DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
8945 LATTY AVENUE
BERKELEY, MISSOURI 63134

REPLY TO
ATTENTION OF:

September 20, 2002

Formerly Utilized Sites Remedial Action Program

Subject: Result of Researching the St. Louis Post-Dispatch Article Titled "Radioactive Dirt at Airport", dated October 1, 1988

Mr. Eric Gilstrap
Missouri Dept. of Natural Resources
917 North Highway 67, Suite 104
Florissant, MO 63031

Dear Mr. Gilstrap:

The U.S. Army Corps of Engineers (USACE) has investigated the St. Louis Post-Dispatch article dated October 1, 1988, regarding radioactive soils moved to the St. Louis Airport. The archives search located a letter dated January 20, 1989, from the Department of Energy (DOE) to Mr. Tom Richter of the St. Louis Airport Authority, Subject: Contaminated Soil Beneath Parking Garage Ramp.

The letter confirms that soils were "removed from a State construction project near the St. Louis Airport Site (SLAPS)...to the airport where it was used as fill during recent construction of a parking garage ramp." The letter continues to state, "Since the contaminated soil is beneath the foundation of the parking ramp, DOE completed an assessment of the potential health risks which would result from leaving the soil in place...Given the results of the risk assessment and the conservative assumptions which are made as part of the assessment, the present location of the material and the nature of alpha radiation, DOE does not recommend removal of the soil." A copy of this letter and the accompanying data analysis is enclosed for your files.

Our review of the enclosed data analysis reveals that the material used as backfill beneath the parking garage ramp foundation is contaminated with elevated thorium-230. In its current location, beneath a concrete foundation of an active parking garage foundation, this material does not pose an immediate health concern, since it is essentially capped in place. Given that removal of the material does not pose an immediate health concern and that its removal could present a greater danger to construction crews, the USACE does not propose removal at this time. However, the USACE will assess the need for radiological support should the area become accessible in the future.

Under the Memorandum of Understanding Between the Department of Energy and the USACE dated March 1999, formal designation of additional properties in the FUSRAP program requires coordination with the Department of Energy. This makes it unlikely that will be able to meet the October 15, 2002 deadline requested; however, the USACE will look into this matter as requested.

If you have any concerns regarding this matter, please contact Ms. Jacqueline Mattingly at (314) 260-3924.

Sincerely,

Sharon R. Cotner
FUSRAP Program Manager

Enclosure

Copies furnished:
Robert Geller, Missouri Department of Natural Resources
Jan Titus, St. Louis Airport Authority
Dan Wall, U.S. Environmental Protection Agency
Richard Cavanagh, St. Louis Oversight Committee Chairperson

Department of Energy
Oak Ridge Operations
P.O. Box 2001
Oak Ridge, Tennessee 37831-8723

January 20, 1989

Mr. Tom Richter
St. Louis Airport Authority
P.O. Box 10212
Lambert Station
St. Louis, MO 63145

Dear Mr. Richter:

CONTAMINATED SOIL BENEATH PARKING GARAGE RAMP

The purpose of this letter is to discuss radiologically contaminated soil beneath a parking garage ramp at the Lambert International Airport. The soil was removed from a State construction project near the St. Louis Airport Storage Site (SLAPS) which was suspected to be contaminated with low levels of thorium-230. This soil was transported to the airport terminal area where it was used as fill during recent construction of a parking garage ramp. The analysis of samples taken at the parking garage ramp during construction confirmed that levels of thorium-230 were slightly above DOE's cleanup criteria of 5 picocuries per gram.

Since the contaminated soil is beneath the foundation of the parking ramp, DOE completed an assessment of the potential health risks which would result from leaving the soil in place. In developing the assessment DOE utilized conservative assumptions for potential exposure to a worker who would be working on the foundation of the parking ramp in the contaminated soil. The resultant maximum dose to an individual working in this manner was estimated to be 0.42 mrem/yr. This estimate was based on external gamma radiation and inhalation doses from uranium-234, -235, -238, radium-226, thorium-230, and -232. For comparison, this value is less than 1/2 of one percent of the DOE allowable dose limit to the public of 100 mrem/yr. The potential for exposure is very low given the present location of the contaminated soil and due to the fact that thorium-230 is the primary contaminant and is an alpha radiation emitter. Alpha radiation is not capable of penetrating the outer layer of skin on the human body and exposure may only be obtained if the soil is ingested (i.e., eaten) or inhaled. Inhalation or ingestion of the contaminated soil in quantities sufficient to cause any exposure is extremely unlikely given the location of the soil.

