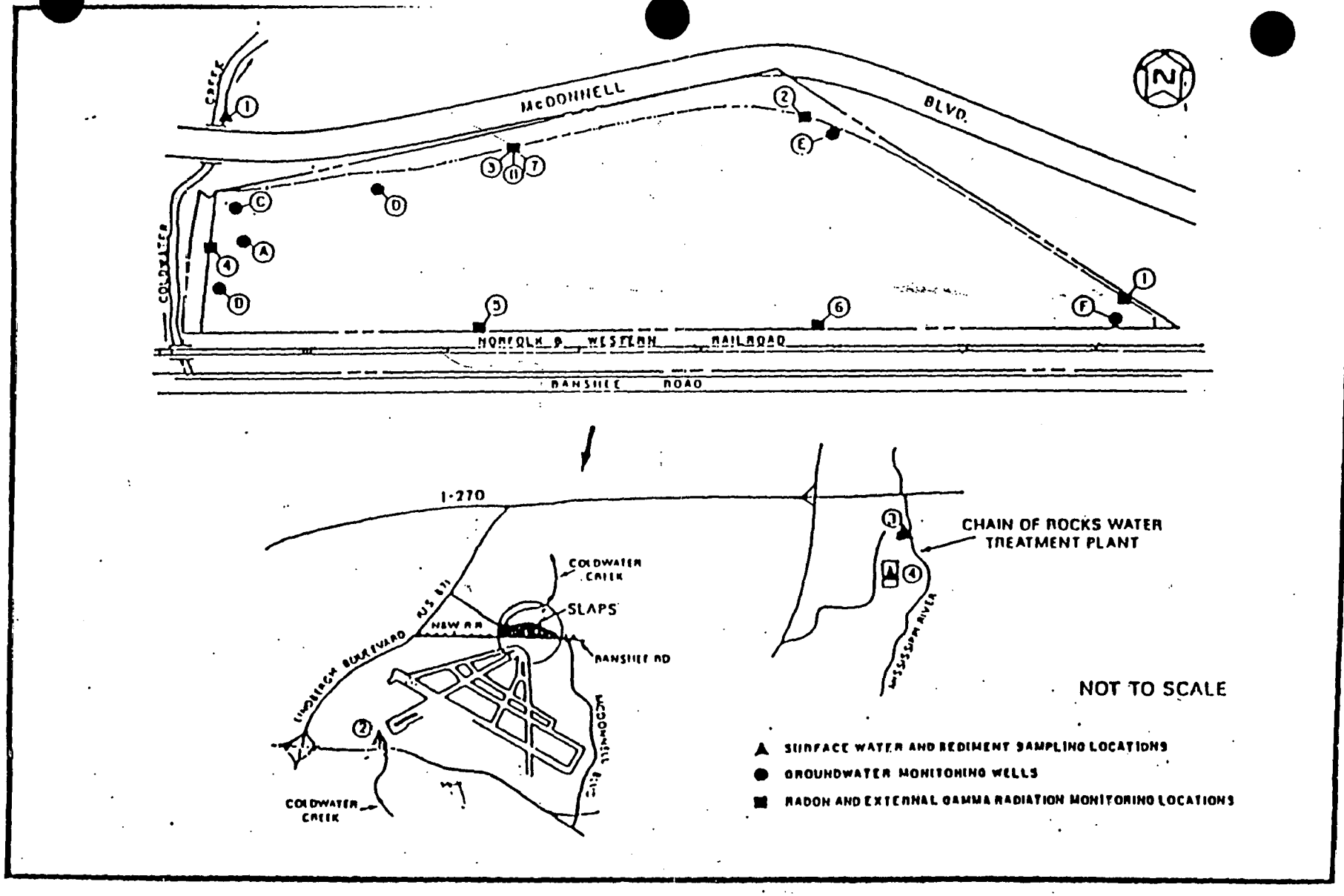

Figure 5. SLAPS environmental monitoring locations

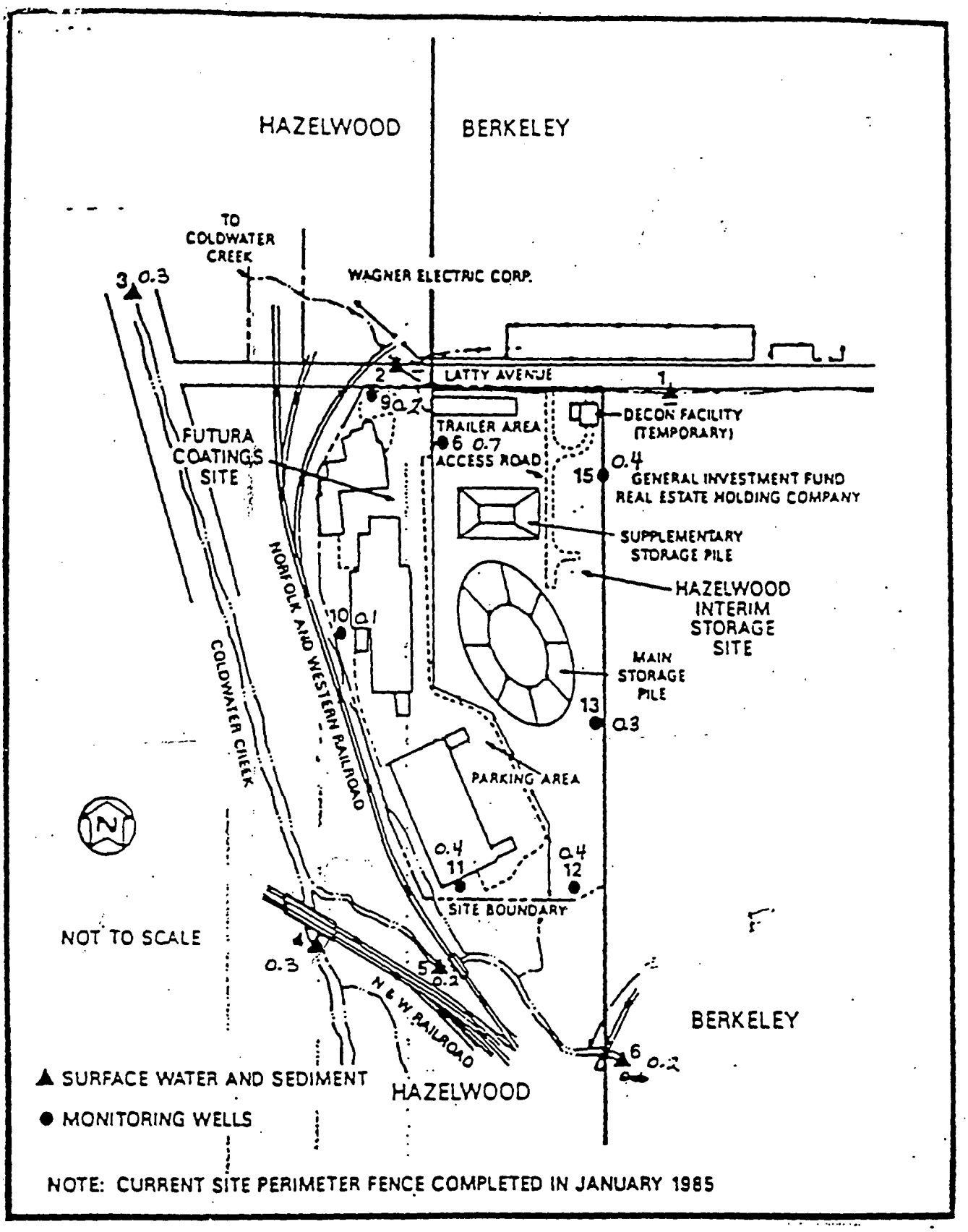

Figure 6. Surface water, groundwater, and sediment sampling locations at the HISS

APPENDIX A - DEPARTMENT OF ENERGY DOSE CALCULATIONS

Department of Energy
Oak Ridge Operations
P. O. Box E
Oak Ridge, Tennessee 37831

April 20, 1988

Mr. Larry Birkla, City Manager
City of Berkeley
6140 North Hanley Road
Berkeley, Missouri 63134

Dear Mr. Birkla:

RADIOLOGICAL STATUS OF RECREATION FIELDS

This letter is in response to your inquiry concerning the radiological status of recreation fields used by the City of Berkeley with regard to potential health risks to persons playing on the fields.

The Department of Energy (DOE) has "standards" or guidelines for radioactive contamination in soil that are adopted from Environmental Protection Agency (EPA) quidelines. If soil contamination exceeds these guidelines, remedial action is considered. On a site specific basis, contamination levels above DOE guidelines are reviewed to determine if there is any practicable way for the contamination to reach the human environment in sufficient quantity to represent a potential health hazard. If such a hazard exists then action is taken immediately. However, if it is determined that there are no significant health risks then site clean up is scheduled accordingly.

