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September 11, 1990

Mr. A.R. Hanke
Waste Programs Branch
Waste Management Division
Environmental Protection Agency
345 Courtland Street, N. E.
Atlanta, Georgia 30365

Date: 9-27-91
Site Disposition: NFRAP
EPA Project Manager: Janet Sheh

SISB/SAS
RECEIVED
SEP 29 1990
EPA - REGION IV
ATLANTA, GA

Subject: Screening Site Inspection, Phase I
Emory University Lullwater Estate
Decatur, DeKalb County, Georgia
EPA ID No. GAD980556799
TDD No. F4-9006-26

Dear Mr. Hanke:

FIT 4 conducted a Phase I Screening Site Inspection at Emory University's Lullwater Estate disposal grounds, which are located in Decatur, DeKalb County, Georgia, 3,000 feet east of the Emory University campus. Phase I of this inspection included a comprehensive review of EPA and state file material, a reconnaissance of the surrounding area, and completion of a target survey.

Emory University's Lullwater Estate disposal grounds are owned by Emory University and are adjacent to its campus (Refs. 1, 2, 3). The entrance to the estate is approximately 160 feet north of the intersection of Clifton Road and Haygood Drive on the eastern side of Clifton Road. The disposal grounds, which consist of two areas, are located on the southern perimeter of the estate, approximately 500 feet from one another (Refs. 2, 3). The first disposal area is approximately 0.5 acre in size. The second disposal area is approximately 2 acres in size and consists of two trenches lying perpendicular to one another (Refs. 1; 4, pp. 2-5). The estate is located in a commercial/residential area and consists of land that is used as a park by local residents, students, faculty members, and the general public (Ref. 1).

In 1982 and in 1985, Preliminary Assessments of one of the disposal areas were completed by the state (Refs. 5, 6). The state assessments were performed on the larger disposal area which was operated from 1960 to 1975 (Ref. 5). A total of 393 millicuries of radioactive materials including approximately 31 millicuries (mCu) of tritium (H-3) and 80 mCu of carbon-14, along with small amounts of cobalt-60, cesium-137, strontium-90, sodium-22, chlorine-36, antimony-241, barium-33, and radon-226, were deposited in this area. Also, other nonradioactive wastes such as animal wastes, dry test tubes, liquid scintillation vials (containing toluene and other organic solvents), as well as other general laboratory wastes were deposited in this disposal area. The waste volume was approximately 20 to 30 cubic meters (Ref. 7). No further action was taken following the two previous assessments (Refs. 8, 9).

The second disposal area, however, has had no previous assessment concerning possible deposition of waste (Ref. 10). A report compiled by four Emory University students in the fall of 1974, stated that wastes were deposited in the area only in September 1974. The report also stated that the following substances were placed in the disposal area in September 1974: 30 to 50 pounds of metallic mercury; 2 gallons of arsenic solution; unknown quantities of metallic sodium, lead, acetate, isopropyl ether, metallic magnesium, inorganic acids, organic solvents, alkyl hydrocarbons, and deuterium-labeled organic compounds; and a container labeled "Carcinogenic Wastes" (Ref. 4, Table 1). Data collected from soil analyses of the area by the students suggested that the metallic mercury had migrated laterally 45 meters in 3 months. The migration was lateral because this disposal area consists of two trenches, one parallel to the contour of the land and the other perpendicular to the first, both lying on the downslope of a hill (Refs. 1; 4, pp. 2-5).

All wastes generated at Emory University, are placed in 55-gallon drums, then transported to the basement of the Woodruff Memorial Building for storage. Final disposal consists of either incineration then burying the wastes under 4 feet of native Georgia clay or decaying the radioactive wastes to background and throwing the decayed wastes in the common trash. Burial is reserved for the following isotopes: tritium (hydrogen-3), phosphorus - 32 (in carcasses), carbon-14, iodine-125, and iodine-131 (Refs. 11; 12, p. 4).

In June 1981, Emory University filed a CERCLA 103(c) notification with the EPA for the period from 1960 to 1975 concerning deposition of wastes into the disposal areas at Lullwater Estate (Ref. 13). Prior to June 1981, both waste disposal areas fell under the jurisdiction of Emory University's 1973 Radioactive Material License (no. GA153-1) (Ref. 12, pp. 4, 5). The areas were no longer in use as of 1975.