Given the results of the risk assessment and the conservative assumptions which are made as part of the assessment, the present location of the material and the nature of alpha radiation, DOE does not recommend removal of the soil. The data which defines the contaminant levels of this soil and the risk assessment will be considered in the overall Remedial Investigation/ Feasibility Study for final determination of the need for remediation. If there are any questions, please contact me at (615) 576-0844.

Sincerely,

Andrew P. Avel

Andrew P. Avel
Site Manager
Technical Services Division

cc: S. Liedle, BNI
A. Wallo, NE-23
J. Wing, CE-53
G. Kepko, EPA Region VII
D. Bedan, MoDNR
G. Turi, NE-23
B. Manning, CE-50

058609

Bechtel National, Inc.
Systems Engineers — Constructors

Jackson Plaza Tower
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37830

Mail Address: P.O. Box 350, Oak Ridge, TN 37831-0350
Telex: 3785873

DEC 8 : 1994

U.S. Department of Energy
Oak Ridge Operations
Post Office Box 2001
Oak Ridge, TN 37831-8723

Attention: Andrew P. Avel, Site Manager
Technical Services Division

Subject: Bechtel Job No. 14501, FUSRAP Project
DOE Contract No. DE-AC05-81OR20722
Hazard Assessment for Exposure to Fill Dirt Used for the Parking Ramp of the St. Louis Airport Parking Garage.
Code: 7340/WBS: 134

Reference: National Council on Radiation Protection and Measurements, Exposure of the Population in the United States and Canada from Natural Background Radiation, Bethesda, MD, December 30, 1987.

Dear Mr. Avel:

In response to your request, a hazard assessment using conservative assumptions was developed for workers performing activities in the vicinity of the St. Louis Airport Site (SLAPS) (see Enclosure A). The hazards to a laborer and truck driver involved in loading and hauling the contaminated soil to the ramp site and to a potential road worker performing repairs on the ramp slopes was assessed for radiation exposure to the contaminated soil taken from Coldwater Creek bed. The methodology and parameters for the dose calculations and tables of the doses are shown in Enclosure A.

In summary, the maximum dose to a laborer loading the soil was estimated to be 0.16 mrem, and the maximum dose to the truck driver hauling the soil to the ramp site was estimated to be 0.12 mrem. The doses were from external gamma only since the soil was wet and no airborne activity was likely. The total dose to the road worker engaged in making repairs on the ramp was estimated to be 0.42 mrem, a total of the combined external gamma and inhalation doses. The highest dose of 0.42 mrem to any of the workers is only 0.42% of the DOE basic limit of 100 mrem for the annual radiation dose received by an individual member of the general public and only about 0.14% of the normal background radiation of 300 mrem/yr for the area (referenced above).

Since the conservative estimate of the doses to the workers are well below the DOE radiation protection standard, there is no hazard to personnel who may come in contact with the ramp or to the general public in leaving the fill material in place.

Very truly yours,

S. D. Liedle

S. D. Liedle
Project Manager - FUSRAP

CRH:djw:8914A
Enclosure: As stated

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ENCLOSURE A

I. EXPOSURE SCENARIOS

A. Laborer Removing Soil From Coldwater Creek

It is assumed that the laborer spent one week (40 hours) during the year removing the soil to be used as fill dirt from the creek bed. It is conservatively assumed he was standing on the contaminated soil during the soil removal, thus if he was using a mechanical loader no shielding factors for reducing the exposure rate was taken into consideration. Since the soil was wet, an inhalation dose due to airborne dust particles was not considered likely.