In October of 1986 samples were taken from the recreation fields in the area extending about 300 feet north of McDonnell Douglas Boulevard. Analysis of these samples found that contamination exceeding DOE soil contamination guidelines was present. This is the same information that was provided to you and to the director of the Airport Authority in a letter dated March 11, 1987.

Utilizing these data, a conservative hazard analysis was performed on the recreation fields. This analysis made conservative assumptions on conditions which are not normally present, such as continuous high dust levels containing the radioactivity. Also, all of the contamination was found in grass covered areas which further reduces the risk of exposure to ball players by means of

injestion or inhalation. The results of this hazard assessment show that a ball player will receive a maximum radiation dose of 13.2 mrem per ball season, which is below the dose the public receives from naturally occurring radiation in the earth, building materials, and the atmosphere. Natural background radiation levels have been estimated to be approximately 100-150 mrem per year. Based on this analysis DOE has concluded that continued use of the recreation fields presents a level of risk well below the standards for the public.

In order to obtain additional information, more soil samples were taken in November 1987, including 26 samples from the infield areas of the ball fields. No areas of contamination above the DOE soil contamination guidelines were found in the infields. This survey was consistant with data collected in 1986 for other areas of the recreation fields.

The recent concern over the safety of the recreation fields apparently originated about two weeks ago when we provided a briefing to representatives of the McDonnell Douglas Corporation. They had not previously heard of the contamination on the recreation fields and were understandably concerned over the safety of their employees who use the fields. While this information was first outlined to McDonnell Douglas employees two weeks ago, it is the same data that had been provided to the Airport Authority in March of 1987 and was reported in the St. Louis Post-Dispatch on April 9 and 17 and June 18 of 1987.

We fully understand the sensitive nature of this issue and will work with you and your staff to provide any additional information needed by the City of Berkeley. If you have any questions, please contact me or Mr. Andrew Avel of my staff at (615) 576-0844.

Sincerely,

Peter J. Gross, Director
Technical Services Division

cc: Thomas A. Villa, President, Board of Alderman, St. Louis
Joseph H. Copeland, McDonnell Douglas Corporation

Department of Energy
Oak Ridge Operations
P. O. Box E
Oak Ridge, Tennessee 37831

April 20, 1988

Mr. Larry Birkla, City Manager
City of Berkeley
6140 North Hanley Road
Berkeley, Missouri 63134

Dear Mr. Birkla:

RADIOLOGICAL STATUS OF RECREATION FIELDS

Please find enclosed a copy of the hazard assessment which was referenced in our letter of April 20, 1988. If there are any questions, please contact Mr. Andrew Avel at (615) 576-0844.

Sincerely,

Peter J. Gross, Director
Technical Services Division

Enclosure:
As stated

Calculations

I. Estimate of the 50 year committed effective dose from dust inhalation by the ball players at SLAPS ballfields.

Assumptions:

1. It is assumed that the playing season is 18 weeks per year. This is the normal season length.

2. The player is at the ballfields for 8 hours per week. This gives a total number of hours at the playing field for the season to be 144 hours. This amount of time would provide for one hour of practice each day and one two hour game each week.

3. The respiration rate is that for a standard man doing light work, 9600 liters per 8 hours. This respiration rate was chosen since baseball does not require great exertion.

4. All of the dust particles are assumed to be of respirable size, 1 micron.

5. The mass loading of soil in the air is assumed to be 5 mg/m^3. This is 50% of the ACGIH TLV for nuisance dusts. Since most of the ballfield area is covered with sod this should be very conservative.

Method for estimating the 50 year committed effective dose: The amount of dust inhaled per season is given by:

dust inhaled/season = (amount of dust in the air) X (respiration rate) X (time) substituting the assumed values gives:

dust inhaled/season = (5 mg/m^3) x (10^{-3} g/mg) x (10^{-3} m^3/liter) x (9600 liters/8 hr) x (144 hr/season)
= 0.864 g/season

From this the 50 year committed effective dose equivalent for one season's exposure is given by:

50 year committed effective dose = (dust inhaled/season) x (soil concentration) x (committed effective dose equivalent factor)

Table I gives the isotope, average soil concentration, committed dose equivalent factor, and the 50 year committed effective dose for the isotopes present at the SLAPS ballfields. The total 50 year committed effective dose from inhalation for one season of play is 9.3 mrem.

1460f-4

II. Estimates of the external dose equivalent from the soil at the SLAPS ballfields.

Assumptions:

1. It is assumed that the playing season is 18 weeks per year. This is the normal season length.

2. The player is at the ballfields for 8 hours per week. This gives the total number of hours at the playing field to be 144 hours per season.

3. Soil is assumed to have a density of 2 g/cm^3.

4. All of the contamination contained in the top 15 cm of soil is assumed to be an infinitely thin layer at the surface. Incorporated in this assumption is the fact that there is no contamination below 15 cm.

5. All short-lived daughters are assumed to be in secular equilibrium with their long-lived parent or be present at the relative abundance found naturally.

Method for estimating the external dose equivalent:

For this estimate it is assumed that all of the contamination in the 15 cm of the soil is located at the surface; this concentration will be called the effective contamination/cm^2. The effective contamination/cm^2 is given by:

effective contamination/cm^2 = (soil concentration of contaminant) x (soil density) x (15 cm)

The estimate of the external dose equivalent is then given by:

external dose equivalent = (effective contamination/cm^2) x (external dose rate conversion factor) x (time spent in contaminated area)

Table 2 gives the isotope, average soil concentration, external dose rate conversion factor, and the external dose equivalent for the isotopes presented the SLAPS ballfields. The total external dose equivalence from all isotopes is a 3.9 mrem.

III. Estimate of the external dose equivalent from immersion in a dust cloud at the SLAPS ballfields.

Assumptions:

1. It is assumed that the playing season is 18 weeks per year.

2. The player is at the ballfields for 8 hours per week.

3. The mass loading of the soil in the air is assumed to be 5 mg/m^3.

4. All short-lived daughters are assumed to be in secular equilibrium with their long-lived parents or be present at the relative abundance found naturally.

Method of estimating the external dose equivalent from immersion in a dust cloud.

The external dose equivalent from immersion in a dust cloud is given by:

external dose equivalent = (soil concentration) x
(mass loading factor) x
(dose rate conversion factor) x
(time spent in dust cloud)

Table 3 gives the isotopes, average soil concentration, external dose rate conversion factor, and the external dose equivalent for the isotopes present at the SLAPS ballfields. The total estimated external dose equivalent from immersion in a dust cloud is 3.8×10^{-6}.

All of the information for these calculations were taken from "Models and Parameters for Environmental Radiological Assessments", DOE/TIC-11468, 1984

Table 1: Data for the calculations of the 50 year committed dose equivalent

Isotope	Average Soil Concentration (PCi/g)	Committed Effective Dose Equivalent (mrem/uCi)	50 Year Committed Dose Equivalent (mrem)
U-238	10	1.0×10^{5} (Y)	8.6×10^{-1}
Th-234	10	3.0×10^{1} (W)	2.6×10^{-4}
Pa-234m	10	3.7×10^{-3} (W)	3.2×10^{-8}
Pa-234	0.013	9.6 (Y)	1.1×10^{-7}
U-234	10	1.1×10^{5} (Y)	9.5×10^{-1}
Th-230	20	3.7×10^{5} (W)	6.5
Ra-226	2	8.5×10^{3} (W)	1.5×10^{-2}
Rn-222	2	2.8×10^{-1} (-)	4.8×10^{-7}
Po-218	2	3.1 (W)	5.4×10^{-6}
Pb-214	2	1.5×10^{1} (W)	2.6×10^{-5}
Bi-214	2	1.2×10^{1} (W)	2.1×10^{-5}
Po-214	2	1.7×10^{-6} (W)	2.9×10^{-12}
Pb-210	2	2.6×10^{3} (W)	4.5×10^{-3}
Bi-210	2	2.0×10^{2} (W)	3.5×10^{-4}
Po-210	2	1.0×10^{4} (D)	1.7×10^{-2}
Th-232	2	4.1×10^{5} (W)	7.1×10^{-1}
Ra-228	2	1.7×10^{3} (W)	2.9×10^{-3}
Ac-228	2	4.4×10^{1} (Y)	7.6×10^{-5}
Th-228	2	1.3×10^{5} (Y)	2.3×10^{-1}
Ra-224	2	1.2×10^{3} (W)	2.1×10^{-3}
Rn-220	2	2.6×10^{-1} (-)	4.5×10^{-7}
Po-216	2	2.3×10^{-3} (Y)	4.0×10^{-9}
Pb-212	2	2.3×10^{2} (W)	4.0×10^{-4}
Bi-212	2	3.5×10^{1} (W)	6.1×10^{-5}
Po-212	1.3	3.6×10^{-9} (W)	4.0×10^{-15}
Tl-208	0.7	1.0×10^{-2} (W)	6.0×10^{-9}

Table 2: Data for the calculations of the estimated external dose equivalence from the soil.