The Emory University Lullwater Estate disposal areas are located in the Piedmont Physiographic Province of north-central Georgia. The area is characterized by rolling hills with moderate relief. The climate is temperate, with a mean annual temperature of 61°F and a net annual rainfall of 8 inches (Refs. 14, Table 1; 15, pp. 43, 63). The 1-year, 24-hour rainfall is 3.3 inches (Ref. 16, p. 93).

Underlying the Piedmont area are metamorphic and igneous rocks. The disposal areas are underlain by residual soils and the Clarkston Formation. The Clarkston Formation, part of the Atlanta Group, is an association of schist interlayered with amphibolite. The formation is of late Precambrian to early Paleozoic age (Ref. 17, p. 87, Plate IV). The residual soil which develops insitu over the bedrock is clay rich. Local thickness is unknown but ranges from under 20 to over 120 feet thick over schist in the area, based on casing depths of local wells (Ref. 18, p. 8).

The Crystalline rock aquifers underlying the area are found in residual soils and in underlying fractured rock, formed by jointing and faulting. Well yields in the area are dependent on the size and degree of interconnection of openings within the bedrock. Wells drilled into schist typically produce small to moderate amounts of water (Ref. 18, p. 9). Hydraulic conductivity of similar bedrock ranges from 1×10^{-3} to 1×10^{-6} cm/sec (Ref. 19, p. 29).

Wells in the residual, soil-fractured bedrock aquifer system typically yield only 2 to 30 gallons per minute (gpm) of water, though yields of over 100 gpm are possible (Ref. 18, p. 3). Wells drilled in schist are typically finished at depths beyond 70 feet below land surface (bls). Size, space, and degree of interconnection of secondary openings decreases with depth (Ref. 18, p. 8). Consequently, most

wells are not drilled to great depths, though there are exceptions. The depth to the water table under the site is variable. The depth to the water table is estimated to range from less than 20 feet bls at the base of the hill by the Peachtree Creek South Fork to as great as 80 feet bls at the top of the hill, based on local topography (Ref. 2). Groundwater flow varies locally but generally is toward the north, again based on local topography (Ref. 2). Recharge of the aquifer system is through percolation of local rainfall through the regolith and into openings within the bedrock.

Drinking water for DeKalb County residents is provided by the DeKalb County Water System, which obtains its water from an intake on the Chattahoochee River, 17 miles upstream from the disposal areas (Ref. 20, pp. 6, 30). No private wells were observed in the area during the reconnaissance (Ref. 1).

Surface water runoff flows 500 feet toward the north from the disposal areas into Candler Lake (Ref. 2). From Candler Lake, the water flows north into South Fork Creek through a spillway less than 250 feet away (Ref. 21). From South Fork Creek, the water flows westward for 5 miles until it enters Peachtree Creek. From Peachtree Creek, it continues to flow westward for 7 miles, until it enters Nancy Creek, which flows southwesterly for 1 mile and enters the Chattahoochee River to complete the 15-mile surface water migration pathway (Ref. 2). Peachtree Creek, South Fork Creek, and Candler Lake are used for recreational fishing (Ref. 1, p. 9). The Chattahoochee River is used for recreational fishing and boating (Ref. 22). There are no known endangered species or sensitive habitats in this area (Ref. 23).

A reconnaissance of both disposal areas was conducted in June 1990. The first disposal area is approximately 0.5 mile from the entrance to the estate. It is enclosed within two 8-foot iron fences, the first of which opens into a clearing that is about 0.5 acre in size. The grass in the clearing is mowed three to four times a year. Only the personnel in the Radiation Department at Emory University have keys to the gates. The second gate opens into a highly overgrown area with a very narrow pathway that disappears before reaching the actual disposal site. A lift apparatus to a cesium source is present at about 2,000 feet into this area. This source was used by Emory University in medical research and is a permitted device. It consists of an underground container containing radioactive cesium that was used to determine the affects of radiation on living tissue. The source is no longer in use. The flora within both of the gates appears to be undisturbed and in good health (Ref. 1, pp. 2-5).