B. Trucker Hauling the Soil from Coldwater Creek to the Airport Parking Garage Ramp (A Distance of three miles)

It is assumed that the trucker spent 30 hours exposed to the contaminated soil while the truck was being loaded and enroute to the ramp. No shielding factors were considered. Thus, his dose would be three-fourths that of the laborer. Since the soil is wet or damp, no inhalation dose is considered likely.

C. Road Worker Working on the Ramp

It is assumed that the worker spends 40 hours during the year working on the ramp slope repairing drainage, etc. It is also assumed that the worker is exposed to dry soil that would become airborne during excavation. A maximum mass loading factor of 4×10^{-4} g/m^3 was used to estimate the air concentration of resuspended contaminated dust particles.

II. SOURCE TERMS

The source terms used for dose calculations are the average concentration of the radionuclides in the top foot of soil taken near the bridge over Coldwater Creek at McDonnel Boulevard.

CONCENTRATION IN SOIL

Radionuclide	(pCi/g)
Uranium-234	5.9
Uranium-235	0.1
Uranium-238	5.9
Radium-226	2.2
Thorium-230	42.2
Thorium-232	1.2

The concentration includes the background levels for the radionuclides in the soil of the St. Louis area.

III. METHODOLOGY AND PARAMETERS

A. Internal Dose Parameters and Methodology

1. Parameters used in calculating internal dose (committed effective dose equivalent) via inhalation pathways:

Parameters	Unit or Definition
Inhalation Rate	8400 m^3/yr
Mass Loading Factor	4×10^{-4} g/m^3
Density of Soil	1.6 g/cm^3
Occupancy Factor	Fraction of year spent in area

DOSE CONVERSION FACTORS

Radionuclide	Inhalation (mrem/pCi)	Lung Class*
Uranium-234	1.32×10^{-1}	Y
Uranium-235	1.23×10^{-1}	Y
Uranium-238	1.18×10^{-1}	Y
Radium-226	8.59×10^{-3}	W
Thorium-230	3.26×10^{-1}	W
Thorium-232	1.64×10^{0}	W

*Lung class for clearance of inhaled radioactive materials from the lung: W and Y correspond to retention half-times of 10 to 100 days, and greater than 100 days, respectively.

2. Methodology for calculating inhalation dose from resuspended contaminated dust particles (Ref. 1):

Dose (mrem/yr) = [concentration of radionuclide in soil (pCi/g)] [mass loading factor (g/m^3)] [inhalation rate (8400 m^3/yr)] [occupancy factor] [dose conversion factor (mrem/pCi)]

NOTE: The occupancy factor, based on spending 40 hours per year at the work location, is 40/8760 or 0.0046.

B. External Dose Parameters and Methodology

1. Parameters used in calculating external gamma dose (effective dose equivalent):

Parameters	Unit or Definition
Occupancy Factor	Fraction of year spent in area
Density of Soil	1.6 g/cm^3
Depth Factor	1 (dimensionless)
Area Factor	1 (dimensionless)

Dose Conversion Factors

Radionuclide	External Dose (mrem/yr per pCi/g)
Uranium-234	1.40×10^{-3}
Uranium-235	9.44×10^{-1}
Uranium-238	1.30×10^{-1}
Radium-226	1.58×10^{1}
Thorium-230	1.90×10^{-3}
Thorium-232	1.26×10^{-3}

2. Methodology for calculating external gamma dose (Ref. 1)

   Dose (mrem/yr) = [concentration of radionuclide in soil (pCi/g] [depth factor] [area factor] [occupancy factor] [dose conversion factor (mrem/yr per pCi/g)]

IV. Maximum Dose to Workers

TABLE 1

TOTAL DOSE TO LABORER REMOVING SOIL FROM COLDWATER CREEK

Radionuclide	External Gamma Dose (mrem/yr)
Uranium-234	3.8×10^{-5}
Uranium-235	4.3×10^{-4}
Uranium-238	3.5×10^{-3}
Radium-226	1.6×10^{-1}
Thorium-230	3.7×10^{-4}
Thorium-232	7.0×10^{-6}
Total	1.6×10^{-1}