Isotope	Average Soil Concentration (pCi/g)	External Dose Rate (Ground Surface) Conversion Factor (rem/yr per uCi/cm^2)	External Dose Equivalent (mrem)
U-238	10	5.7×10^{2}	2.8×10^{-3}
Th-234	10	8.9×10^{3}	4.4×10^{-2}
Pa-234m	10	1.1×10^{4}	5.4×10^{-2}
Pa-234	0.013	1.8×10^{6}	1.2×10^{-2}
U-234	10	7.1×10^{2}	3.5×10^{-3}
Th-230	10	7.8×10^{2}	7.7×10^{-3}
Ra-226	2	6.8×10^{3}	6.7×10^{-3}
Rn-222	2	3.7×10^{3}	3.7×10^{-3}
Po-218	2	0.0	0.0
Pb-214	2	2.5×10^{5}	2.5×10^{-1}
Bi-214	2	1.3×10^{6}	1.3
Po-214	2	7.9×10^{1}	7.8×10^{-5}
Pb-210	2	2.6×10^{3}	2.6×10^{-3}
Bi-210	2	0.0	0.0
Po-210	2	8.1	8.0×10^{-6}
Th-232	2	5.7×10^{2}	5.6×10^{-4}
Ra-228	2	4.8×10^{4}	4.8×10^{-2}
Ac-228	2	8.5×10^{5}	8.4×10^{-1}
Th-228	2	2.4×10^{3}	2.4×10^{-3}
Ra-224	2	1.0×10^{4}	9.9×10^{-3}
Rn-220	2	5.0×10^{2}	5.0×10^{-4}
Po-216	2	0.0	0.0
Pb-212	2	1.5×10^{5}	1.5×10^{-1}
Bi-212	2	1.7×10^{5}	$1.7\ 10^{-1}$
Po-212	1.3	0.0	0.0
Tl-208	0.7	2.8×10^{6}	1.0

Table 3: Data for the calculations of the estimated external dose equivalence from the immersion in a dust cloud.

	Average Soil Concentration (pCi/g)	External Dose Rate Conversion Factor (mrem/yr per uCi/cm^3) (Immersion)	External Dose Equivalent (mrem)
U-238	10	4.6×10^{5}	3.8×10^{-10}
Th-234	10	3.4×10^{7}	2.8×10^{-8}
Pa-234	10	5.6×10^{7}	4.6×10^{-8}
Pa-234	0.013	9.60×10^{9}	1.0×10^{-8}
U-234	10	6.70×10^{5}	5.5×10^{-10}
Th-230	20	1.7×10^{6}	2.8×10^{-9}
Ra-226	2	3.7×10^{7}	6.1×10^{-9}
Rn-222	2	1.8×10^{6}	3.0×10^{-10}
Po-218	2	0.0	0.0
Pb-214	2	1.1×10^{9}	1.8×10^{-7}
Bi-214	2	7.7×10^{9}	1.3×10^{-6}
Po-214	2	4.1×10^{5}	6.8×10^{-11}
Pb-210	2	5.9×10^{6}	9.7×10^{-10}
Bi-210	2	0.0	0.0
Po-210	2	4.2×10^{4}	6.9×10^{-12}
Th-232	2	8.2×10^{5}	1.4×10^{-10}
Ra-228	2	2.3×10^{1}	3.8×10^{-15}
Ac-228	2	4.5×10^{9}	7.4×10^{-7}
Th-228	2	8.8×10^{6}	1.5×10^{-9}
Ra-224	2	4.6×10^{7}	7.6×10^{-9}
Rn-220	2	2.5×10^{6}	4.1×10^{-10}
Po-216	2	0.0	0.0
Pb-212	2	6.7×10^{8}	1.1×10^{-7}
Bi-212	2	9.0×10^{8}	1.5×10^{-7}
Po-212	1.3	0.0	0.0
Tl-208	0.7	1.9×10^{10}	1.1×10^{-6}

APPENDIX B - PUBLIC COMMENTS

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
and Disease Registry
Atlanta GA 30333

NEWS RELEASE

For more information, contact:
Mike Greenwell
ATSDR Office of Policy and External Affairs
404/639-0727

For immediate release: April 29, 1991

ATSDR ANNOUNCES PUBLIC COMMENT PERIOD ON HEALTH ASSESSMENT

ATLANTA -- The Agency for Toxic Substances and Disease Registry (ATSDR), part of the U.S. Public Health Service, is investigating the St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company National Priorities List site in St. Louis, Missouri, focusing on various potential sources of environmental contamination to determine their public health implications.

ATSDR is preparing a Health Assessment -- an evaluation of data and information on the release of hazardous substances into the environment -- on the site. Health Assessments are used to assess any current or future impact on public health, develop Health Advisories or other recommendations and identify studies or actions needed to evaluate and mitigate or prevent human health effects.

Health Assessments rely on three sources of information: environmental data, health outcome data and reports of community concerns. Environmental data detail the chemicals at a site and indicate their potential pathways to reach humans. Health

-more-

outcome data include reports of injury, disease or death in the community. Reports of community concerns document the public's descriptions of how a site affects their health and quality of life.

Following internal ATSDR review, and review by the Environmental Protection Agency and the Missouri Department of Health, the St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company Health Assessment is now available for public review and comment. The public comment period for the Health Assessment will run May 15-June 13, 1991. Comments received after that time will not be considered.

Comments received during the public comment period will be logged and become part of the administrative record for the Health Assessment. Comments (without attribution) and responses will be included in an appendix to the final Health Assessment. Although commenters' names will not be included in the Health Assessment, they are subject to Freedom of Information Act requests. Only written comments will be accepted.

Health Assessments will be available in the community. Repositories include:

Department of Energy Public Information Office
9200 Latty Avenue
Hazelwood, MO 63042

St. Louis County Library-Prairie Commons Branch
915 Utz Lane
Hazelwood, MO 63042

St. Louis Public Library-Government Information Section
1301 Olive Street
St. Louis, MO 63103

-more-

Health Assessment -- Add 2

Citizens seeking information on the public comment procedures should contact Regional Representatives for the area, Daniel Harper or David Parker, at 913/551-7692 or the Community Involvement Liaison, Lydia Ogden Askew, at 404/639-0610 (during the workday) or 404/330-9543 (24-hour message service).

News representatives seeking information about the Health Assessment, the public comment period or related issues should contact Mike Greenwell, ATSDR Office of Policy and External Affairs, 404/639-0727.

-30-

Public Notice
St. Louis, Missouri

The Agency for Toxic Substances and Disease Registry Health Assessment for the St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company National Priorities List site will be available on May 15, 1991, at the following repositories:

Department of Energy Public Information Office
9200 Latty Avenue
Hazelwood, MO 63042

St. Louis County Library-Prairie Commons Branch
915 Utz Lane
Hazelwood, MO 63042

St. Louis Public Library-Government Information Section
1301 Olive Street
St. Louis, MO 63103

The Public Comment Period will run May 15-June 13, 1991. Comments received after that time will not be considered. Comments received during the public comment period will be logged and become part of the administrative record for the Health Assessment. Comments and responses will be included in an appendix to the final Health Assessment. Commenters' names will not be included in the Health Assessment, however, they are subject to Freedom of Information A requests. Only written comments will be accepted. Comments shou be directed to:

Lydia Ogden Askew
Community Involvement Liaison
ATSDR (E32)
1600 Clifton Road, NE
Atlanta, GA 30333

Please contact Daniel Harper or David Parker, ATSDR Regional Representatives, at 913/551-7692 or Ms. Ogden Askew at 404/639-0610 or 404/330-9543 (24 hours) if you have questions.

ST. LOUIS POST-DISPATCH
TUESDAY, MAY 14, 1991 5-STAR

Study Cites Hazards At Waste Area

By Christine Bertelson
Of the Post-Dispatch Staff

Radiation from nuclear waste stored near Lambert Field is a potential public health concern but not an immediate threat for people who live or work nearby, a federal report says.

The report is by the Agency for Toxic Substances and Disease Registry within the U.S. Public Health Service. The report says the potential health concerns are because of emissions of radon and the presence of thorium in the air and soil near three sites near the airport. Uranium waste from the nation's atomic energy program was dumped at the site between 1946 and 1966.

Because many people may have been exposed to contaminants in the area in the past, it says, follow-up health studies should be done.

The report says it found no evidence of a high incidence of cancer on Nyflot Avenue in Hazelwood, less than a half-mile from two of the sites under study. The agency had been asked to investigate reports of leukemia and other forms of cancer in that area.