The second disposal area is approximately 5,000 feet west of the first area and is readily accessible to the public. It consists of an unfenced clearing approximately 2 acres in size. This area is mowed two to three times a week. The plant life here also appears healthy. This area is used as part of the park (Ref. 1, pp. 5-8).

The Emory University president's house, which is the nearest residence, is 1,600 feet north of the disposal areas on Lullwater Estate. Within a 1-mile radius is Emory University, the Veterans Administration Hospital, and Clairmont Place (a retirement community) (Ref. 1, pp. 9-10). Approximately 11,733 people reside within a 1-mile radius; 32,813 people reside in a 2-mile radius; 54,673 people reside in a 3-mile radius; and 83,246 people reside in a 4-mile radius (Ref. 24).

Based on the preceding information, FIT 4 recommends that no further remedial action be planned for Emory University Lullwater Estate. However, due to the nature of the materials buried at Lullwater Estates, FIT 4 recommends that this site be investigated by the state. If you have any questions concerning the Lullwater Estate area, feel free to contact me at NUS Corporation.

Very truly yours,

Charlotte E. Robinson

Charlotte E. Robinson
Project Manager

Approved:

Hugh Sahank

Professional Geologist

CER/gwn

Enclosures

cc: Mario Villamarzo

REFERENCES

1. NUS Corporation Field Logbook No. F4-2393 for Emory University Lullwater Estate, TDD No. F4-9004-26. Documentation of facility reconnaissance, June 25, 1990.

2. U.S. Geological Survey, 7.5 minute series Topographic Quadrangle Maps of Georgia: Stone Mountain 1956 (Photorevised 1982), Southeast Atlanta 1954 (PR 1983), Northwest Atlanta 1954 (PR 1983), Northeast Atlanta 1954 (PR 1968, 1972), scale 1:24,000.

3. Aerial Photograph, Emory University Lullwater Estates, Decatur, Dekalb County, Georgia, Parcel Nos. 1805901004 and 18052180021 (March 14, 1977).

4. Wendell Cropper, et al., Mercury Contamination from Emory Chemical Burial Site, prepared as a class project for Plant Ecology, Course No. 306, Emory University (Atlanta, Georgia, 1974).

5. Potential Hazardous Waste Site Preliminary Assessment (EPA Form 2070-12), attachments for Emory University Lullwater Estate. Filed by Mike Allred, Department of Natural Resources, Georgia, February 5, 1985.

6. Potential Hazardous Waste Site Preliminary Assessment (EPA Form 2070-2) for Emory University Lullwater Estate. Filed by Jim Ussery, September 13, 1982.

7. Henry C. Karp, University Radiation Safety Officer, Emory University School of Medicine, Atlanta, Georgia, letter to John Palms, Vice President, Arts and Sciences, May 30, 1981. Subject: Substances deposited in the Lullwater landfill.

8. Action Report and attachment, Industrial and Hazardous Waste Management Program, Environmental Protection Division, Atlanta, Georgia. Filed by Mike Allred, January 1, 1985.

9. Mario E. Villamarzo, Georgia Project Officer, United States Environmental Protection Agency, letter to John Taylor, Chief, Land Protection Branch, Georgia Department of Natural Resources, August 7, 1989. Subject: No further remedial action planned for Disposal Area I at Lullwater Estate.

10. Jennifer R. Kaduck, Program Manager, Hazardous Waste Management Program, Georgia Department of Natural Resources, letter to Mario Villamarzo, Georgia Project Officer, United States Environmental Protection Agency, June 6, 1990. Subject: Need to evaluate Disposal Area II at Lullwater Estate.

11. Waste Management Data Sheet, Environmental Protection Division, Department of Natural Resources, Atlanta, Georgia. Filed by Henry C. Karp, Radiation Safety Officer, Emory University School of Medicine.

12. Andrejs Simanis, memorandum to file, November 29, 1973. Subject: Inspection of Board Medical License, Emory University, Atlanta, Georgia; License No. Ga. 153-1.

13. EPA Notification of Hazardous Waste Site (EPA Form 8900-1) for Emory University Lullwater Estate, Decatur, Georgia. Filed by Henry C. Karp, Radiation Safety Officer, June 9, 1981.