TABLE 2

TOTAL DOSE TO TRUCKER HAULING SOIL TO RAMP SITE

Radionuclide	External Gamma Dose (mrem/yr)
Uranium-234	2.8×10^{-5}
Uranium-235	3.2×10^{-4}
Uranium-238	2.6×10^{-3}
Radium-226	1.2×10^{-1}
Thorium-230	2.7×10^{-4}
Thorium-232	5.1×10^{-6}
Total	1.2×10^{-1}

IV. Maximum Dose to Workers

TABLE 1

TOTAL DOSE TO LABORER REMOVING SOIL FROM COLDWATER CREEK

Radionuclide	External Gamma Dose (mrem/yr)
Uranium-234	3.8×10^{-5}
Uranium-235	4.3×10^{-4}
Uranium-238	3.5×10^{-3}
Radium-226	1.6×10^{-1}
Thorium-230	3.7×10^{-4}
Thorium-232	7.0×10^{-6}
Total	1.6×10^{-1}

TABLE 2

TOTAL DOSE TO TRUCKER HAULING SOIL TO RAMP SITE

Radionuclide	External Gamma Dose (mrem/yr)
Uranium-234	2.8×10^{-5}
Uranium-235	3.2×10^{-4}
Uranium-238	2.6×10^{-3}
Radium-226	1.2×10^{-1}
Thorium-230	2.7×10^{-4}
Thorium-232	5.1×10^{-6}
Total	1.2×10^{-1}

TABLE 3

TOTAL DOSE TO ROAD WORKER REPAIRING
SLOPE OF GARAGE RAMP

Radionuclide	External Gamma Dose (mrem/yr)	Inhalation Dose (mrem/yr)
Uranium-234	3.8×10^{-5}	1.2×10^{-2}
Uranium-235	4.3×10^{-4}	1.9×10^{-4}
Uranium-238	3.5×10^{-3}	1.1×10^{-2}
Radium-226	1.6×10^{-1}	2.9×10^{-4}
Thorium-230	3.7×10^{-4}	2.1×10^{-1}
Thorium-232	7.0×10^{-6}	3.0×10^{-2}
Total*	1.6×10^{-1}	2.6×10^{-1}

*The combined dose from external gamma and inhalation = 4.2×10^{-1} mrem/yr.

TABLE 3

TOTAL DOSE TO ROAD WORKER REPAIRING

SLOPE OF GARAGE RAMP

Radionuclide	External Gamma Dose (mrem/yr)	Inhalation Dose (mrem/yr)
Uranium-234	3.8×10^{-5}	1.2×10^{-2}
Uranium-235	4.3×10^{-4}	1.9×10^{-4}
Uranium-238	3.5×10^{-3}	1.1×10^{-2}
Radium-226	1.6×10^{-1}	2.9×10^{-4}
Thorium-230	3.7×10^{-4}	2.1×10^{-1}
Thorium-232	7.0×10^{-6}	3.0×10^{-2}
Total*	1.6×10^{-1}	2.6×10^{-1}

*The combined dose from external gamma and inhalation = 4.2×10^{-1} mrem/yr.

REFERENCE

1. Gilbert, T. L., et al. A Manual for Implementing Residual Radioactive Material Guidelines, Washington, D.C., January 1988 (In press). A Supplement to U.S. Department of Energy Guidelines for Residual Radioactivity at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites.

FUSRAP Document Management System

Year: 00 | ID: 3374

Further Info? ☐

Operating Unit: North County | Site: SLAPS | Area: | MARKS Number: FN:1110-1-8100g

Primary Document Type: Site Management | Secondary Document Type: Correspondence

Subject or Title: Result of Researching the St. Louis Post-Dispatch Article Titled "Radioactive Dirt at Airport" dated 10/01/88

Author/Originator: Sharon Cotner | Company: CEMVS-PM-R | Date: 9/20/2002

Recipient (s): Eric Gilstrap | Company (-ies): MDNR | Version: Final

Original's Location: Central Files | Document Format: Paper | Confidential File? ☐

Comments:

SAIC number:

Bechtel ID:

Include in which AR(s)?

- ☒ North County
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- ☐ Iowa

ETL: 01.01

Filed in Volume: 01