The nine cancers found there were not the type normally associated with exposure to the kind of radiation present at the sites, the report says.

The report also recommends that:

- Air and dust samples be taken along roads used to carry contaminated material in and out of the storage sites.
- Steps be taken to reduce airborne dust during cleanup of the sites.
- Consideration be given to fencing off the former Berkeley Athletic Complex, closed by the city in 1988.

Berkeley Mayor Bill Miller said the report confirmed his city's long-held view that the radioactive material was a threat to public health, notwithstanding assurances to the contrary by the U.S. Department of Energy.

"This ... makes a liar out of the Department of Energy," Miller said. "The [department] told us years ago we could plant a garden, have animals out there, eat the dirt, ... and use the area as we saw fit. This confirms ... that we have an explosive situation. We want it out of the area."

Rep. Joan Kelly Horn, D-Ladue, said the report was "telling us something we already knew."

"I wish they would stop studying and do something about it," Horn said. "It's time to get on with it, get it cleaned up and get it out of there."

The agency is seeking public comment on the report through June 13. The report is based on data compiled by the Department of Energy, the U.S. Environmental Protection Agency and the Missouri Department of Health.

The agency studied three sites where almost 1 million cubic yards of radioactive material are stored: the St. Louis airport site — 22 acres just north of the airport — and two other sites on 11 acres near Latty Avenue.

The three sites and areas nearby were used to store uranium waste generated by Mallinckrodt Chemical Co. under contract with the U.S. Department of Energy during the Manhattan Project. The energy department, which owns the waste, is studying the sites in preparation for a major federal cleanup. The St. Louis site is one of 33 storage sites in the nation on a priority list for cleanup by the Energy Department.

The Energy Department wants to build an earthen bunker to store the waste permanently on 22 acres near the airport. Citizens groups, nearby communities and the city of St. Louis, which owns the property, have fought the proposal, contending it poses a health threat.

The health report adds fuel to the city's argument that the airport sites should be cleaned up quickly, said David Bohm, associate city counselor.

"This [report] says, 'Hold it! This is a serious problem,' " he said.

May 30, 1991

Paul A. Charp, Ph.D.
ATSDR, MS E-32
1600 Clifton Road, N.E.
Atlanta, Georgia 30333

Re: "Preliminary Health Assessment for St. Louis Airport / Hazelwood Interim Storage / Futura Coatings Company, St. Louis, St. Louis County, Missouri, CERCLIS NO. MOD980633176, May 10, 1991."

Dear Dr. Charp:

I am writing to offer some comments on the report that you prepared entitled "Preliminary Health Assessment for St. Louis Airport / Hazelwood Interim Storage / Futura Coatings Company, St. Louis, St. Louis County, Missouri, CERCLIS NO. MOD980633176, May 10, 1991."

I am not certain of the intended audience for this report. If the intended audience is interested members of the general public, the report should be less technical. Despite my background in Nuclear Medicine and my long interest in the health effects of radiation, I found it difficult to extract information from the report that was useful from a public health point of view.

On page 4, paragraph 1: The report should include some statement as to the size of the population that would be necessary in order to detect an increase in cancers (assuming that our estimates of the cancer risk of radiation are reasonable) from a 10-15 mrem/year radiation dose. This would help public health officials decide whether long-term studies of the cancer incidence around St. Louis nuclear waste sites are likely to be definitive.

Page 9, last paragraph: It would be useful to note that although the levels of radon-222 are elevated relative to the outside air concentration, they are actually less than the radon levels in many homes.

Page 11, first paragraph: It would be useful to try to put the 15 mrem and 6.5 calculation into perspective. This variation in radiation exposure is considerably smaller than differences in natural background radiation. It is also considerably smaller than differences in radiation exposures due to the varying radon levels in a home.

5 In order to determine the public health impact from playing baseball on contaminated fields, the adverse health effects from the 15 mrem radiation dose should be compared with the adverse health effects from 1) driving to a more distant baseball field; 2) a decline in general health if people stop playing baseball because it is inconvenient to play elsewhere.

6 Is this 15 mrem estimate intended to be a "conservative (worst case)" estimate? What are the 95% confidence intervals for this estimate? If 15 mrem is the "conservative" estimate, what is a more realistic (probabilistic) estimate of the risk?

7 Page 11, last paragraph: The statement is made that the ATSDR considers the St. Louis nuclear waste sites to be "a potential public health concern". What is the definition of "a potential health concern"? How does one differentiate a real public health concern from a potential health concern? How does the potential public health concern from St. Louis nuclear waste compare with other public health concerns (peri-natal mortality, obesity, smoking, excess alcohol ingestion, drug abuse, AIDS, etc)?

In summary, I thought the report does little to put the radiation doses from St. Louis' nuclear waste into a public health perspective. I would have liked to have seen some estimate of the number of person-sieverts that could be attributed to St. Louis' waste. The report should also include some estimate of the costs for preventing the adverse health effects from the radiation. A cost benefit analysis would help decision-makers determine how to best protect the public health. The resources to protect the public health are limited. Your report could help ensure that these resources are spend wisely.

I hope these comments have been helpful. Please feel free to call if you have any questions.

Sincerely,

RECD 6/11/91 Logged in 6/12

802

6-7-91

copies to:
Li Ogden-Askew
Carol Charp

Ms. Ogden-Askew,

I would like to comment on the preliminary health assessment for the Radioactive Waste in North St. Louis County.

We've had enough studies! The federal government must immediately find an alternative site and move the waste out of this populated area.

Sincerely,

(A)

June 10, 1991

To Agency for Toxic Substances and Disease Registry;

In response to the Preliminary Health Assessment of St. Louis city and county - cerclis number MOD980633176 - May 10, 1991, I have these comments.

1. It is unfortunate this report had no new data. This report was compiled from a variety of old reports. The need for an epidemiology study is glaringly apparent. Mallinckrodt employees: Waste haulers, employees working on contaminated sites (Wetteraun, etc.), past and present residents near Latty Ave. (both sides of Hanley) and the offspring of all the people should be in the study. It has been shown that exposure to radiation can alter the males genes therefore causing genetic disorders, such as Downs Syndrome (hate Nyflot case).

2. The report (page 4) sites no connection between the 9 Nyflot cancers because the cancers are types related to gamma radiation exposure and H.T.S.S. had only alpha emmissions. In the next paragraph (page 4) it states that significant amounts of U-236 and Radon

are present. U-238 has four daughters that are gamma emmitters - Bismuth 214, Thorium 234, Protactinium 234 and Lead 214. Radon daughters also have gamma emission. In 1977 E G and G performed an aerial gamma radiation survey and found gamma radiation at both sites. The Committee on Hazardous and Toxic Wastes (7-7-88) quotes Victor Gilinsky, former Nuclear Regulatory Commiss "Since radon is a gas, it is also possible for large populations, thousands of miles from the source to be exposed, albeit an extremely low dose." (Radon gas is the second leading cause of lung cancer)

3. Comman sense dictates that the potential health risks involved in storing this waste in an urban area, polluting air, soil and ground water is not feasible. Radioactive waste has dangers that last more than a thousand years. The only "safe" way to protect future humans is consolidate the waste into huge "graves" on land

that is basically inhospitible to humans.

4. Also enclosed is an "Issue Analysis" from a graduate class - S I U - E. None of the students live near the contaminated areas. They are future business people. Cost effectiveness is a business students motto, yet even they acknowledge that the DOE storage site choices are not feasible. Maintenance and possible dangers of "break-up" make storage in the St. Louis area economically unsound.

Sincerely,

APPENDIX C - ATSDR RESPONSE TO PUBLIC COMMENTS

ATSDR received comments from eight sources concerning the St. Louis Airport, Hazelwood Interim Storage, Futura Coatings Company in St. Louis, Missouri. The comment period for this health assessment was published in the St. Louis Post-Dispatch and an article in the newspaper appeared on Tuesday, May 14, 1991. The comment period ran from May 15 to June 13, 1991. The responses were entered into a tracking system, photocopied, and distributed to the health assessment author. Where multiple comments from an individual were received, the comments were numbered. For Appendix B, all personal identifiers were removed from the comments received and placed in chronological order. The comments are addressed in chronological order as received.

May 30, 1991

1. The ATSDR Health Assessment for the St. Louis Airport, Hazelwood Interim Storage, Futura Coatings Company is written for several audiences, both technical and public. The technical audience includes the U.S. Environmental Protection Agency (EPA), other federal agencies involved with the site, state agencies, and the parties responsible for the site (owners or caretakers). In this respect the technical aspects of the assessment are a necessity. Because of the technical nature, ATSDR has attempted to structure certain sections of the health assessment to the public. These sections include the Summary, Human Exposure Pathways, and the Public Health Implications.