14. U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of DeKalb County, Georgia (July 1982).

15. U.S. Department of Commerce, Climatic Atlas of the United States (Washington, D.C.: GPO, June 1968) Reprint: 1983, National Oceanic and Atmospheric Administration.

16. U.S. Department of Commerce, Rainfall Frequency Atlas of the United States, Technical Paper Number 40 (Washington, D.C.: GPO, 1961).

17. Keith I. McConnell and Charlotte E. Abrams, Geology of the Greater Atlanta Region, Bulletin 96 (Atlanta, Georgia, 1984).

18. C.W. Cressler, C.J. Thurmond, and W.G. Hester, Ground Water in the Greater Atlanta Region, Georgia, Information Circular 63 (Atlanta, Georgia, 1983).

19. R. Allan Freeze and John A. Cherry, Groundwater (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1979).

20. Georgia Department of Natural Resources, Environmental Protection Division, Water Availability and Use, Chattahoochee River Basin (1984).

21. Charlie Scott, Horticulturist, Emory University, Atlanta, Georgia, telephone conversation with Charlotte Robinson, NUS Corporation, July 9, 1990. Subject: Water flow into and from Candler Lake.

22. Alford Mauldin, Georgia Department of Natural Resources (Fisheries), telephone conversation with Walter Riley, NUS Corporation, March 17, 1989. Subject: Recreational use of the Chattahoochee River.

23. U.S. Fish and Wildlife Service, Endangered and Threatened Species of the Southeastern United States (Atlanta, Georgia, 1988), p. 45.

24. U.S. Environmental Protection Agency, Graphical Exposure Modeling System (GEMS) Data Base, compiled from U.S. Bureau of the Census data (1980).

HAZARD RANKING SYSTEM SCORING SUMMARY

FOR

EMORY UNIVERSITY LULLWATER ESTATES
EPA SITE NUMBER GAD980556799
DECATUR
DEKALB COUNTY, GA
EPA REGION: 4

SCORE STATUS: IN PREPARATION

SCORED BY C. ROBINSON
OF NUS CORPORATION
ON 06/21/90

DATE OF THIS REPORT: 06/21/90
DATE OF LAST MODIFICATION: 06/21/90

GROUND WATER ROUTE SCORE	:	4.49
SURFACE WATER ROUTE SCORE	:	10.91
AIR ROUTE SCORE	:	0.00
MIGRATION SCORE	:	6.82

HRS GROUND WATER ROUTE SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
1. OBSERVED RELEASE	NO	0	0
2. ROUTE CHARACTERISTICS			
DEPTH TO WATER TABLE	30 FEET		
DEPTH TO BOTTOM OF WASTE	6 FEET		
DEPTH TO AQUIFER OF CONCERN	24 FEET	2	4
PRECIPITATION	48.0 INCHES		
EVAPORATION	41.0 INCHES		
NET PRECIPITATION	7.0 INCHES	2	2
PERMEABILITY	1.0X10-4 CM/SEC	2	2
PHYSICAL STATE		3	3
TOTAL ROUTE CHARACTERISTICS SCORE:			11
3. CONTAINMENT		3	3
4. WASTE CHARACTERISTICS			
TOXICITY/PERSISTENCE:MERCURY			18
WASTE QUANTITY CUBIC YDS	2501		
DRUMS	0		
GALLONS	0		
TONS	0		
TOTAL	2501 CU. YDS	8	8
TOTAL WASTE CHARACTERISTICS SCORE:			26
5. TARGETS			
GROUND WATER USE		1	3
DISTANCE TO NEAREST WELL	0 FEET		
AND	MATRIX VALUE	0	0
TOTAL POPULATION SERVED	0 PERSONS		
NUMBER OF HOUSES	0		
NUMBER OF PERSONS	0		
NUMBER OF CONNECTIONS	0		
NUMBER OF IRRIGATED ACRES	0		
TOTAL TARGETS SCORE:			3

