DEPARTMENT OF THE ARMY
WALTER REED ARMY MEDICAL CENTER
WALTER REED HEALTH CARE SYSTEM
WASHINGTON, DC 20307-5001

MCHL-HP (11-9d) 15 April 2001

MEMORANDUM FOR Commander, U.S. Army Research Laboratory, ATTN: Mr. Michael Borisky, Health Physicist, 2880 Powder Mill Road, Adelphi, MD 20783-197

SUBJECT: Soil Sample Analysis

1. During 1999 three underground storage tanks located on the Walter Reed Army Medical Center (WRAMC) Forest Glenn Annex next to the Building 513 were removed from the ground and disposed of by a contractor. Extensive monitoring of the soil around the tanks, samples from inside the tank, and wipe smear samples inside and outside the tanks was accomplished. Prior to removing the tanks from the ground, some initial soil samples taken and analyzed by Oak Ridge Institute for Science and Education (ORISE). The ORISE analyses indicated background levels for gross alpha and beta. Observed uranium concentrations were consistent with background. The tanks were removed, monitored, found free of any contamination, and shipped off-site in September 1999.

2. During the removal of the tanks from the ground, 20 additional soil samples were taken at various depths around each tank. Since the initial soil samples prior to removal of the tanks, and the monitoring of the tanks indicated no significant radiation above background, the 20 soil samples were held, but not sent out for analysis. The 20 soil samples were sent to ORISE for analysis on 1 August 2000. The ORISE report dated 1 November 2000 is attached. Gross alpha and beta levels and gamma spectroscopy tests for selected gamma emitting radionuclides are within regulatory limits. Observed uranium concentrations were consistent with background.

3. Pont of contact for further information is Mr. David Burton, Chief, Radioactive Materials Control Branch, Health Physics Office, WRAMC at (202) 356-0062.

Encl
as

WILLIAM B. JOHNSON
COL, MS
Chief, Health Physics

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

November 1, 2000

Lt. Colonel Trent Moxley
The U. S. Army at Walter Reed Medical Center
Environmental Division
6825 16th St., NW
Washington, DC 20307-5001

SUBJECT: REVISION 1 - RESULTS OF ANALYSES OF SOIL SAMPLES COLLECTED SEPTEMBER 28, 1999 FROM WALTER REED MEDICAL CENTER

Dear Lt. Colonel Moxley:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) received 20 soil samples from Walter Reed Medical Center on August 4, 2000. The analytical results were initially provided in the letter report of September 13, 2000. This revised report includes your request for comparison of the results to available background data.

The samples were dried before being analyzed. The percent moisture for each of the samples is presented in Table 1. The entire set of samples was analyzed by gamma spectroscopy and by gross alpha and beta. The results from the gamma spectroscopy analysis are presented in Table 2. The gross alpha and beta results are presented in Table 3. The Statement of Work (SOW) requires ESSAP to return these samples to Walter Reed Medical Center. After your approval of the data provided, we will ship these samples for your disposal.

A comparison was made for this data set to the one background sample that was taken during an ESSAP survey conducted February 24-25, 1999. The observed uranium concentrations for this data set are consistent with the concentration of that background sample.

ESSAP's Quality Control (QC) procedures were followed for these analyses. Analytical and instrumentation QC for these analyses were within acceptable limits. The QC files are available for your review upon request.

If you have any questions, please call me at (865) 241-3242 or Wade Ivey at (865) 576-9184.

Sincerely,

Dale Condra

Dale Condra
Laboratory Manager
Environmental Survey and Site
Assessment Program

DC:ar

Enclosures

cc: W. Beck, ORISE/ESSAP E. Abelquist, ORISE/ESSAP
Wade Ivey, ORISE/ESSAP File/923

TABLE 2

CONCENTRATIONS OF URANIUM AND SELECTED GAMMA EMITTING RADIONUCLIDES IN SOIL SAMPLES WALTER REED MEDICAL CENTER BETHESDA, MARYLAND

ESSAP Sample ID	Walter Reed Sample ID	Radionuclide Concentrations (pCi/g dry weight)					
		U-238 by Th-234	U-235	Eu-152	Cs-137	Eu-154	Co-60
923S001	Tank C, bottom, exhaust end	1.83 ± 0.81*	<0.18	<0.09	<0.04	<0.16	<0.06
923S002	Tank C, top, inlet side	1.66 ± 0.56	<0.16	<0.07	<0.03	<0.14	<0.04
923S002D	Tank C, top, inlet side	1.61 ± 0.46	<0.16	<0.08	<0.03	<0.14	<0.04
923S003	Tank C, pipe, inlet	1.36 ± 0.86	<0.31	<0.18	<0.07	<0.27	<0.10
923S004	Tank C, pipe, exhaust	1.85 ± 0.86	<0.19	<0.10	<0.04	<0.18	<0.06
923S005	Tank C, bottom, middle	1.51 ± 0.80	<0.21	<0.10	<0.05	<0.21	<0.06
923S006	Tank C, bottom, inlet end	1.67 ± 0.59	<0.16	<0.07	<0.03	<0.14	<0.04
923S007	Tank B, bottom, inlet end	1.16 ± 0.74	<0.30	<0.16	<0.06	<0.30	<0.09
923S007D	Tank B, bottom, inlet end	1.40 ± 0.75	<0.32	<0.15	<0.06	<0.29	<0.09
923S008	Tank B, bottom, exhaust end	1.18 ± 0.56	<0.19	<0.10	<0.04	<0.19	<0.07
923S009	Tank B, pipe, exhaust	1.88 ± 0.67	0.11 ± 0.13	<0.08	<0.04	<0.17	<0.06
923S010	Tank B, pipe, inlet	1.85 ± 0.82	<0.28	<0.16	<0.06	<0.28	<0.08

TABLE 3

GROSS ALPHA AND BETA CONCENTRATIONS IN SOIL SAMPLES WALTER REED MEDICAL CENTER BETHESDA, MARYLAND

ESSAP Sample ID	Walter Reed Sample ID	Concentrations (pCi/g dry)	
		Gross Alpha	Gross Beta
0923S001	Tank C, bottom, exhaust end	23.9 ± 5.2[a]	37.3 ± 4.7
0923S002	Tank C, top, inlet side	18.1 ± 4.6	32.4 ± 4.3
0923S003	Tank C, pipe, inlet	21.1 ± 5.0	32.6 ± 4.4
0923S004	Tank C, pipe, exhaust	15.1 ± 4.4	37.2 ± 4.7
0923S005	Tank C, bottom, middle	25.9 ± 5.3	37.0 ± 4.6
0923S006	Tank C, bottom, inlet end	22.1 ± 5.0	31.4 ± 4.2
0923S007	Tank B, bottom, inlet end	26.0 ± 5.4	36.6 ± 4.6
0923S008	Tank B, bottom, exhaust end	22.5 ± 5.1	38.4 ± 4.7
0923S009	Tank B, pipe, exhaust	20.1 ± 4.9	38.0 ± 4.7
0923S010A	Tank B, pipe, inlet	23.7 ± 5.1	38.9 ± 4.8
0923S010B	Tank B, pipe, inlet	24.4 ± 5.2	43.1 ± 5.1
0923S011	Tank B, bottom, middle	19.9 ± 4.8	37.5 ± 4.7
0923S012	Tank C, top, exhaust	20.7 ± 4.9	34.7 ± 4.5
0923S013	Tank B, top, exhaust	16.8 ± 4.5	36.5 ± 4.6
0923S014	Tank A, bottom, exhaust end	21.1 ± 4.9	35.1 ± 4.5
0923S015	Tank A, pipe, inlet	19.6 ± 4.8	36.0 ± 4.6
0923S016	Tank B, top, inlet	26.2 ± 5.4	37.0 ± 4.6
0923S017	Tank A, pipe, exhaust	17.8 ± 4.6	39.4 ± 4.8
0923S018	Tank A, top, exhaust	16.4 ± 4.5	38.9 ± 4.8
0923S019	Tank A, bottom, inlet	18.9 ± 4.8	36.6 ± 4.6
0923S020A	Tank A, top, inlet	16.7 ± 4.6	35.8 ± 4.6
0923S020B	Tank A, top, inlet	17.2 ± 4.6	35.6 ± 4.6

[a]Uncertainties represent the 95% confidence level, based on total uncertainties.

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

November 1, 2000

Lt. Colonel Trent Moxley
The U. S. Army at Walter Reed Medical Center
Environmental Division
6825 16th St., NW
Washington, DC 20307-5001

SUBJECT: REVISION 1 - RESULTS OF ANALYSES OF SOIL SAMPLES COLLECTED SEPTEMBER 28, 1999 FROM WALTER REED MEDICAL CENTER

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The samples were dried before being analyzed. The percent moisture for each of the samples is presented in Table 1. The entire set of samples was analyzed by gamma spectroscopy and by gross alpha and beta. The results from the gamma spectroscopy analysis are presented in Table 2. The gross alpha and beta results are presented in Table 3. The Statement of Work (SOW) requires ESSAP to return these samples to Walter Reed Medical Center. After your approval of the data provided, we will ship these samples for your disposal.

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If you have any questions, please call me at (865) 241-3242 or Wade Ivey at (865) 576-9184.

Sincerely,

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[a]Uncertainties represent the 95% confidence level, based on total uncertainties.

Johnson, William B COL WRAMC-Wash DC

From: Morton, Arthur R CPT WRAMC-Wash DC
Sent: Thursday, October 21, 1999 4:45 PM
To: Johnson, William B COL WRAMC-Wash DC; Burton, David A
Subject: FW: Cost Estimate

-----Original Message-----
From: Wright, Gary W CHPPM
Sent: Thursday, October 21, 1999 1:42 PM
To: Morton, Arthur R CPT WRAMC-Wash DC
Cc: Swatski, Ronald J CHPPM; Wright, Gary W CHPPM
Subject: Cost Estimate

CPT Morton,

The following cost estimate is based on the analysis of thirty (30) soil samples within standard turn around and for existing detection limits for the procedures. Lower detection limits will increase costs and require more time for analysis. An increase in the total number of samples will also increase the cost and depending on the total number of samples submitted, possibly the turn around time. Since these are soil samples, local background soils will be required if an accurate interpretation is necessary.

Gross Alpha/Gross Beta in Soil, Acode R765, Method AB003	$ 85.00 each	$ 2550.00
Gamma-100 in Soil by Quant.Gamma Spect., Acode R803, Method G_002	$ 90.00 each	$ 2700.00
Tritium in Soil by Soak & Distillation, Acode R582, Method H_005	$100.00 each	$ 3000.00
Carbon-14 in Soil, Acode XXXX, Method XXXXX	$125.00 each	$ 3750.00
	Total	$12000.00

This is an approximate price based on the information provided. If there are any questions/comments, please contact me.