2. The determination of the size of a population that would be necessary to detect an increase in cancers is risk analysis. The National Academy of Science in their Biological Effects of Ionizing Radiation report (BEIR V) did publish risk factors for excess cancer mortalities for populations exposed to ionizing radiation. In a population of 100,000 males exposed over a lifetime to 100 mrem per year, the excess cancer mortality rate is estimated to be on the order of 520 excess deaths. For females under these same conditions, the excess death from cancer was estimated to be 600 individuals. However, there is much disagreement among radiation specialists as to the long term health effects of low doses of radiation. A statement of these studies has been included in the Public Health Implications section.

3. ATSDR believes that the commenter's remarks concerning radon stand on its own merit. A statement has been added in the Toxicological Implications section.

4. The dose calculations of ATSDR and DOE indicate the potential dose deposited directly to the bone surface after the internalization of radioactive materials. This dose is above and beyond that which might be received from the naturally occurring background radiation. ATSDR disagrees with the comment that "it is also considerably smaller than differences in radiation exposures due to the varying radon levels in a home." The National Council on Radiation Protection and Measurements (NCRP) in Report 78 state that the lung dose as a result of radon is low. However, the major lung damage is from the radon decay products. The NCRP estimates that the average dose to the lung bronchial epithelium for adults is 180 mrad per year and

for a 10 year old the average dose is 300 mrad per year. These doses are 10 to 20 times higher than the bone doses calculated by ATSDR or DOE.

5. A response to this question requires a comparative risk assessment which is not in the purview of ATSDR.

6. The 15 mrem estimate was calculated using current methodology and data of the International Commission on Radiological Protection. The variation for these calculations is determined by the amount of contaminated soil a ball player might receive if they ingested a gram of soil. In some cases, it is conceivable that a very intense ball player may have ingested much more than a gram; however, it is believed that the average ball player would ingest much less. ATSDR is not aware of any studies involving soil ingestion in athletic events.

7. ATSDR has developed a Public Health Assessment Guidance Manual which describes five levels of public health concern. At the time this health assessment was prepared, the St. Louis Airport Site would have been classified as a Potential Public Health Hazard. Under the new guidance manual, the site has been reevaluated and upgraded to an Indeterminate Public Health Hazard. The manual states that this category is used for sites in which there is incomplete information. Although ATSDR believes humans have been exposed to levels of contaminants that could cause adverse health effects, data or information from this site are not available for all environmental media, such as biota, to which human may have been exposed.

8. It is the opinion of ATSDR that an estimate of the number of person-sieverts would not be beneficial for this site. This is because exposure depends on many factors including those related to life styles, use of the environment around the site, and in some instances, biological aspects. The International Commission on Radiological Protection Report 26, paragraph 219 states that "because of its complexity, assessments of collective dose equivalent involve the use of simplifications and approximations, particularly when a large population is irradiated at low dose levels. Because of this, they may involve considerable uncertainties and these must be borne in mind when the assessments are being used to appraise the detriment associated with a practice."

   A response to the cost benefit analysis requires a risk assessment which is not in the purview of ATSDR.

June 7, 1991

ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

June 10, 1991 (a)

1. The ATSDR health assessment is not designed to generate new data for an existing site. However, the health assessment is to review the existing documents associated

with a site. This information is garnered from government and public documents and comments from citizens. The health assessment does not serve as an epidemiological study, but it can suggest that an epidemiological study be considered. This indeed has been stated in the Recommendations section of the health assessment as the site is being considered for follow-up health studies.

Although it is true that radiation can cause genetic disorders, radiation is not specific for male or female genes. In cases of Down's Syndrome where there is a breakage and realignment of human chromosome 21, the radiation doses resulting in chromosome breakage are orders of magnitude higher that those found at this site.

2. The majority of the radioactive materials found at this site are predominately alpha emitters with an emission of gamma radiation associated with the decay. Many of these resulting gamma ray emissions are very weak and are easily diminished in air. In cases of internalization of alpha emitters, the damage resulting from alpha radiation is twenty times more serious than damage resulting from gamma radiation. When alpha emitters, such as those found at this site, are internalized, they can result in bone cancers or lung cancer. In the case of radon exposure, it is not the radon that causes the most damage, but the alpha particles resulting from the decay of the radon progeny.

3. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

4. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

June 10, 1991 (b)

ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

June 12, 1991 (a)

An additional statement has been added to Part C. DEMOGRAPHICS, LAND USE, AND NATURAL RESOURCE USE indicating that some neighborhoods may use the creek for recreational purposes.

June 12, 1991 (b)

1. This comment has been addressed in the Summary section and the Background section of the health assessment.

2. Uranium-235 is found at the site; however, its concentration in the waste piles is low. Uranium-235 can be the main component in nuclear weapons or reactors and because of its value, is rarely disposed of as waste. The term enriched uranium refers to the

chemical and physical processes whereby the amount of uranium-235 in natural uranium (0.3 percent) is amplified to a higher or enriched amount of uranium-235. This enriched uranium can then be used as previously described. The health effects of uranium-235 are believed to be the same as natural uranium in which the chemical toxicity resulting in renal damage is the major cause for concern.

Radon-219 is a decay product of uranium-235, although present at the site was not discussed in the health assessment because of its short half-life, 3.96 seconds. After 40 seconds, the amount of radon-219 remaining is about 0.1 percent of the original amount. Of the decay products of radon-219, the member with the longest half-life is thallium-207 with a half-life of 4.8 minutes. After 48 minutes, the amount of thallium-207 remaining is also 0.1 percent of the original amount. In fact, if you speculate that the waste uranium-235 has been at the site for 25 years, then the ratio of radon-219 present with respect to the uranium-235 is 1/443,000 of uranium-235.

3. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

4. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

June 13, 1991 - Missouri Department of Health

1. ATSDR addresses this comment in the Health Outcome Data Evaluation section of the public health assessment. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

2. ATSDR addresses this comment in the Health Outcome Data Evaluation section of the public health assessment. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

June 13, 1991

1. ATSDR believes that the levels of radionuclides found at these sites are high levels from an environmental point of view as many samples exceeded ambient background levels of the St. Louis, Missouri area.

2. The spelling correction for Futura has been made in the health assessment. The properties in question have now been referred to Latty Avenue Vicinity Properties. The figure in question was derived from a draft document released by Bechtel in 1988.

3. The health assessment has been corrected to reflect the commenter's concern.

4. The health assessment stated that materials had been placed in a second pile. The initial reference (Bechtel, 1987a) stated that materials were stored in a supplementary pile at HISS. The health assessment has been corrected to reflect the commenter's concern.

5. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

6. The values in the health assessment were derived from Tables I1-I12 of Bechtel document. The values in those tables for each month were averaged over the 12-month period and the averages reported in the health assessment.

7. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

8. ATSDR believes that the commenter's remarks concerning this site stand on its own merit.

9. The health assessment has been corrected to reflect the commenter's concern.

10. The health assessment has been corrected to reflect the commenter's concern.

MISSOURI DEPARTMENT OF HEALTH

John Ashcroft
Governor

John R. Bagby, Ph.D.
Director

P.O. Box 570, Jefferson City, MO 65102 • 314-751-6400 • FAX 314-751-6010

June 13, 1991

Paul Charp
Health Physicist
ATSDR
Mailstop E32
1600 Clifton Road
Atlanta, GA 30333

Dear Mr. Charp:

The Missouri Department of Health wishes to comment on the ATSDR preliminary health assessment, released May 10, 1991, for the St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company site (CIRCLIS No. MOD980633176) in St. Louis, Missouri.

The preliminary health assessment refers on page 4 to an inquiry conducted by the Missouri Department of Health at the request of a citizen. This inquiry examined a number of cancer cases found in residents of Nyflot Avenue, which is one block from the street that borders the Hazelwood Interim Storage Site. Because ATSDR's conclusions regarding the cancer cases on Nyflot Avenue appeared somewhat at variance with the conclusions of the Missouri Department of Health (DOH), DOH reexamined the literature and its own conclusions.

The results and conclusions of this reexamination are presented in the enclosed summary of the DOH inquiry. Our major conclusions are:

1) The possibility of an excess of cancer, particulary leukemia, should not be dismissed on the basis of lack of similarity between the cancers.

2) The possibility exists of an association between the cancers and the radiation found at the site. Contrary to ATSDR's statement on page 4, gamma radiation has been measured at the site. Several residents have reported visits to areas of potential gamma exposure, although re-creation of exposure is impossible.

We hope you will take this analysis into consideration when preparing your final health assessment of the area. We feel that the existence of the cancer cases on Nyflot Avenue lends further support to both your conclusion that the site is a potential public health concern and your recommendations outlined on page 12 of the health assessment.