GROUND WATER ROUTE SCORE (Sgw) = 4.49

HRS SURFACE WATER ROUTE SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
1. OBSERVED RELEASE	NO	0	0
2. ROUTE CHARACTERISTICS			
SITE LOCATED IN SURFACE WATER	NO		
SITE WITHIN CLOSED BASIN	NO		
FACILITY SLOPE	20.0 %		
INTERVENING SLOPE	15.0 %	3	3
24-HOUR RAINFALL	3.3 INCHES	3	3
DISTANCE TO DOWN-SLOPE WATER	600 FEET	3	6
PHYSICAL STATE	3		3
TOTAL ROUTE CHARACTERISTICS SCORE:			15
3. CONTAINMENT	3		3
4. WASTE CHARACTERISTICS			
TOXICITY/PERSISTENCE:MERCURY			18
WASTE QUANTITY CUBIC YDS	2501		
DRUMS	0		
GALLONS	0		
TONS	0		
TOTAL	2501 CU. YDS	8	8
TOTAL WASTE CHARACTERISTICS SCORE:			26
5. TARGETS			
SURFACE WATER USE		2	6
DISTANCE TO SENSITIVE ENVIRONMENTS		0	0
COASTAL WETLANDS	NONE		
FRESH-WATER WETLANDS	NONE		
CRITICAL HABITAT	NONE		
DISTANCE TO STATIC WATER	> 3 MILES		
DISTANCE TO WATER SUPPLY INTAKE	> 3 MILES		
AND	MATRIX VALUE	0	0
TOTAL POPULATION SERVED	0		
NUMBER OF HOUSES	0		
NUMBER OF PERSONS	0		
NUMBER OF CONNECTIONS	0		
NUMBER OF IRRIGATED ACRES	0		

SURFACE WATER ROUTE SCORE (Ssw) = 10.91

SITE: EMORY UNIVERSITY LULLWATER ESTATES

HRS AIR ROUTE SCORE

CATEGORY/FACTOR	RAW DATA	ASN. VALUE	SCORE
1. OBSERVED RELEASE	NO	0	0

2. WASTE CHARACTERISTICS

REACTIVITY: MATRIX VALUE

INCOMPATIBILITY

TOXICITY

WASTE QUANTITY CUBIC YARDS
DRUMS
GALLONS
TONS

TOTAL

TOTAL WASTE CHARACTERISTICS SCORE: N/A

3. TARGETS

POPULATION WITHIN 4-MILE RADIUS
0 to 0.25 mile
0 to 0.50 mile
0 to 1.0 mile
0 to 4.0 miles

DISTANCE TO SENSITIVE ENVIRONMENTS
COASTAL WETLANDS
FRESH-WATER WETLANDS
CRITICAL HABITAT

DISTANCE TO LAND USES
COMMERCIAL/INDUSTRIAL
PARK/FOREST/RESIDENTIAL
AGRICULTURAL LAND
PRIME FARMLAND
HISTORIC SITE WITHIN VIEW?

TOTAL TARGETS SCORE: N/A

AIR ROUTE SCORE (Sa) = 0.00

HAZARD RANKING SYSTEM SCORING CALCULATIONS
FOR
SITE: EMORY UNIVERSITY LULLWATER ESTATES
AS OF 06/21/90

GROUND WATER ROUTE SCORE

ROUTE CHARACTERISTICS		11
CONTAINMENT	X	3
WASTE CHARACTERISTICS	X	26
TARGETS	X	3

= 2574 /57,330 X 100 = 4.49 = S_{gw}

SURFACE WATER ROUTE SCORE

ROUTE CHARACTERISTICS		15
CONTAINMENT	X	3
WASTE CHARACTERISTICS	X	26
TARGETS	X	6

= 7020 /64,350 X 100 = 10.91 = S_{sw}

AIR ROUTE SCORE

OBSERVED RELEASE 0 /35,100 X 100 = 0.00 = S_{air}

SUMMARY OF MIGRATION SCORE CALCULATIONS

	S	S^2
GROUND WATER ROUTE SCORE (S_{gw})	4.49	20.16
SURFACE WATER ROUTE SCORE (S_{sw})	10.91	119.03
AIR ROUTE SCORE (S_{air})	0.00	0.00
$S^2_{gw} + S^2_{sw} + S^2_{air}$		139.19
$\sqrt{(S^2_{gw} + S^2_{sw} + S^2_{air})}$		11.80
$S_M = \sqrt{(S^2_{gw} + S^2_{sw} + S^2_{air})}/1.73$		6.82