Gary W. Wright
RAD Team Leader

DEPARTMENT OF THE ARMY
UNITED STATES ARMY RESEARCH LABORATORY
2800 POWDER MILL ROAD
ADELPHI, MARYLAND 20783-1197

REPLY TO
THE ATTENTION OF

AMSRL-CS-IS-SH (385-11m) 6 December 1999

MEMORANDUM FOR Commander, Walter Reed Army Medical Center,
ATTN: MCHL-HP, 6825 16th Street, Building 41, Room 38,
Washington, DC 20307-5001

SUBJECT: Building 516 Underground Storage Tank - Soil Samples

1. Reference memorandum, MCHL-HP, 20 Oct 99, subject: Final Survey of the Underground Storage Tanks, Building 516, Forest Glen Annex.

2. I appreciate your office preparing the final survey report referenced above and providing it to my Health Physicist for review and filing. As you are probably aware, the Army Reactor Office has issued an Army Reactor Permit to the Director, U.S. Army Research Laboratory (ARL), to ensure that the subject facility is surveyed and remediated to present day decommissioning standards before the building is ever released for unrestricted use. The report you provided will be filed at ARL as survey data and historical information to be considered later for eventual unrestricted release of the building and grounds.

3. ARL as the permit holder would also like to ensure that the approximately 20 soil samples taken around and under the tanks during tank removal are also analyzed to support future facility release efforts. Analysis of these samples is not included in the referenced survey report. Therefore, we would greatly appreciate being provided the samples (or portion of each) as well as a diagram/description of where each sample was taken. We will then make arrangements to have these samples evaluated. Alternatively, if your office would like to make arrangements for analysis of the samples, we would appreciate your efforts. Please contact my Health Physicist, Mr. Michael Borisky, in advance, to discuss funding of the analysis. Mr. Borisky can be reached at (301) 394-6310.

4. Your assistance in this matter as well as efforts to date is greatly appreciated.

KENNETH O. LOGAN
COL, QM
Chief of Staff

CF:
USANCA, ATTN: MONA-ARO, 7150 Heller Loop, Suite 101, Springfield, VA 22150-3198

DEPARTMENT OF THE ARMY
WALTER REED ARMY MEDICAL CENTER
WASHINGTON, DC 20307-5001

REPLY TO
ATTENTION OF:

MCHL-HP

30 September 1997 ~~1990~~

MEMORANDUM FOR Chief, Environmental Office, ATTN: Mr. Brooks, Walter Reed Army Medical Center, Washington, DC

SUBJECT: Release of Storage Tanks from Building 513 Area

1. Three underground storage tanks located on the WRAMC Forest Glen Annex next to Building 513 have been removed from the ground by a contractor. Two of the tanks were in stand-by mode and one of the tanks was part of a direct line from Building 513 to the sewer. The tanks were part a possible hold up system to hold water contaminated with radioactive materials from the operation of a medical research reactor that was in Building 513. This facility was decommissioned about 20 years ago, and for the last 20 years the building has been used as low level radioactive waste consolidation facility for WRAMC. Liquid waste that meets NRC requirements have been discharged through the sewer line.

2. The tanks were sampled prior to removal and found to contain very low levels of radioactive material well within any NRC discharge limits. Radiation support and monitoring was provided during the removal of the tanks. The tanks were filled with soapy water, the water circulated and then the tanks were drained prior to removal. All monitoring and analysis of the tanks after removal indicate no removable levels of any radioactive materials present above the unrestricted release limit of 200 dpm. Scanning using calibrated survey meters found no levels of gamma or x-ray radiation above our release limit of 2X background.

3. Based on smears analyzed by NaI and liquid scintillation counting, and scanning of the tinside of the tanks using calibrated survey meters, no radiological contamination is present in any of the three tanks that would preclude the tanks removal from government control. Recommend that the tanks be released to the contractor to remove the tanks off site.

William B. Johnson
WILLIAM B. JOHNSON
COL, MS
Chief, Health Physics Office

DEPARTMENT OF THE ARMY
WALTER REED ARMY MEDICAL CENTER
WASHINGTON, DC 20307-5001

REPLY TO
ATTENTION OF:

MCHL-HP

30 September 1999

MEMORANDUM FOR Chief, Environmental Office, ATTN: Mr. Brooks, Walter Reed Army Medical Center, Washington, DC

SUBJECT: Release of Storage Tanks from Building 513 Area

1. Three underground storage tanks located on the WRAMC Forest Glen Annex next to Building 513 have been removed from the ground by a contractor. Two of the tanks were in stand-by mode and one of the tanks was part of a direct line from Building 513 to the sewer. The tanks were part a possible hold up system to hold water contaminated with radioactive materials from the operation of a medical research reactor that was in Building 513. This facility was decommissioned about 20 years ago, and for the last 20 years the building has been used as low level radioactive waste consolidation facility for WRAMC. Liquid waste that meets NRC requirements have been discharged through the sewer line.

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William B. Johnson
WILLIAM B. JOHNSON
COL, MS
Chief, Health Physics Office

DEPARTMENT OF THE ARMY
WALTER REED ARMY MEDICAL CENTER
WASHINGTON, DC 20307-5001

REPLY TO
ATTENTION OF:

MCHL-HP

30 September ~~1990~~ 1995

MEMORANDUM FOR Chief, Environmental Office, ATTN: Mr. Brooks, Walter Reed Army Medical Center, Washington, DC

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COL, MS
Chief, Health Physics Office

ORISE

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

P.O. BOX 117
OAK RIDGE, TENNESSEE 37831-0117

FACSIMILE SERVICES

ORISE/ESSAP FAX TELEPHONE NO.
COMM: (423) 241-3497
VERIFY: (423) 576-6348 or Sender

*** UNCLASSIFIED ***
Please Type Or Use Black Pen
Remove All Staples

DATE: 4/16/99

FROM: Tim Vitkus
Radiological Survey, Assessments, and Training (RSAT)
TELEPHONE: (423) 576-5073 FAX: (423) 241-3497

****

TO: Lt Col. Martha Sanders ORGANIZATION: WRAMC
TELEPHONE: _____ OFFICE/LOCATION: _____
FAX: (202) 782-8383 VERIFY: Yes [ ] No [ ]
TELE: _____

THIS TRANSMITTAL CONSISTS OF 6 PAGE(S), EXCLUDING COVER SHEET.
*** (NUMBER PAGES IF 4 OR MORE) ***

COMMENTS

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

April 6, 1999

Lt. Col. Martha Sanders
Walter Reed Army Medical Center
Environmental Division
6825 16th Street, NW
Washington, DC 20307-5001

SUBJECT: REPORT OF DATA FOR ANALYSIS OF SAMPLES COLLECTED FROM WALTER REED ARMY MEDICAL CENTER ANNEX, FEBRUARY 24-25, 1999, FOREST GLEN, MARYLAND (MIPR9DRAU0942)

Dear Lt. Col. Sanders:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) provided technical assistance to the Walter Reed Army Medical Center (WRAMC) in the form of sample collection and analysis support for the Building 516 Underground Storage Tank (UST) Project. The project is at the WRAMC Annex located in Forest Glen, Maryland (Figure 1). An ESSAP representative traveled to the site and on February 24, 1999, collected one sludge sample and three water samples from the USTs located near Building 516 (Figures 2 and 3). In addition, WRAMC personnel provided a drilling contractor who collected subsurface soil samples from nine boreholes, one of which represented a background location (Figure 3). Subsurface samples were collected at two-foot intervals beginning at 11 feet below grade—the depth that corresponded to the bottom tank level. Samples were maintained under ESSAP chain-of-custody and transported to ESSAP's laboratory in Oak Ridge, Tennessee for analysis.

Gamma spectroscopy analysis was performed on the nine soils that corresponded to the first sample depth of 11 feet—the remaining soil samples were archived for possible analysis, pending the initial results. The three water samples and one sludge sample were also analyzed by gamma spectroscopy. The results were reviewed for uranium and any other identifiable photopeaks corresponding to fission or activation products. The gamma spectroscopy analysis on the soil and the sludge tank samples showed uranium concentrations in the 1 to 2 pCi/g range, which is typical for most soils. The activation and fission product review of the soil and sludge gamma spectroscopy data identified very low levels of Co-60 and Cs-137 in the sludge sample. All other sample results were less than the respective minimum detectable concentrations (MDCs) for each radionuclide. The gamma spectroscopy results are presented in Table 1. Analysis of uranium in water by gamma spectroscopy has a very high MDC (>40 pCi/L) and serves primarily as a screening method. . The isotopic uranium and plutonium alpha spectroscopy results are presented in Table 2. When analyzed by alpha spectroscopy, one water sample had a result above MDC for isotopic uranium. The other water sample results were less than the MDCs for uranium by alpha spectroscopy, which ranged from 0.2 pCi/L to 0.4 pCi/L. The uranium isotopic results for the sludge sample indicated a low concentration of enriched uranium. The observed uranium

concentrations may still be representative of background conditions.[1] All plutonium isotopic results were below MDC.

ESSAP's Quality Control (QC) procedures were followed for these analyses. The daily QC and detector background for the counting instrumentation used in the analyses were within acceptable limits. The QC files are available for your review upon request.

Please contact me at (423)576-5073 or Dale Condra at (423)241-3242 with any questions or comments.

Sincerely,

Timothy J. Vitkus
Survey Projects Manager
Environmental Survey and
Site Assessment Program

TJV:RDC:cds

cc: W. Beck, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
D. Condra, ORISE/ESSAP
File/586

1 National Council on Radiation Protection and Measurement. Report No. 77, Exposures From the Uranium Series with Emphasis on Radon and Its Daughters. Chapters 2 and 6.