Should you have any questions about our summary of this inquiry, please contact Dr. Kathleen Anger at (314) 876-3248. Thank you for your attention to this matter.

Sincerely,

Ross Brownson

for John R. Bagby, Ph.D.
Director

Enclosures

JRB/RB/KA/bk

cc: Juan Reyes
Chief of Health Assessment Branch, ATSDR
Ross Brownson, Ph.D., Director
Division of Chronic Disease Prevention & Health Promotion
William Schmidt, M.P.H., Director
Division of Environmental Health and Epidemiology
Members of the Cancer Inquiry Committee

SUMMARY STATEMENT

June 6, 1991

Inquiry No.: CI89-002

Location: St. Louis (Hazelwood; Nyflot Avenue)

Recieved: January 26, 1989

Initiator: Residents of Nyflot Avenue, parents of child with leukemia

Type(s) of cancer reported:

Initially, leukemia (ANLL/AML, ALL, HCL), colon and prostate cancer were reported. Later, cases of breast, lymphoma, melanoma, and thyroid cancer were found in addition to the types of cancer initially reported.

Suspected Cause(s):

Nearby radioactive waste sites

Associated regulatory issues (if any):

Regulation/clean-up of radioactive waste sites

Related inquiry (if any):

CI88-017

Summary of Inquiry:

[A more detailed summary of the activities up to November, 1989, related to this inquiry is given in the attached earlier summary, labelled "Summary A."]

In January, 1989, the parents of a child with leukemia reported four cases of leukemia associated with the four houses on Nyflot Avenue in closest proximity to the Hazelwood Interim Storage Site (HISS) on neighboring Latty Avenue, plus a fifth cancer case--a man with two separate primaries--at the far end of the same block.

Although a study of this area in response to an earlier inquiry (CI88-017) had not revealed an excess of cancer, residents of the area were contacted in response to the present inquiry. These contacts confirmed the five cases of cancer and revealed two additional cases. These findings, coupled with knowledge of radioactive contamination in the area (at two radioactive waste sites [SLAPS AND HISS] and along haul roads formerly used to transport radioactive materials), led the Cancer Inquiry Committee to recommend expanding the inquiry in February, 1989.

The expanded inquiry included further interviews of residents and former residents, examination of medical records, review of the literature and the reports of other agencies, and the construction of chronologies of deposition of radioactive materials as well as the dates of diagnosis and times of residence of the cancer patients. The investigation confirmed the existence of nine cases of cancer in residents of one city block containing only eight houses. (Two of the houses no longer exist, because they were destroyed for construction of the interstate highway.) A summary (Summary A) of the investigation, written in November, 1989, concluded that for only one of the nine cases could an association between the cancer and the radioactive contamination be ruled out.

It was decided that the Missouri Department of Health (DOH) would request the Agency for Toxic Substances and Disease Registry (ATSDR) to assist with the investigation. Summary A was therefore transmitted to ATSDR under cover of a letter from the Director of DOH. A copy of this letter is attached.

At the December, 1990, meeting of the DOH Cancer Inquiry Committee, David Bedan of the Missouri Department Natural Resources (DNR) reported on exposure calculations that DNR had requested and received from the U.S. Department of Energy (DOE). In making these calculations, DOE developed two exposure scenarios: 1) a child playing in Coldwater Creek 4 hours/day, 5 days/week, for 12 weeks; and 2) a utility worker working along the haul roads for 8 hours/day, 5 days/week, for 2 weeks. The estimated dose for scenario #1 was 7.8 mrem/year, and for scenario #2 was 23.9 mrem/year.

The Chief of DOH's Bureau of Radiological Health, Kenneth Miller, was asked to evaluate the health effects of the doses calculated by DOE. That evaluation, which was discussed at the February, 1991, meeting of the DOH Cancer Inquiry Committee, indicated that the dose levels calculated do not present health threats such that immediate action is required. The committee, however, thought that the DOE scenarios were for relatively short-duration exposures, and that calculations should be made for long-term exposures that could be experienced by the long-term residents of the area.

On May 10, 1991, ATSDR released its preliminary health assessment for public comment. The basic conclusion stated in this document is that ATSDR considers the site to be a potential public health concern because of on-site and off-site radiation emissions. However, in regard to the cancer cluster on Nyflot Avenue, the document stated (p. 4) that ATSDR met with the State and investigated complaints of nine cases of cancer reported in homes closest to HISS. The document continued:

> "it was determined that a cancer cluster did not exist in the area surrounding the SLAPS. A cancer cluster is used to describe similarities between cancers, and in this location nine different cancers were found. Furthermore, the types of cancers in the Hazelwood area are not normally associated with exposure to alpha emitters found at this site but with exposure to gamma radiation."

In response to ATSDR's conclusion, DOH staff reexamined the literature pertaining to induction of cancer by ionizing radiation, with a particular view toward checking the accuracy of both its own earlier conclusions and those of ATSDR. The results of that examination follow.

Reexamination of Literature and Conclusions

<u>Definition of "cancer cluster"</u>

Although ATSDR is correct that the term "cancer cluster" usually refers to a grouping of a number of cases of the same type of cancer, the suspected risk factor should be taken into consideration. Underlying the concept of "cluster" is the notion that the cases in a cluster may be associated with the same causal factor. In this particular grouping of cancers on Nyflot Avenue, the suspected causal factor is ionizing radiation, which is known to cause cancer of a number of different types/sites. Therefore, it seems unwise to dismiss the possibility of a cluster in this situation, even though a number of different types of cancer are involved.

Another problem exists, however, with determining whether or not the present grouping represents an excess of cancer. This is the problem of comparing the number of cases with the number to be expected if the amount of cancer is similar to that experienced in other geographical areas. Many methods exist for making such a comparison, but all the methods have serious difficulties either due to lack of availability of necessary information (such as the number of people in the population at risk, i.e., the denominator used to determine the cancer rate), the small number of cases involved, or inadequacies of the statistical methods themselves. The committee decided that these difficulties preclude a meaningful analysis in this case, so the probability of such a cancer "cluster" occurring by chance is, as yet, unknown. However, because the total number of residents of this section of Nyflot over the past 30 years has been quite small, an elevated level of cancer incidence appears likely. Furthermore, to our knowledge, ATSDR has not analyzed available data and shown that a cluster does not exist. Given the level of public concern about this potential cluster, it is inappropriate to dismiss the possibility of a cluster as ATSDR has done.

Alpha emitters and gamma radiation

The ATSDR report found that the types of cancers on Nyflot Avenue are probably not due to the radioactive contamination in the area because the types of cancers are associated with exposure to gamma radiation and "not to alpha emitters found at this site". The statement implies that gamma radiation is not found at the site. However, the same ATSDR report (p. 5) states that gamma radiation above background levels has been measured at the site. Interviews with cancer cases and their families indicate that several cases may have been exposed to the gamma radiation during visits to the contaminated sites.

Tentative conclusions:

The number of cancers that have occurred in a small number of residents of Nyflot Avenue appears to be in excess of that expected, but it has not been possible to conduct statistical tests to confirm the accuracy of this impression. Most of the types/sites of cancers are highly to moderately sensitive to radiation induction, though the induction of melanoma and prostate cancer by radiation are questionable. The time of development of most of the cancers is consistent with an association with the radioactive waste materials, with the probable exception of the case of melanoma. Although an association between the specific cancers in the residents of Nyflot Avenue and the radioactive waste cannot be conclusively confirmed on the basis of this evidence, the evidence is consistent with the possibility of an association. Because of the potential for further exposures and possible consequent cancer induction, steps should be taken to reduce exposure to the radioactive materials and further follow-up studies should be conducted.

Recommendation(s) to committee:

Pursue assessments of health consequences of long-term exposures to the levels of radiation present in the area by requesting assistance from the Bureau of Radiological Health

Develop a protocol for the study of cancer incidence in residents of the neighboring street, Heather Lane

Committee decision(s):

LATTY AVENUE DUMP-SITE

ISSUE ANALYSIS

PRESENTED BY 510B ISSUE ANALYSIS CLASS

SOUTHERN ILLINOIS UNIVERSITY at EDWARDSVILLE

For Course Taught by PROFESSOR MARK DRUCKER

Paul Gillespie SIUE Public Administration, Policy Analysis

DAVID C. WHIPPLE

Christine Kozenski

LeRay Burris-Washington

Florence Griebat

FLORENCE GRIEBAT

Introduction:

The disposal and containment of radioactive wastes from industry is a major issue of vital concern to the health of citizens in the community. Disposal sites, haul roads, and groundwater contamination from radioactive wastes containing uranium and thorium pose serious health risks to St. Louisians. These wastes, the by-products of uranium processing for production of the nation's atomic weapons, have been stored in St. Louis since the late 1940's. Forty years later, the waste products have been moved from where they were originally produced. Some of these new locations lie within residential and commercial/industrial areas. The risks that these sites pose to occupants until recently has not been dealt with. A recent report stated that high levels of uranium, thorium, radium, and radon were detected in soil, groundwater, and air. The Agency for Toxic Substances and Disease Registry considers the St. Louis sites to be a potential health concern because of the emission of radon and the presence of thorium in on-site and off-site soils, and the emission of radiation resulting form the presence of these materials.