586-001 (1)

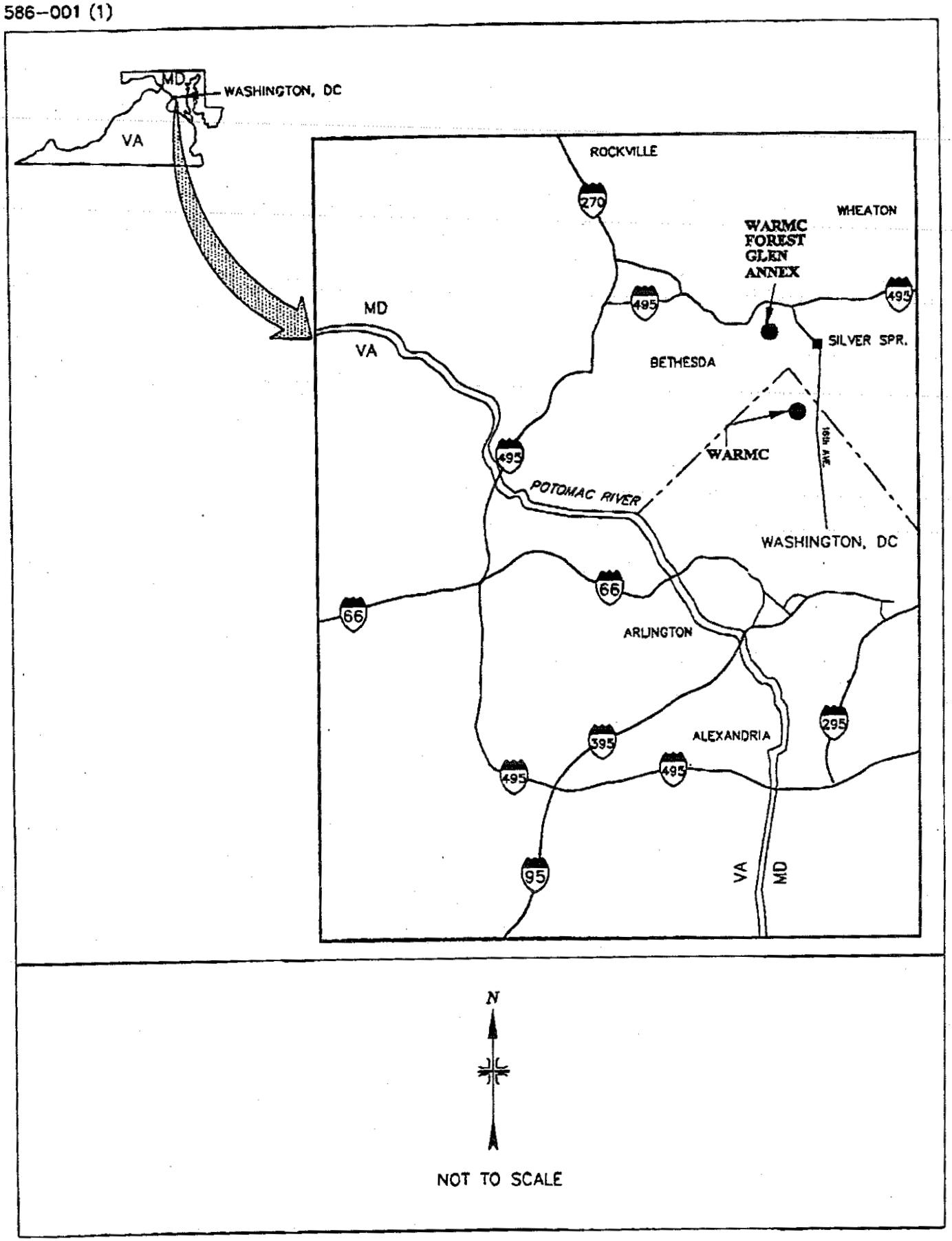

FIGURE 1: Location of the Walter Reed Army Medical Center, Washington, DC

586-002 (1)

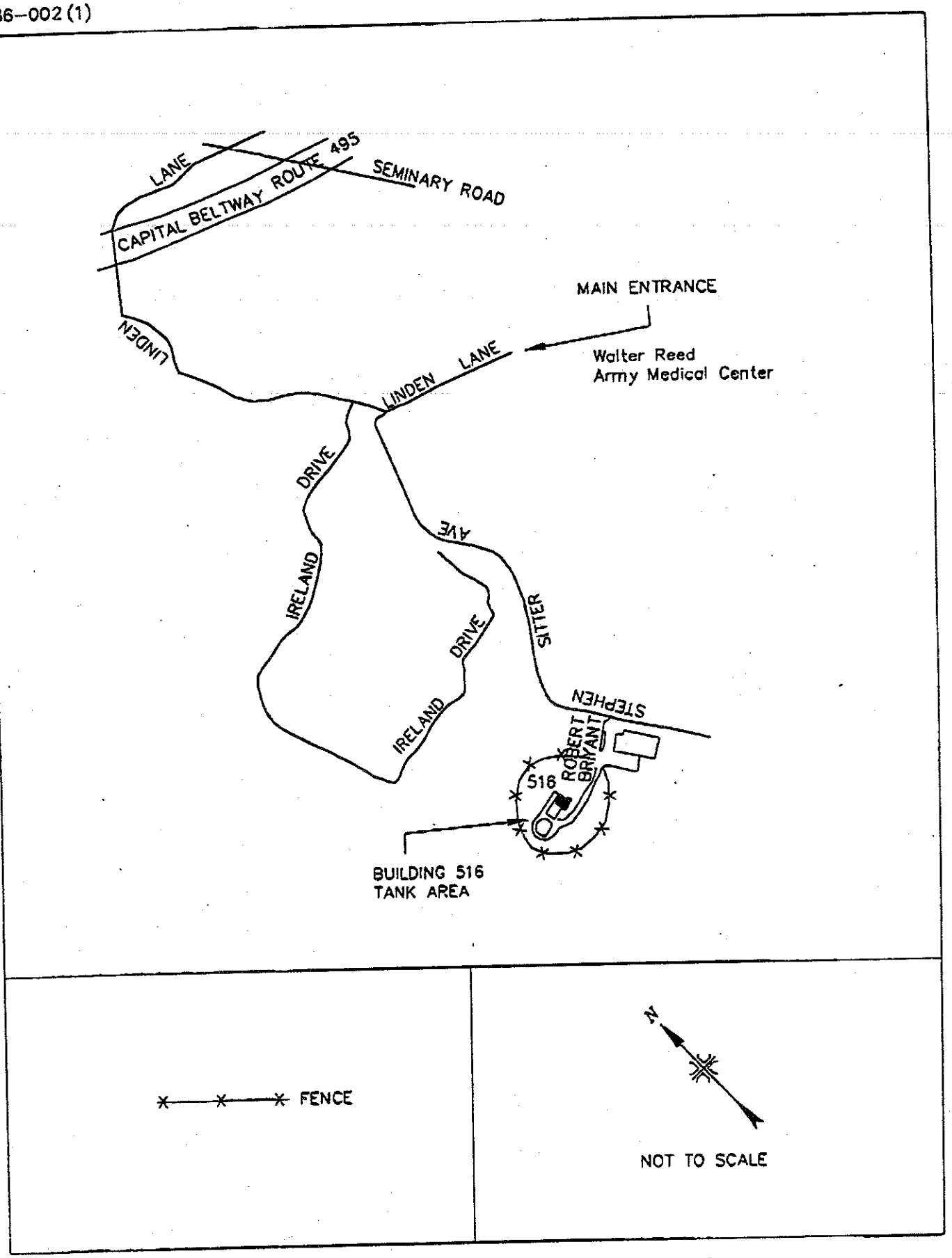

FIGURE 2: Walter Reed Army Medical Center Forest Glen Annex — Building 516 Tank Site

586-003 (1)

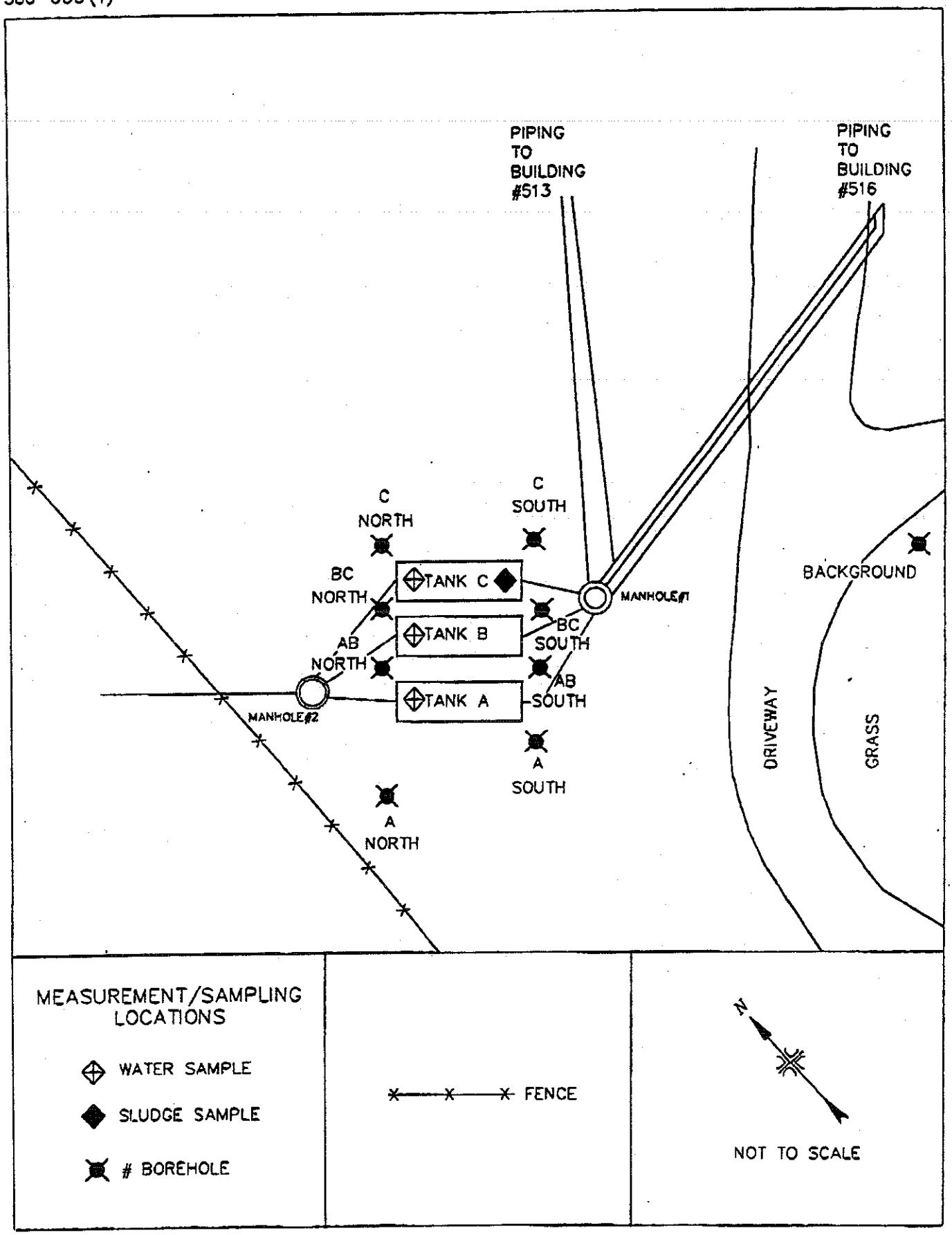

FIGURE 3: Water Reed Army Medical Center – Tank Sample Locations

TABLE 1

RADIONUCLIDE CONCENTRATIONS BY GAMMA SPECTROSCOPY IN SLUDGE AND SOIL SAMPLES WATER REED ARMY MEDICAL CENTER BETHESDA, MARYLAND

ESSAP Sample ID	Radionuclide Concentrations (pCi/g or L)					
	Co-60	Cs-137	Eu-152	Eu-154	U-235	U-238
586M001	0.110 ± 0.036[a]	0.090 ± 0.038	<0.095	<0.15	<0.16	<0.81
586S001	<0.053	<0.037	<0.10	<0.19	<0.20	1.99 ± 0.74
586S004	<0.039	<0.027	<0.065	<0.12	<0.14	1.38 ± 0.49
586S007	<0.060	<0.042	<0.096	<0.18	<0.19	1.67 ± 0.77
586S010	<0.051	<0.037	<0.078	<0.15	<0.17	0.99 ± 0.62
586S013	<0.054	<0.034	<0.089	<0.17	<0.19	1.90 ± 0.83
586S016	<0.041	<0.027	<0.068	<0.13	<0.14	1.57 ± 0.60
586S019	<0.059	<0.044	<0.095	<0.18	<0.18	1.79 ± 0.72
586S022	<0.050	<0.037	<0.080	<0.15	<0.17	1.09 ± 0.61
586S025	<0.038	<0.025	<0.057	<0.11	<0.12	0.90 ± 0.49
586W001	<4.8	<4.5	<9.8	<18	<17	<73
586W002	<3.9	<3.8	<9.3	<16	7 ± 16	<66
586W003	<3.4	<2.8	<7.7	<13	<14	<43

[a]Uncertainties represent the 95% confidence level, based on total uncertainties.

TABLE 2

URANIUM AND PLUTONIUM CONCENTRATION IN SOIL AND WATER SAMPLES ANALYZED BY ALPHA SPECTROSCOPY WALTER REED ARMY MEDICAL CENTER BETHESDA, MARYLAND

ESSAP Sample ID	Radionuclide Concentrations (pCi/g or L)					
	U-234	U-235	U-238	Total Uranium	PU-238	PU-239
586W001	0.19 ± 0.16[a,b,c]	0.05 ± 0.12	0.04 ± 0.11	0.28 ± 0.23	0.21 ± 0.21[d]	0.03 ± 0.10
586W002	0.05 ± 0.19	-0.20 ± 0.21	0.13 ± 0.19	-0.02 ± 0.34	0.03 ± 0.19	0.18 ± 0.16
586W003	0.93 ± 0.31	0.000 ± 0.067	0.21 ± 0.15	1.14 ± 0.35	0.0 ± 0.0	-0.04 ± 0.13
586M001A	2.80 ± 0.34	0.112 ± 0.036	0.607 ± 0.095	3.51 ± 0.35	0.005 ± 0.022	0.000 ± 0.007
586M001B	2.33 ± 0.28	0.085 ± 0.030	0.582 ± 0.090	2.99 ± 0.30	0.002 ± 0.015	0.011 ± 0.013

[a]Uncertainties represent the 95% confidence level, based on total uncertainties.

[b]MDCs for uranium in water range from 0.2 to 0.4 pCi/L.

[c]Alpha isotopic results are based on net counts in the regions of interest.

[d]MDCs for plutonium in water range from 0.2 to 0.4 pCi/L and in soil from 0.04 to 0.05 pCi/g.

DEPARTMENT OF THE ARMY
WALTER REED ARMY MEDICAL CENTER
WALTER REED HEALTH CARE SYSTEM
WASHINGTON, DC 20307-5001

REPLY TO
ATTENTION OF

MCHL-HP

11 June 1999

MEMORANDUM THRU Commander, Walter Reed Army Medical Center
Installation, WRAMC, Washington, DC 20307

FOR Chief, DPW, WRAMC Installation, Washington, DC

SUBJECT: Proposed Demolition/Decommissioning of Building 516

1. The Health Physics Office received a copy on 9 June 1999 of a MEDCOM funding request to demolish building 516, Forest Glen Section dated 21 March 1999 (enclosure). I nonconcur with the proposed action and strongly recommend that this action be revoked.

2. Building 516 is the radiological low level waste storage facility for Walter Reed Army Medical Center. Low level waste is constantly generated by WRAMC, WRAIR, AFIP and now NMRI. Building 516 is an ideal location for storage and processing of this radiological waste since this building formerly housed a medical research reactor.

3. The reason cited for the demolition of building 516 was to support the construction of a new installation supply warehouse on the site. The existing installation supply warehouse is programmed to be transferred to the National Park Seminary Historic District in the next couple years. The new warehouse is programmed into the FY 2002 MILCON program.

4. Building 516 has the capacity to store 500 drums of low level radioactive waste, has a radiological fume hood, a vial crusher, drum compactor, and a walk-in freezer to store biological waste. Currently low level radioactive waste for the Department of Defense is taken to one of two burial sites for disposal. These sites could exclude the DOD from radiological waste shipments at any time and building 516 provides the capacity to store waste for 5 to 10 years from this installation in that contingency.

5. When the reactor was decommissioned, some of the low level waste was entombed in the concrete, as well as the concrete walls of the expsure room were activated during reactor

operations and this material will need to be disposed of as radioactive waste. The Army Reactor Office maintains the permit for the low level activation products and waste entombed in building 516. Any plans to demolish this building must be first coordinated and approved by the Army Reactor Office and the Department of Army Reactor Council. Disposal costs for the low level radioactive waste generated from the dismantling of building 516 would be quite significant. The concrete walls surrounding the reactor space are about 10 feet thick and the reactor pool is about 15 feet in diameter and 25 feet thick filled with concrete. Most or all of this material will have to be disposed of as low level radioactive waste.

6. The Health Physics Office has not been contacted regarding the planned demolition of building 516 or plans for a replacement low level radioactive waste storage facility. Building 516 is ideally located to support the low level radioactive waste mission and it would be extremely costly to demolish and construct a new facility.

7. If building 516 is not demolished, we would also request that the security fence surrounding building 516 remain intact to maintain the security and exclusion area that we currently have as a condition on WRAMC's Nuclear Regulatory Commission Byproduct Material License.

8. Point of contact regarding this memorandum is the undersigned or CPT Arthur Morton, Chief, Health Physics Operations at (202) 356-0058.

Encl
as

WILLIAM B. JOHNSON
COL, MS
Chief, Health Physics Office

CF:
COL Vaeth, Chief, Preventive Medicine Service
LTC Sanders, Chief, Environmental Office

FFID: DC211621156 PRJ# WR0099F010

Installation Name: WALTER REED AMC
Abbreviation: WRAMC
Street Address: 6825 16TH ST NW
City: WASHINGTON State: DISTRICT OF COLUMBIA Country: US Zip: 20307-5001
Local Information:
Project Name: DECOMMISSIONING OF BLDG. 516
Agency Project Number: WR0099F010
Date First Entered: 03/21/1999
Reason for Initiation: Other
Pillar:
Geographic Initiative: Chesapeake Bay
Program Area: DECONTAMINATION
Progress Code: 8-Other
Date Completed:
Date Discontinued:
Reason Discon:
Project Type: Remediation
Other Project ID Type:
Other Project ID:
P2 Category:

FFID: DC-211621156
Property Number: 21156
Congressional District:
Multiple Installations: N
Date of Last Revision: 03/21/1999
Must Fund: Y
Design/Plan Completion: 08/31/2001 —
Construction/Work Started: 10/01/2002 —
Construction/Work Completed: 10/01/2003 —
Command Priority: H
Local Priority: H

Major Command: MEDCOM
Support Installation:
ASG:
BSB:
Installation Type: MEDICAL ACTIVITY
Ownership Type: GOGO
Subcommand:
Law/Reg Area: MULT
Environmental Category: SMPL
Class: 0
Compliance Status: OTHR
Project Assessment: H
Required Compliance Date: 09/02/2002
Year Funding Required: 2000
Total Cost Estimate: $10,000,000
Project Contact Name: MASTER PLANNING, DPW
Contact Telephone: (202)782-7115
Tracey Porter

Fund Code	AMS Code	FY	Required	Prog/Bdgt	Obligated	Fund Code	AMS Code	FY	Required	Prog/Bdgt	Obligated
OMA(VENC)	8477XX.XX	2000	$5,000,000			OMA(VENC)	8477XX.XX	2001	$5,000,000		

Narrative: FUNDS ARE REQUIRED TO SUPPORT THE CONSTRUCTION OF A NEW INSTALLATION SUPPLY WAREHOUSE AT FOREST GLEN SECTION. THE PROPOSED SITE FOR THE NEW WAREHOUSE IS THE LOCATION OF BLDG. 516, HEALTH PHYSICS LABORATORY FACILITY. THE WAREHOUSE PROJECT HAS BEEN ON THE APPROVED MASTER PLAN AS LONG RANGE PROJECT SINCE 1992. HOWEVER, WITH THE PENDING EXCESSING AND TRANSFER OF THE NATIONAL PARK SEMINARY HISTORIC DISTRICT (NPSHD) TO THE GENERAL SERVICES ADMINISTRATION (GSA) FOR DISPOSAL, THE WAREHOUSE PROJECT HAS MOVED INTO THE SHORT RANGE PROGRAM. SUBSEQUENTLY, THE NEW WAREHOUSE PROJECT PROGRAMMED IN THE FY 2002 MILCON PROGRAM. HOWEVER, CONSTRUCTION CANNOT TAKE PLACE UNTIL THE SITE IS CLEAN AND BLDG. 516 CAN BE DEMOLISHED. THIS WILL REQUIRE THAT ALL CHEMICAL, BIOLOGICAL AND RADIOLOGICAL SUBSTANCES BE DECONTAMINATED FROM THE LABORATORIES IN BLDG. 516. THE PROJECT SCOPE WILL INCLUDE: A BASELINE FIELD INVESTIGATION OF THE EXISTING FACILITY, THE DEVELOPMENT OF DECONTAMINATION PROTOCOL (DECON METHODOLOGY), PROJECT PHASING WITH ASSOCIATED COSTS, AND THE DEVELOPMENT OF A FINAL REPORT FOR APPROVAL THROUGH USACHPPM AND NCR. IT IS ESTIMATED THAT IT WILL COST APPROXIMATELY $10.0 MILLION TO DECOMMISSION BLDG. 516. MOREOVER, THE SCOPE OF THIS PROJECT WILL NOT INCLUDE ABATEMENT OF LEAD BASE PAINT AND ASBESTOS. THE MILCON PROJECT HAS CAPTURED THIS COSTS AS A PART OF THE DEMOLITION COSTS.