Study Purpose:

The objectives of this study are to identify alternatives and make recommendations that will be useful in reducing to acceptable levels the radioactivity at the uncontrolled hazardous waste sites near the Latty Avenue area.

Issue Environment and Health Concerns:

The radioactive materials at the Latty Avenue site consist of primarily wastes from uranium and thorium processing. These wastes contain residual quantities of these elements and their radioactive decay products, which have remained as contaminants in buildings, soil material, and stream channels after operations at the sites have ceased -- or have been dumped as waste in on-site or off-site disposal areas.

The radioisotopes of concern belong to the uranium 238 and thorium 230 decay series. Hazards to the general population could occur through several pathways, including:

1) inhalation of radon decay products, particularly where radon is concentrated in building structures;
2) inhalation of particulates or ingestion of materials containing radioisotopes of the two decay series;
3) ingestion of radionuclides via drinking water and food; and
4) external body exposure to gamma radiation.

Radiation definitions and levels:

There are three types of radiation generally believed to pose health hazards. One is the alpha radiation (positively charged nuclear particles) associated with the radioactive decay of uranium. Although alpha radiation cannot pass through the outer layers of skin, it can enter the body through inhalation and ingestion. Inhalation of alpha emitting particles is a major health hazard and may contribute to lung cancer. Ingestion of water, dust, plants, or animals that contain alpha-emitters may contribute to cancer in the various parts of the body where the alpha-emitters lodge.

The second type of radiation that may pose a health hazard is gamma radiation. Gamma emitters can contribute to external exposure, since they can irradiate the human body. Such exposure can contribute to cancer in various parts of the body. Different measures may be required to reduce exposure to alpha and gamma radiation.

The third type of radiation is beta radiation (electrons). Energetic beta particles cab pass through skin. The primary hazard from beta radiation, however, is internal deposition by ingestion or inhalation. The beta radiation is of secondary concern relative to the alpha and gamma radiation, as the associated risks are typically much lower.

Picocurie (pCi/gram): A picocurie is one trillionth of a curie, which refers to the amount of radioactivity in a gram of soil. One picocurie has 2.22 disintegration of radiation particles per minute.

What occurs in nature: There are emissions of radioactive particles in nature. Thorium-230 occurs at 0.2 pCi/g in soil. Uranium-238 and Radium-226 occur at 1.0 pCi/g in soil.

Soil samples taken along the haul routes of Hazelwood, Latty and Pershall indicate concentration of contaminants above the stated guidelines of: 5 pCi/g of soil for surface soil, and not more than 15 pCi/g for below surface soil levels (6 inches). These areas also indicate higher than normal gamma radiation levels. Normal background levels occur at 6 uR/h.

Samples taken along the haul routes in Hazelwood indicate radioactive disintegrations primarily from the Uranium 238 decay chain. In the banks of Coldwater Creek adjacent to the Hazelwood sites, Thorium 230 was found to be far above the DOE guidelines. Tests show readings of 5100 pCi/g of Thorium and 78 pCi/g of Uranium.

Concentrations of Thorium-230 at levels of 5700 pCi/g were found at the Latty site #2 with Uranium-238 at levels as high as 100 pCi/g, both taken at surface soil levels.

Along the RR at Latty site high levels of Uranium were found at 309 pCi/g, Radium at 1100 pCi/g, and Thorium at 26,000 pCi/g. All at surface soils.

On Hazelwood Avenue, extremely contaminated soil samples show Thorium at 4810 pCi/g. On the west side of Hazelwood across from a perishable food storage warehouse, soil samples show a level of 3500 pCi/g of Thorium. A level 17,500 times above that which occurs in nature, and 700 times above that which is the Department of Energy's guidelines for clean.

Policy Issues:

Policy Issue #1: How can the haul roadways of Latty Avenue and adjacent ground areas be decontaminated?

Alternatives:

a) Removal of contaminated soil to off-site disposal areas for land encapsulation.

Local disposal by capping or vertical barriers.

b) Capping involves covering the contaminated site with a barrier sufficiently thick and impermeable to minimize the diffusion of radon gas and attenuate the gamma radiation associated with radionuclides.

c) Vertical Barriers are walls installed around the contaminated zone to help confine the material and any contaminated ground-water that might otherwise flow from the site.

Policy Issue #2: How can groundwater contamination be treated and removed?

Alternatives:

a) Ion Exchange: Uses synthetic resin material to exchange radion nuclide ions in the polluted water with ions in the resin material.

b) Pump it out and remove it.

c) Filtration: Removes solids by passing the fluid through a filtering system.

Policy Issue #3: What precautions should be taken at the Latty Avenue site upon completion of clean-up procedures?

Alternatives:

a) Surface seal the area (asphalt).

b) Land bank the area either temporarily or perpetually.

c) Let it revert to commercial land use.

Reduced Alternative List:

1. 1a, 2a, 3a: Removal of contaminated soil to off-site disposal areas, treat groundwater with ion exchange, and surface seal the Latty Avenue area site.

2. 1b, 2c, 3b: Local disposal by capping the contaminated soil, use filtration to remove solid radioactive waste of water, and land bank the Latty Avenue site either temporarily or perpetually.

3. 1c, 2c, 3c: Vertical barriers installed around the contaminated zone, use filtration to remove radioactive solids from the water, and eventually have the Latty Avenue site return to commercial land use.

4. 1a, 2b, 3b: Removal of contaminated soil to off-site disposal areas, remove polluted groundwater by pumping process, and land bank the Latty Avenue site either temporarily or perpetually.

Recommendations:

The Latty Avenue dumpsite is in a designated flood plain, earthquake zone, heavily populated and traveled residential/commercial area, and its groundwater directly contributes to the St. Louis County water supply. For these reasons, we have decided to recommend alternative #4. This alternative provides for the removal of contaminated soil to off-site disposal areas, removal of polluted groundwater by pumping process, and land-banking of the Latty Avenue site either temporarily or perpetually.

Costs: Removal of soil is quite expensive, $895/cubic meter. But once the radioactive soil is removed, the cost for operations and maintenance is relatively inexpensive. We assume that if FUSRAP agrees to decontaminate the groundwater, the methods for clean-up will be equally expensive. After the removal of the waste, the Latty Avenue area could be turned into a GREEN area. We recommend in alternative #4 that trees be planted and the area left as a land bank either temporarily or perpetually.

In comparison with alternatives #2 and #3 which recommend the local disposal by capping or vertical barriers, replacement of containment materials will be needed every 50 to 100 years because waste remains radioactive longer than the containment materials. Therefore, maintenance costs are much higher with these alternatives.

Effectiveness: Alternative #4 stresses the removal of all radioactive material, water and soil, from the St. Louis vicinity. Local disposal methods, recommended in

alternatives #2 and #3, suggest that the radioactive waste be removed and then disposed of here in the St. Louis area. Due to the fact that this area has high instability because of potential earthquakes and floodplains, we believe that the permanent storage of nuclear waste is not safe.

With the removal of radioactive wastes, we assume that there will be a great reduction in the alpha and gamma rays which may cause serious health problems to those exposed.

Contamination of groundwater is much less likely to occur if waste is removed. Capping and vertical barriers only control certain migrational patterns of groundwater, allowing for potential contamination of groundwater. Capping does not control horizontal groundwater migration and vertical barriers do not control vertical migration.

Feasibility: First and foremost we would like to state that any method of nuclear waste removal and storage that is done haphazardly could cause severe health and environmental problems. Once again, alternative #4 seems to be the best method of dealing with potential future risks. Waste disposal in barriers or capping methods presents a future problem of radiation exposure due to the fact that containment material will need to be replaced. If alternative #4 is implemented efficiently and correctly, the possibilities of having an uncontaminated source of groundwater are better than with the other alternatives #2 and #3.

We agree in principle with alternative #1, however the feasibility of FUSRAP choosing ion exchange to clean the groundwater is not likely due to its high cost. The ion exchange method usually requires a pre-treatment filtration system which is very expensive. According to an EPA Superfund report, ion exchange was rated very high in effectiveness and reliability in decontamination of groundwater. However, alternative #4 recommends pumping the groundwater after the waste soil has been removed. We believe this method to more acceptable and less costly to FUSRAP.

BIBLIOGRAPHY

Radiological Emergency Operations - Students Manual
United States Atomic Commission.