Comments: IN ACCORDANCE WITH AR 200-1, 210-20 AND 415-15, AS WELL AS DEFENSE ENVIRONMENTAL RESTORATION PROGRAM (DERP), INSTALLATION RESTORATION PROGRAM (IRP), AND ENVIRONMENTAL QUALITY CONTROL GUIDANCE, THE ARMY IS RESPONSIBLE FOR PROVIDING A CLEAN SITE FOR NEW CONSTRUCTION AND RENOVATION. SUBSEQUENTLY, BLDG. 516 MUST BE DECOMMISSIONED OF CHEMICAL, BIOLOGICAL AND RADIOLOGICAL WASTE SO THE NEW INSTALLATION WAREHOUSE CAN BE CONSTRUCTED. BLDG. 516 MUST BE A CLEAN SITE NLT OCTOBER 2002 TO MEET THE MILCON CONSTRUCTION START SCHEDULE. THE TIMELINESS AND SUPPORT OF THIS PROJECT IS PARAMOUNT TO THE EXCESSING OF THE NATIONAL PARK SEMINARY HISTORIC DISTRICT (NPSHD) FROM THE ARMY, AND TRANSFERRING TO THE GENERAL SERVICES ADMINISTRATION (GSA) FOR DISPOSAL.

Encl

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

April 23, 1999

Lt. Col. Martha Sanders
Walter Reed Army Medical Center
Environmental Division
6825 16th Street, NW
Washington, DC 20307-5001

SUBJECT: REVISION 1 - REPORT OF DATA FOR ANALYSIS OF SAMPLES COLLECTED FROM WALTER REED ARMY MEDICAL CENTER ANNEX, FEBRUARY 24-25, 1999, FOREST GLEN, MARYLAND (MIPR9DRAU0942)

Dear Lt. Col. Sanders:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) provided technical assistance to the Walter Reed Army Medical Center (WRAMC) in the form of sample collection and analysis support for the Building 516 Underground Storage Tank (UST) Project. The project is at the WRAMC Annex located in Forest Glen, Maryland (Figure 1). An ESSAP representative traveled to the site and on February 24, 1999, collected one sludge sample and three water samples from the USTs located near Building 516 (Figures 2 and 3). In addition, WRAMC personnel provided a drilling contractor who collected subsurface soil samples from nine boreholes, one of which represented a background location (Figure 3). Subsurface samples were collected at two-foot intervals beginning at 11 feet below grade—the depth that corresponded to the bottom tank level. Samples were maintained under ESSAP chain-of-custody and transported to ESSAP's laboratory in Oak Ridge, Tennessee for analysis.

Gamma spectroscopy analysis was performed on the nine soils that corresponded to the first sample depth of 11 feet—the remaining soil samples were archived for possible analysis, pending the initial results. The three water samples and one sludge sample were also analyzed by gamma spectroscopy. The results were reviewed for uranium and any other identifiable photopeaks corresponding to fission or activation products. The gamma spectroscopy analyses on the soil and the sludge tank samples showed uranium concentrations in the 1 to 2 pCi/g range, which is the typical background concentration level for most soils. The activation and fission product review of the soil and sludge gamma spectroscopy data identified very low levels of Co-60 and Cs-137 in the sludge sample. All other sample results were less than the respective minimum detectable concentrations (MDCs) for each radionuclide. The gamma spectroscopy results are presented in Table 1. Analysis of uranium in water by gamma spectroscopy has a very high MDC (>40 pCi/L) and serves primarily as a screening method. The isotopic uranium and plutonium alpha spectroscopy results are presented in Table 2. When analyzed by alpha spectroscopy, one water sample had a result above MDC for isotopic uranium. The other water sample results were less than the MDCs for uranium by alpha spectroscopy, which ranged from 0.2 pCi/L to 0.4 pCi/L. The uranium isotopic results for the sludge sample indicated a low concentration of enriched

uranium. The observed uranium concentrations may still be representative of background conditions.[1] All plutonium isotopic results were below MDC.

ESSAP's Quality Control (QC) procedures were followed for these analyses. The daily QC and detector background for the counting instrumentation used in the analyses were within acceptable limits. The QC files are available for your review upon request. Because the initial borehole depth interval samples did not identify radionuclides in excess of expected background levels, the remaining subsurface samples were not analyzed. Gross alpha measurements were not performed due to the limited utility of this type of analysis for soil and sludge samples. It was determined that the radionuclide-specific analyses performed would provide quantitative results for any of the suspect contaminants through either the isotopic alpha spectroscopy or measurement of alpha emitter progeny through gamma spectroscopy. It is ESSAP's opinion that the only alpha emitters that would not have been identified either directly or indirectly by these methods are accelerator-produced transuranics.

Please contact me at (423)576-5073 or Dale Condra at (423)241-3242 with any questions or comments.

Sincerely,

Timothy J. Vitkus
Survey Projects Manager
Environmental Survey and
Site Assessment Program

TJV:RDC:cds

cc: W. Beck, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
D. Condra, ORISE/ESSAP
File/586

1 National Council on Radiation Protection and Measurement. Report No. 77, Exposures From the Uranium Series with Emphasis on Radon and Its Daughters, Chapters 2 and 6.

586-001 (1)

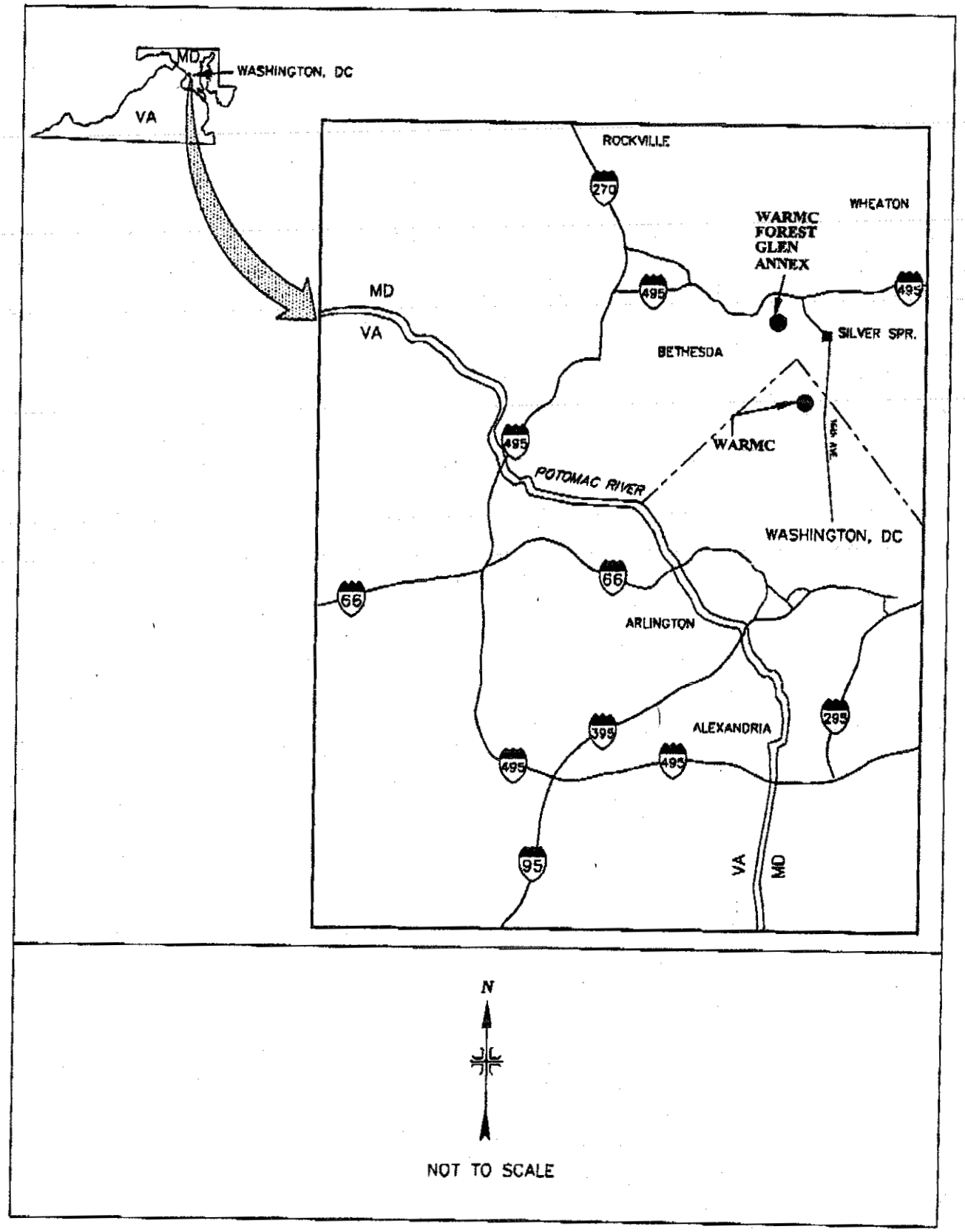

FIGURE 1: Location of the Walter Reed Army Medical Center, Washington, DC

586-002 (1)

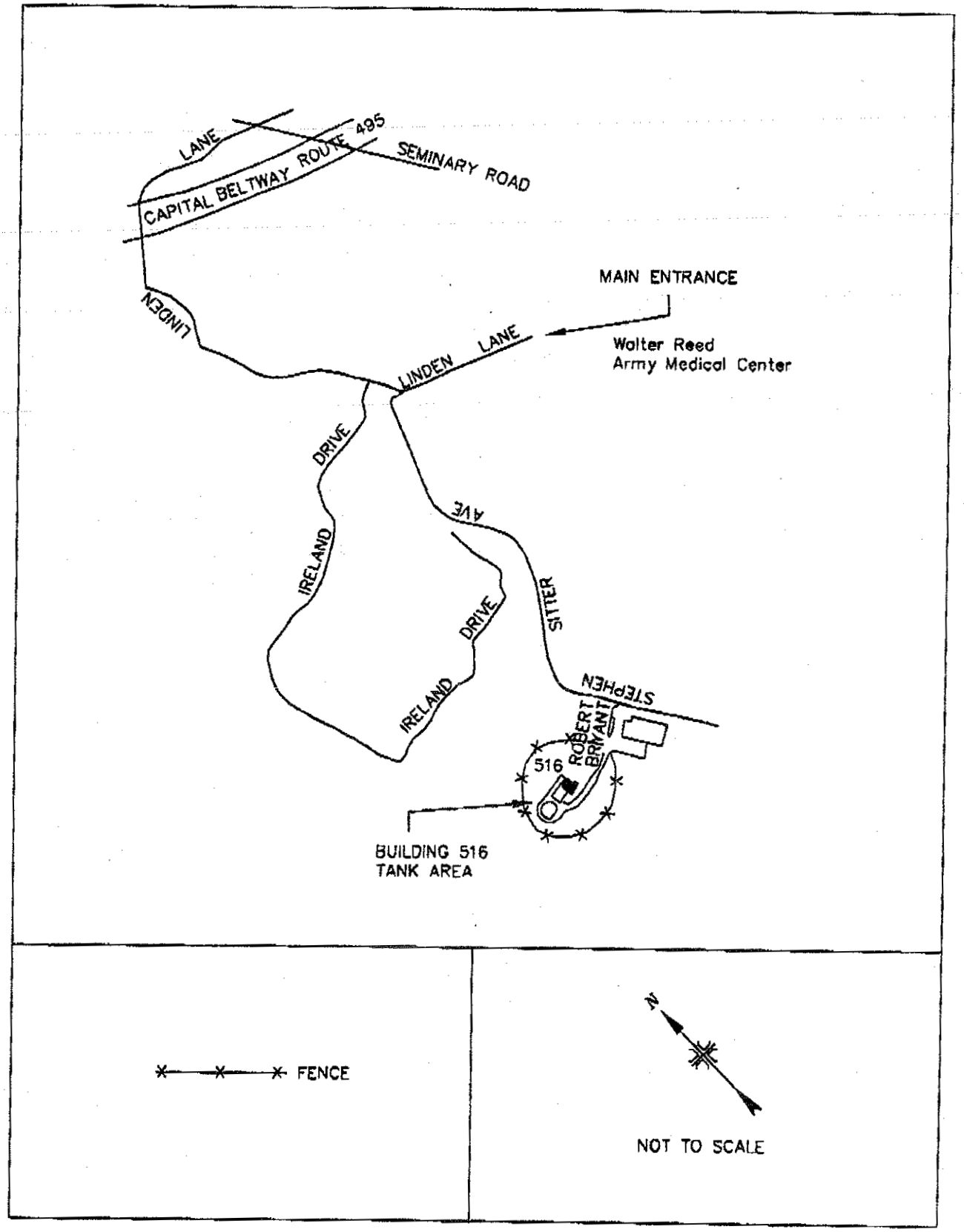

FIGURE 2: Walter Reed Army Medical Center Forest Glen Annex – Building 516 Tank Site

586-003 (2)

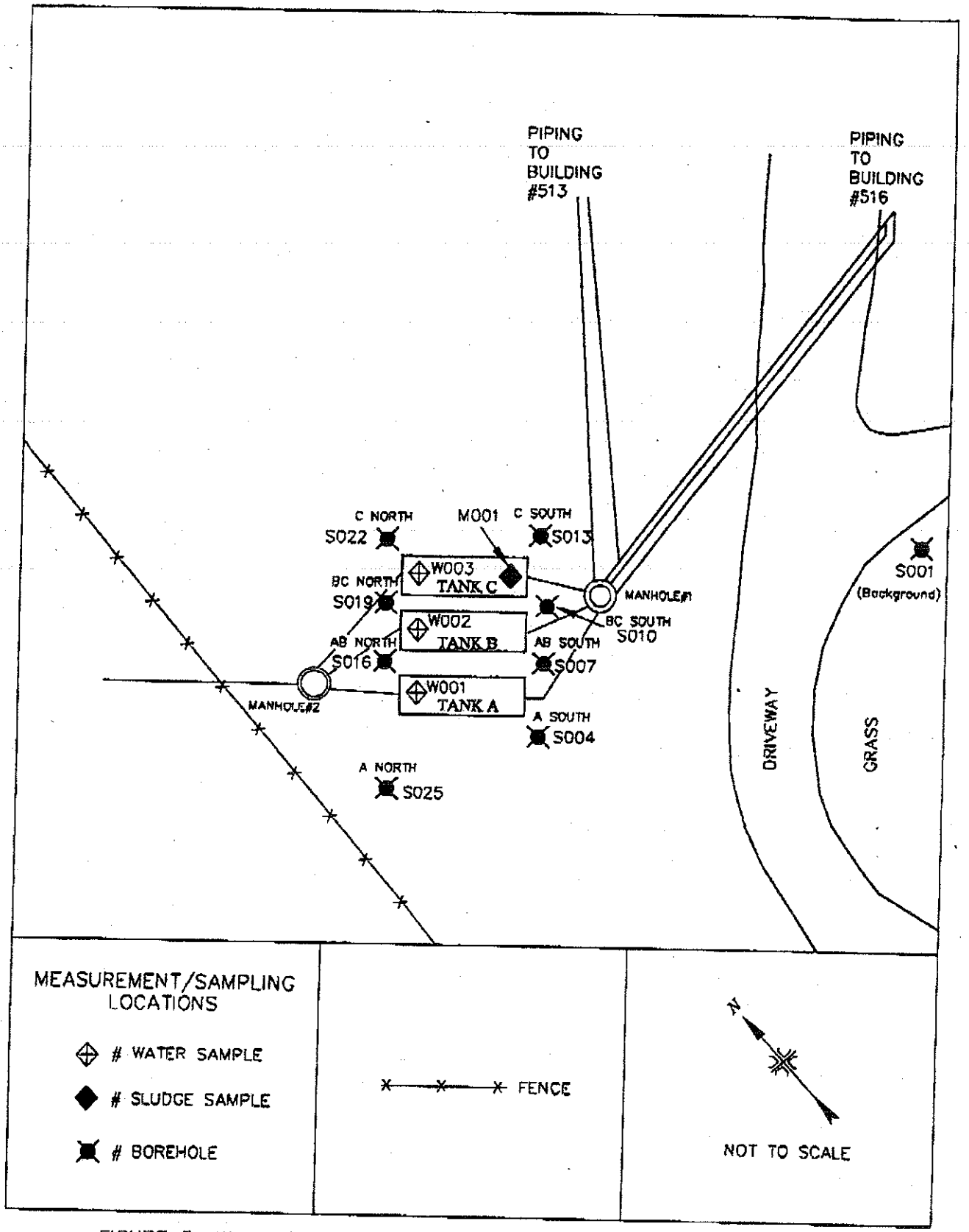

FIGURE 3: Water Reed Army Medical Center – Tank Sample Locations

TABLE 1

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[a]Uncertainties represent the 95% confidence level, based on total uncertainties.

TABLE 2

URANIUM AND PLUTONIUM CONCENTRATION IN SOIL AND WATER SAMPLES ANALYZED BY ALPHA SPECTROSCOPY WALTER REED ARMY MEDICAL CENTER BETHESDA, MARYLAND

ESSAP Sample ID	Radionuclide Concentrations (pCi/g or L)					
	U-234	U-235	U-238	Total Uranium	PU-238	PU-239
586W001	0.19 ± 0.16[a,b,c]	0.05 ± 0.12	0.04 ± 0.11	0.28 ± 0.23	0.21 ± 0.21[d]	0.03 ± 0.10
586W002	0.05 ± 0.19	-0.20 ± 0.21	0.13 ± 0.19	-0.02 ± 0.34	0.03 ± 0.19	0.18 ± 0.16
586W003	0.93 ± 0.31	0.000 ± 0.067	0.21 ± 0.15	1.14 ± 0.35	0.0 ± 0.0	-0.04 ± 0.13
586M001A	2.80 ± 0.34	0.112 ± 0.036	0.607 ± 0.095	3.51 ± 0.35	0.005 ± 0.022	0.000 ± 0.007
586M001B	2.33 ± 0.28	0.085 ± 0.030	0.582 ± 0.090	2.99 ± 0.30	0.002 ± 0.015	0.011 ± 0.013

[a]Uncertainties represent the 95% confidence level, based on total uncertainties.

[b]MDCs for uranium in water range from 0.2 to 0.4 pCi/L.

[c]Alpha isotopic results are based on net counts in the regions of interest.

[d]MDCs for plutonium in water range from 0.2 to 0.4 pCi/L and in soil from 0.04 to 0.05 pCi/g.

DEPARTMENT OF THE ARMY
WALTER REED ARMY MEDICAL CENTER
WALTER REED HEALTH CARE SYSTEM
WASHINGTON, DC 20307-5001

REPLY TO
ATTENTION OF

MCHL-HP (385-11d) 27 April 1999

MEMORANDUM FOR U.S. Army Nuclear & Chemical Agency, ATTN: Army Reactor Office/Mr. Burns, 7150 Heller Loop, Suite 101, Springfield, VA 22150-3198

SUBJECT: Data Analysis of Soil, Water and Sludge Samples from the Wastewater Holding Tanks, Bldg. 516, Forest Glen Section

1. References are provided in the Appendix to this report.

2. All soil, water and sludge samples from the wastewater holding tanks from building 516, Forest Glen Section, Silver Spring, Maryland indicate the tanks can be safely removed from the ground and disassembled in accordance with the Comprehensive Work Plan (reference 1).

3. Based on an initial survey of the water and sludge samples by the U.S. Army TMDE, reference 4, taken in the 3 underground holding tanks, 200 pCi/gm of Cr-51, 30 pCi/gm of mixed alpha, and 300 pCi/gm of total beta activity (H-3) was measured from sludge samples from Tank 1, the tank closest to building 516.

4. Because of the elevated alpha activity in the tank, the CHPPM analyzed a sludge sample from the tank and measured 6.1 +/- 2.6 pCi/gm of total alpha activity in the sludge. This was considered within normal background concentration levels of naturally occuring radioactive materials in this region.

5. The Oak Ridge Institute for Science and Education sampled the sludge, water and soil samples inside and surrounding the tanks (reference 2). An isotopic specific analysis for alpha and gamma found 3.51 +/- 0.35 pCi/gm of total uranium in the tank closest to building 516. This is consistent with the CHPPM measurement and estimated background concentrations in this region. The soil samples indicate no liquid contamination had escaped the tanks.

6. All radionuclides measured in the soil, water and sludge samples are well below the NRC license exempt concentrations. The tanks will be thoroughly flushed prior to removal and the inside of the tanks, as well as any sediment removed from the tanks will be screened by the WRAMC Health Physics Office prior to the tanks being removed or disassembled.

7. A historical review found that previous soil, water, sediment, and vegetation samples were analyzed by the U.S. Army Environmental Hygiene Agency during the close-out survey of the DORF reactor facility in 1980 (reference 7).