E.P.A. Assessment of Technologies for the Remediation of Radioactively Contaminated Superfund Sites. January, 1990.

E.P.A. Technological Approaches to the Cleanup of Radiological Contaminated Superfund Sites. August, 1988.

$395/ cubic meter

	COSTS		EFFECTIVENESS (HEALTH RELATED)			FEASIBILITY	
	TYPICAL COSTS	MAINTENANCE COSTS	REDUCTION OF WATER HAZARDS	REDUCTION OF SOIL HAZARD	REDUCTION OF AIR HAZARDS GAMMA & ALPHA RAYS	AVOID CREATION OF A WORSE HAZARD	IS TECHNOLOGY AVAILABLE TO PULL THIS OFF WILL FUSRAP USE THIS
1. REMOVE OFF-SITE ION EXCHANGE SURFACE SEAL	a) Removal of offsite $ 875/cubic meter b) Asume groundwater remediation is high priced in dollars c) High costs for asphalt Higher cost for ~~asphalt~~ concrete	Cost and maintenance for first year for for off-site $ .045/cubic meter UTAH Ion exchange Concrete cover	Removal & land encapsulation is effective control for all migration but must find a suitable site	Removes source of radiation	We assume there will be a great reduction in Alpha & Gamma Rays with the removal of the contaminated soil.	If done haphazardly there could be severe problems	Less likely because ion-exchange is expensive & generally requires filtration as pretreatment. Potential problem with acceptance of states (i.e. CO) where waste would travel through
2. LOCAL DISPOSAL BY CAPPING, FILTRATION, LAND BANK	a) For capping w/clay $ 200/cubic meter b) Assume groundwater remediation is high priced in dollars c) Land Banl has little to no public cost	$ .44/cubic meter for capping concrete Replacement of capping material will be needed within next 50 to 100 years because waste remains radioactive longer than capping materials life	Capping protects surface water but does not control horizontal groundwater migration Potential contamination due to flood & earthquake	Degree of radiation reduction is unknown and does not remove source of radiation Potential radiation leakage due to earthquake	Level of Alpha & Gamma Rays may not be reduced.	If done haphardly there could be severe problems Because of replacement need for capping material for radiation exposure will reoccur Groundwater pollution is not eliminated	Yes
3. VERTICAL BARRIERS, FILTRATION, COMMERCIAL LAND USE	a) Vertical barrier $ 377/sq meter b) Assume groundwater remediat on is high priced in dollars c) Little to no public cost	Replacement of capping material will be needed within next 50 to 100 years because waste remains radioactive longer than capping materials life	Vertical barriers controls horizontal groundwater migration but does not control vertical migration Potential contamination due to flood & earthquakes	May not reduce radiation and does not remove source of radiation Potential radiation leakage due to earthquake	Level of Alpha and Gamma Rays may not be reduced	If done haphazardly there could be severe problems Because of replacement need for capping material for radiation exposure will reoccur Groundwater pollution is not eliminated	Yes
4. REMOVE OFF SITE, GROUNDWATER PUMPING, LAND BANK	a) Removal to offsite is $ 865/cubic meter b) Assume groundwater remediat on is high in dollars c) Land Ban. has little to no public cost	Cost for off-site $ .045/per cubic meter	Removal & land encapsulation is effective control for all migration but must find a suitable site	Removes source of radiation	We assume there will be a great reduction in Alpha & Gamma Rays with the removal of the contaminated soil.	If done haphazardly there could be severe problems	Potential problem with acceptance of states (i.e. CO) where wastes would travel through

6/10/91 (B)

Post marked 6/10

Copies to: P. Chie
L. Ogden-Ask

Dear Ms. Ogden-Askew,

There has been enough studies done on the toxic waste and the nuclear waste problem here in St. Louis County at the Latty Ave. and the St. Louis International Airport sites.

My daughter played soccer at the Khoury League Park across from the Airport site, and my younger daughter played in the dirt as her sister played soccer. The park has been closed because of the contamination that has spread there.

It would be insane to build a nuclear waste storage bunker here. I along with my husband and children want it cleaned up and moved out of this area. Hopefully it's not to late.

Thank you.

Sincerely,

Florissant, MO 63031

6/12/91 (A)

Dear Ms Ogden,

I mailed my comments on the Preliminary Health assessment for Red Haste Sites in St. Louis, Mo to Secretary Director J. Watkins by mistake instead of to you. He should have my letter

I would like to add comment to page 8 of the assessment to correct that <u>there is</u> recreation along Coldwater Creek as can see in the enclosed picture I am including.

Also, there are wells located near Cold Water Creek.

Thank you for considering my comments.

Sincerely,

50

June 12, 1991 (8)

Agency for Toxic Substances
and Disease Registry
Divn. of Health Assessment
Public Health Service
Atlanta, GA 30333

Attn: Ms. Lydia Ogden-Askew
Community Involvement Liaison
Mail Stop E-32

Re: PRELIMINARY HEALTH ASSESSMENT: St. Louis Airport/Hazelwood Interim Storage/Futura Coatings Company -- St. Louis, St. Louis County, MO. -- May 10, 1991. CERCLIS No. MOD980633176

Radioactive wastes from the earliest days of the Atomic Age have been contaminating the St. Louis environment -- our air, water and soil -- for almost fifty years.

Now, after decades of deliberation and research, citizens and public officials agree that the St. Louis Airport Site is not acceptable for the permanent disposal of the consolidated St. Louis City and County nuclear weapons wastes. The conclusion of your agency's Preliminary Health Assessment, that these sites do indeed pose "a potential public health concern," affirms the importance of a safe, expeditious cleanup and of the removal of these wastes from Missouri's largest population center.

In an effort to clarify the nature and extent of the radioactive contamination at the St. Louis Airport Site and related National Priorities List sites, I am submitting the following comments about the ATSDR Preliminary Health Assessment:

1. Chronology: While it is correct that the Airport Site was used to store radioactive materials "from 1946 to 1973," wastes are still stored there today. Wastes were trucked to the Airport Site, around the clock, over a 12-year period (from 1946 through 1957). While some was removed during a five-month period in 1966, much remains. High radiation levels in water, soil, radon, and gamma samples are a continuing reminder that the wastes are present.

2. Waste components: Since both uranium and thorium were processed at the Mallinckrodt Chemical Works, the resulting wastes include a wide range of isotopes. In addition, because the Belgian Congo uranium ore processed here was notoriously rich (containing from 60 to 65% uranium, as compared with an average of about one percent in American ores), the relatively-rare uranium-235 isotope is found here in levels described as "enriched." Its daughter products are also readily detectable here, such as radon-219. (Please see the enclosed July 1981 Health Physics article.) Uranium-235 and its daughters and many other of our hazardous isotopes are not

addressed in the Preliminary Health Assessment.

3. Volume: While virtually all the St. Louis haul routes that have been surveyed to date have been found to be contaminated, many of the potentially contaminated truck and rail routes have not yet been surveyed -- for instance, between the Downtown Mallinckrodt plant and the Airport, between the Downtown plant and the Weldon Spring Quarry in St. Charles County, and between Latty Avenue and West Lake Landfill in St. Louis County (in the Missouri River floodplain), where Latty wastes were illegally dumped in 1973. It seems to me that the long-lived uranium/thorium wastes which were dumped at West Lake should be exhumed and removed from St. Louis at the same time as the other St. Louis weapons wastes. (West Lake itself, as a hazardous waste site, was placed on the final EPA National Priorities List on August 30, 1990.)

4. Hazard: Comparing the contamination levels in the surface soil at our St. Louis sites with the DOE's cleanup guideline of 5 picocuries per gram also underscores the need for a cleanup: the Preliminary Health Assessment notes, for example, that a thorium-230 level of 4900 pCi/g was found along one of the haul routes (page 17) -- a level 980 times greater than the permissible DOE level and 24,500 times greater than the level found naturally in soil (0.2 pCi/g). According to the enclosed table from a June 1980 Health Physics article, originally published 25 years ago, thorium-230 and actinium-227, another widespread St. Louis contaminant, have been ranked with the most radiotoxic substances known.

All geohydrologic reports I have read on the Airport Site have agreed that the Site groundwater flows into Coldwater Creek. And that the creek in turn flows into the Missouri River upstream from the river's confluence with the Mississippi River, immediately upstream of the City of St. Louis's major drinking water intake. Furthermore, Coldwater Creek is enjoyed year-round by neighborhood residents, particularly children. Floodwaters from the creek often flow onto adjacent backyard food gardens.

The Department of Energy has estimated that some 3600 sites in our nation are contaminated with nuclear weapons wastes. I think the ATSDR Preliminary Health Assessment should encourage federal officials to give our St. Louis waste sites their deserved high cleanup priority.

Sincerely,

Enclosures

Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the St. Louis Site, Missouri

U.S. Department of Energy