8. Point of contact regarding this memorandum is Mr. David Burton, CPT Arthur Morton or the undersigned at (202) 356-0058.

WILLIAM B. JOHNSON
COL, MS
Chief, Health Physics Office

MCHL-HP
SUBJECT: Data Analysis of Soil, Water and Sludge Samples from the Wastewater Holding Tanks, Bldg. 516, Forest Glen Section

REFERENCES

1. Comprehensive Work Plan, Contract No: DACW31-95-D-0069, D.O. # 0012, Walter Reed Army Medical Center Annex, Forest Glen, Maryland, UST Removals, Building 516, Prepared For: U.S. Army Corps of Engineers, Baltimore District, Prepared By: Waste-Tron of Maryland, Inc., 3922 M. Vero Road, Baltimore, Maryland 21227.

2. Revision I - Report of Data for Analysis of Samples Collected from Walter Reed Army Medical Center Annex, February 24-25, 1999, Forest Glen, Maryland (MIPR9DRAU0942), 23 April 1999, Oak Ridge Institute for Science and Education.

3. Memorandum, U.S. Army Test, Measurement and Diagnostic Equipment Activity, AMSAM-TMD-SB, 29 September 1998, Subject: Analysis of Aqueous and Sludge Samples from Underground Tanks at the Walter Reed Army Medical Center, Forest Glen Annex.

4. Memorandum, U.S. Army Test, Measurement and Diagnostic Equipment Activity, AMSAM-TMD-SB, 8 July 1998, Subject: Analysis of Sludge Samples from Underground Tanks at the Walter Reed Army Medical Center, Forest Glen Annex.

5. Memorandum, U.S. Army Center for Health Promotion and Preventive Medicine, MCHB-TS-OMH, 22 October 1998, Subject: Interpretation of Analysis of Sludge Collected from the DORF Reactor Holding Tank 1687-B-3, 22 June - 23 September 1998.

6. Facsimile, Radioanalysis Report, Waste Tank Liquid/Sludge Samples, WRAMC, Armed Forces Radiobiology Research Institute, 15 September 1998.

7. Radiation Protection Special Study No. 28-42-0982-80, Close-Out Survey of Diamond Ordnance Radiation Facility (DORF), 25-28 February 1980, U.S. Army Environmental Hygiene Agency, HSE-RH/WP, 6 August 1980.

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

P.O. BOX 117
OAK RIDGE, TENNESSEE 37831-0117

FACSIMILE SERVICES

ORISE/ESSAP FAX TELEPHONE NO.
COMM: (423) 241-3497
VERIFY: (423) 576-6348 or Sender

*** UNCLASSIFIED ***
Please Type Or Use Black Pen
Remove All Staples

DATE: _____

FROM: Tim Vitkus

Radiological Survey, Assessments, and Training (RSAT)

TELEPHONE: (423) 576-5073 FAX: (423) 241-3497

****

TO: David Burton ORGANIZATION: HPS Walter Reed

TELEPHONE: (202) 356-0058 OFFICE/LOCATION: _____

FAX: (202) 356-0086 VERIFY: Yes [ ] No [ ]

TELE: _____

THIS TRANSMITTAL CONSISTS OF 7 PAGE(S), EXCLUDING COVER SHEET.
***** (NUMBER PAGES IF 4 OR MORE) *****

COMMENTS

David,

Please read over the text and review the figures to make sure I've addressed your comments. If so, let me know and I'll "officially" distribute the letter. I'll hold onto it until I hear from you

DRAFT

MCHL-HP 9 June 1999

MEMORANDUM FOR Commander, Walter Reed Army Medical Center
Installation, WRAMC, Washington, DC 20307

SUBJECT: Decommissioning of Building 516

1. The Health Physics Office received a copy on 9 June 1999 of a MEDCOM funding request to demolish building 516, Forest Glen Section dated 21 March 1999 (enclosure). We would strongly encourage that this action be revoked.

2. Building 516 is the radiological low level waste storage facility for Walter Reed Army Medical Center. Low level waste is constantly generated by WRAMC, WRAIR, AFIP and now NMRI. Building 516 is an ideal location for storage and processing of this radiological waste since this building used to house a research reactor.

3. The reason cited for the demolition of building 516 was to support the construction of a new installation supply warehouse on the site. The existing installation supply warehouse is programmed to be transferred to the National Park Seminary Historic District in the next couple years. The new warehouse is programmed into the FY 2002 MILCON program.

4. Building 516 has the capacity to store 500 drums of low level radioactive waste, has a radiological fume hood, a vial crusher, drum compactor, and a walk-in freezer to store biological waste. Currently low level radioactive waste for the Department of Defense is taken to one of two burial sites for disposal. These sites could exclude the DOD from radiological waste shipments at any time and building 516 provides the capacity to store waste for 5 to 10 years from this installation in that contingency.

5. When the reactor was decommissioned, some of the low level waste was entombed in the concrete, as well as some of the facility was activated during reactor operations and this material will need to be disposed of as radioactive waste. The Army Reactor Office maintains the permit for the low level activation products and waste entombed in building 516. Any plans to demolish this building must be first coordinated with the Army Reactor Office. Disposal costs for the low level radioactive waste generated from the dismantling of building 516 would be quite significant. The concrete walls surrounding the

Date 30 September 1998

Number of pages including cover sheet 11

U.S. ARMY TEST, MEASUREMENT and DIAGNOSTIC EQUIPMENT ACTIVITY

Project Development & Radiation Research Office
Dr. Ram K. Bhat, Chief
MAILING ADDRESS: US ARMY TMDE ACTIVITY
ATTN: AMSAM-TMD-SB
10115 DUPORTAIL ROAD STE 136
FT. BELVOIR VA 22060-5847

FAX PHONE: (703) 704-2796
DSN: 654-2796

To: David Burton

Phone (202) 356-0062

Fax (202) 356-0086

CC

From: Tim Mikulski

Phone (703) 704-2807

DSN 654-2807

E-mail: rbhat@belvoir.army.mil
tmikulski@belvoir.army.mil
lbender@belvoir.army.mil

REMARKS:

☒ Urgent ☒ For your review ☐ Reply ASAP ☐ Please comment

Mr Burton,

We have completed our studies of the WRAMC soil standards. Please review the report. After much review we feel confident that the levels reported ~30 pCi/g for α is correct. Please call if you have any questions

Thanks
Tim

DEPARTMENT OF THE ARMY
US ARMY TEST, MEASUREMENT AND DIAGNOSTIC EQUIPMENT ACTIVITY
PROJECT DEVELOPMENT AND RADIATION RESEARCH OFFICE
10115 DUPORTAIL ROAD, SUITE 136
FORT BELVOIR, VIRGINIA 22060-5847

REPLY TO ATTENTION OF

AMSAM-TMD-SB (385-11d) 29 September 1998

MEMORANDUM FOR Walter Reed Army Medical Center (WRAMC)

SUBJECT: Analysis of Aqueous and Sludge Samples from Underground Tanks at the Walter Reed Army Medical Center, Forest Glen Annex

1. Reference conversation between Mr. David Burton, WRAMC Radiation Protection Officer, WRAMC Health Physics Office and Mr. Timothy Mikulski, Radiation Protection Officer, Fort Belvoir, 23 Sep 98, concerning the reference subject.

2. The Project Development and Radiation Research Office (PDRRO) sampled three underground tanks that were used at one time to store radioactive materials from the DORF reactor and are currently being utilized for low level radioactive waste storage by WRAMC. A map of the reservoir and a description of how the sampling was performed are provided as Enclosure 1.

3. The aqueous sample report for Tanks 1, 2 and 3 was submitted on 8 May 98. The sludge sample report was submitted on 7 Aug 98. The method used in the 7 Aug 98 report for determining total gross alpha and beta activities involved a mass attenuation curve that was established by the PDRRO lab using NIST traceable standards and Tennelec LB5100 software. As a result of the reference conversation dated 23 Sep 98, the Tank 1, 2 and 3 sludge samples were reanalyzed using two additional methods.

4. The first method used a generic protocol, using deep dish planchets and approximately two gram sludge samples that provided results in counts per minute. NIST traceable standards and EPA spiked filter paper standards were analyzed along with the sludge samples and all had the same geometry. In this method no mass attenuation curve was applied. The quality assurance check of the NIST traceable standards and the EPA spiked filter paper samples in the deep dish planchets is provided as Enclosure 2.

5. The second method also used a generic protocol but differed from the first in that the analysis was performed using shallow dish planchets and approximately 0.4 gram sludge samples. As a result, the detector distance from each sample and standard was shorter than in the first method. EPA spiked filter paper

SUBJECT: Analysis of Aqueous and Sludge Samples from Underground Tanks at the Walter Reed Army Medical Center, Forest Glen Annex

standards were analyzed with the samples. Both the EPA spiked filter paper standards and the soil samples had the same geometry. The quality assurance check of the EPA filter paper method is provided as Enclosure 3.

6. The results of the 8 May 98 (aqueous solution), the 7 Aug 98 (sludge with the mass attenuation protocol) and the 29 Sep 98 (deep dish with NIST standards and the shallow dish with EPA spiked samples) analyses are provided as Enclosure 4. The aqueous samples from the 8 May 98 analysis was sent to the U.S. Army Center for Health Promotion and Preventative Medicine (CHPPM) laboratory for additional analysis. The results of the CHPPM analysis are also provided in Enclosure 4.

7. The POC for this action is the undersigned at DSN 654-1979/2807, commercial (703) 704-1979/2807, FAX (703) 704-2796/DSN 654-2796, e-mail rbhat@belvoir.army.mil.

FOR THE DIRECTOR:

RKBhat

4 Encls

RAMACHANDRA K. BHAT, Ph.D.
Chief, Project Development
and Radiation Research Office
USATA, MICOM

CF:
AMSAM-TMD-D (Chen)
AMCSF-P (Manfre)

ENCLOSURE 1, METHOD OF SAMPLING THE AQUEOUS SOLUTION AND SLUDGE FROM THE UNDERGROUND TANKS AT WRAMC

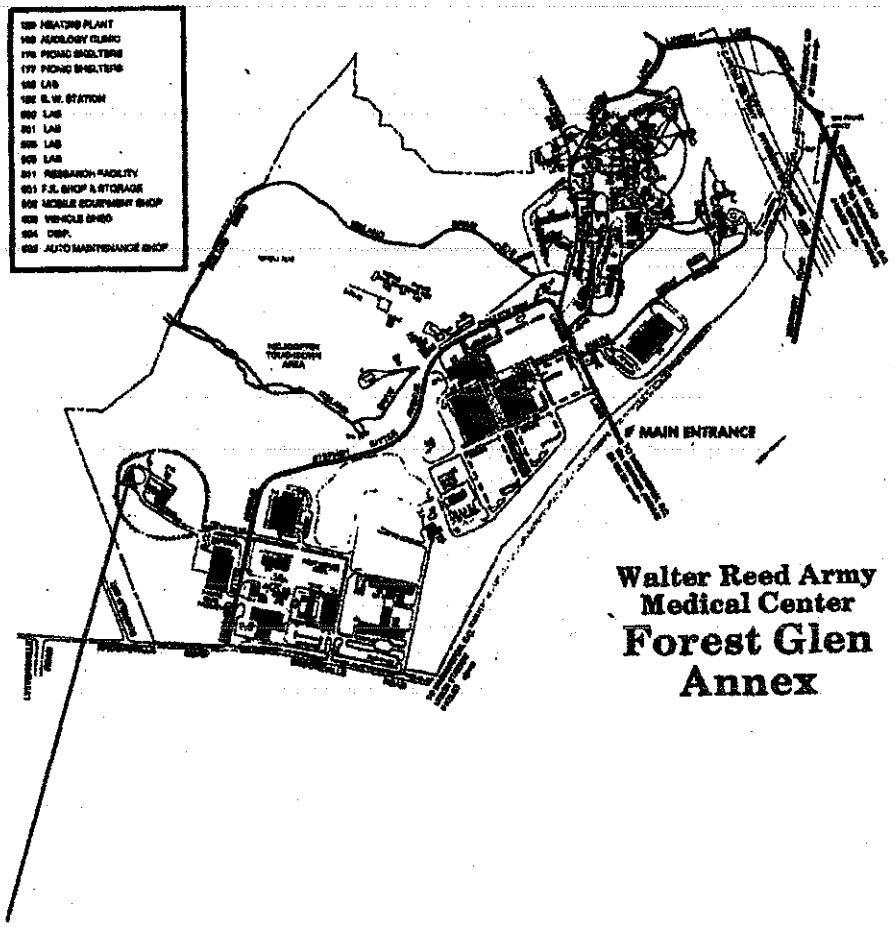
1. There are three underground tanks located on the WRAMC Forest Glen campus next to the DORF reactor Building 516. The tanks are located on the map see Fig 1. A sketch of the underground tanks is given as Fig 2.

2. The PDRRO assembled a unit designed to extract the water and sludge via the sampling tube. The unit is a fifteen meter rubber tube connected to an Erlenmeyer flask connected to a vacuum pump. The pump is powered by a portable generator. The entire unit is drawn in Fig. 3. When the flask was full the pump was turned off and the sludge and aqueous solution were sampled using a radiac meter to see the radioactivity of the samples. The samples were near background levels. The aqueous solution was transferred to Marinelli beakers and the sludge samples were transferred to metal buckets.

3. The samples were labeled and again checked with the radiac meter. The aqueous samples in the Marinelli beakers were sealed and returned to the laboratory for analysis. The sludge samples were let sit overnight at the DORF reactor facility. The aqueous material was skimmed off the top leaving the sludge that settled out at the bottom of the bucket. The metal buckets were sealed and transported to the PDRRO laboratory for analysis.

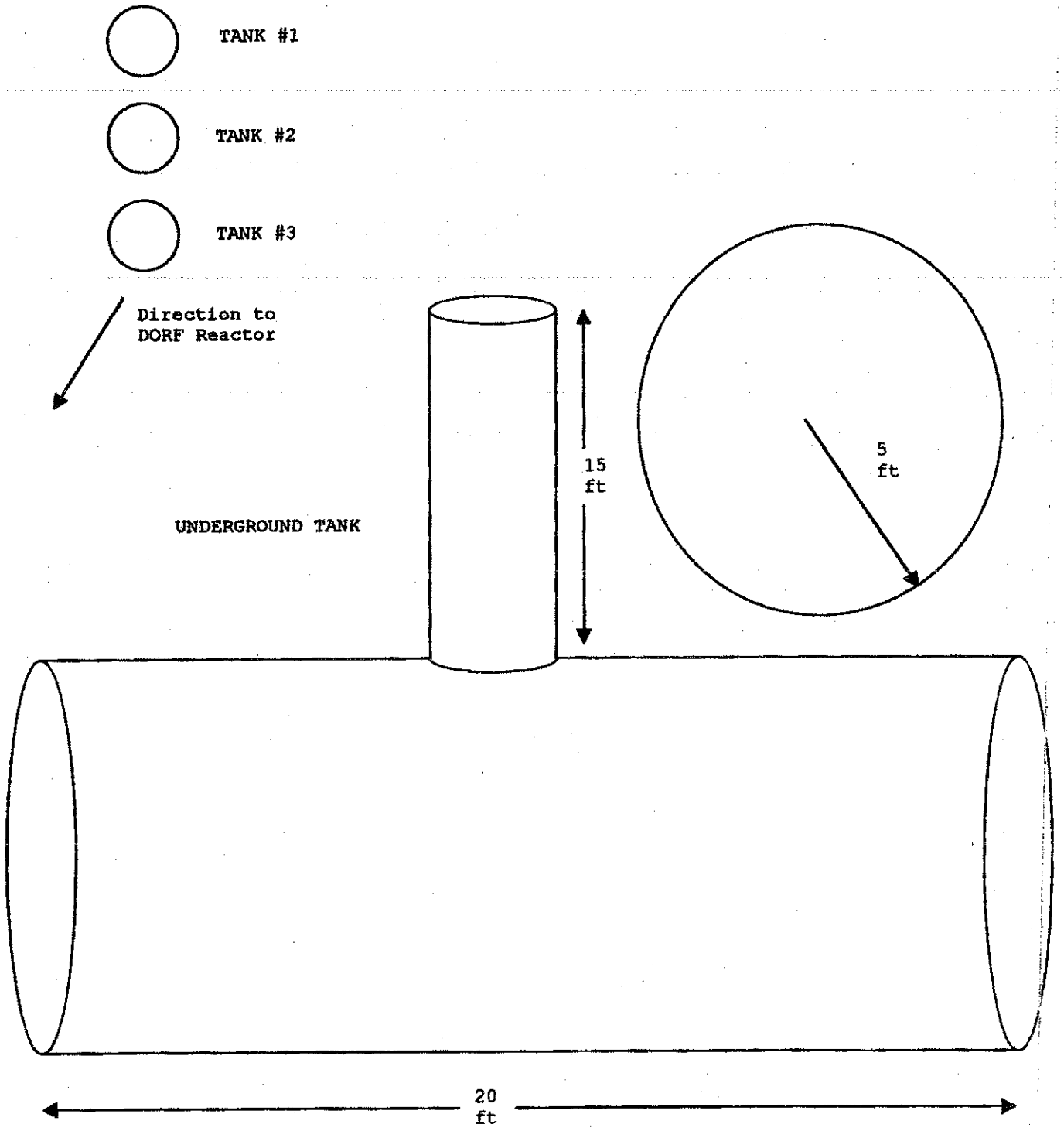
4. The slurry containing the sludge was evaporated to dryness and then the sample aliquot was taken for further analysis.

FIGURE 1 MAP OF WALTER REED ARMY MEDICAL CENTER (WRAMC), FOREST GLEN ANNEX



Location of the Three
Under Ground Tanks

FIGURE 2 UNDERGROUND TANKS AT WRAMC



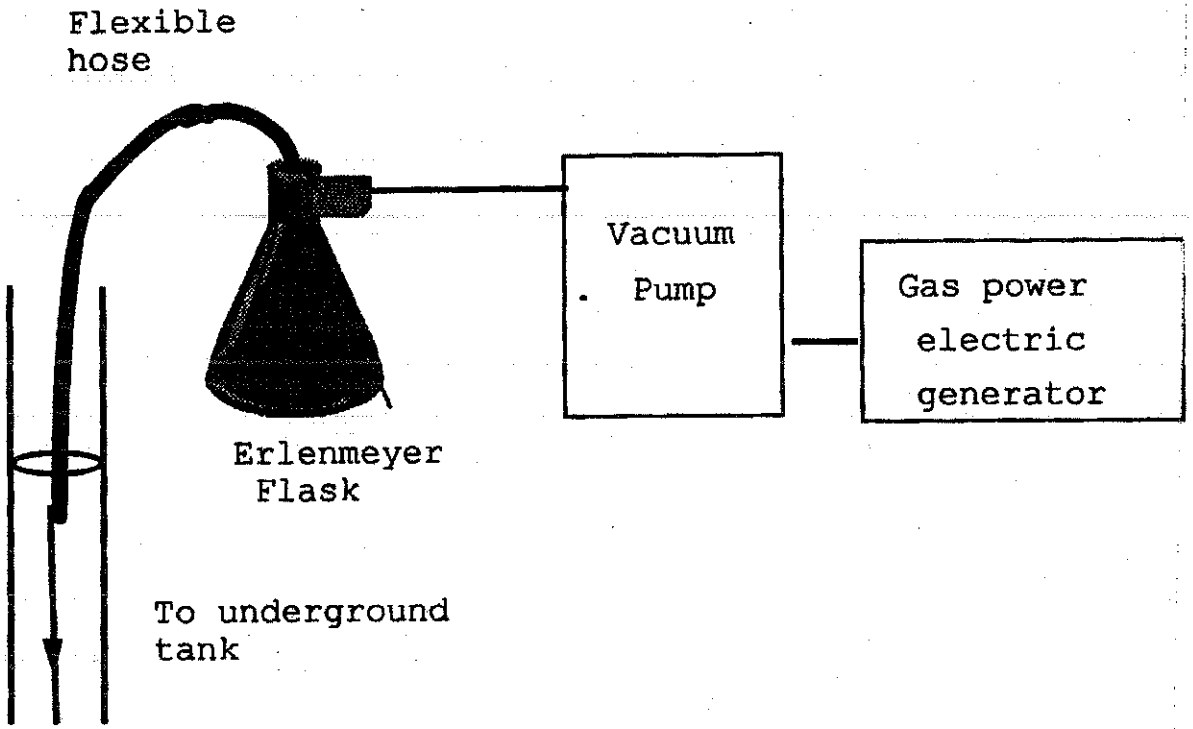
ENCLOSURE 2, QUALTIY ASSURANCE OF THE LB5100 GAS PROPORTIONAL FOR THE NIST TRACABLE STANDARD METHOD ON DEEP DISH PLANCHETS

1. NIST traceable Po-210 and Sr-90 standards and EPA cross check samples were run in deep dish planchets to check the accuracy of the gas proportional counter at high and low levels of alpha and beta activity. Alpha and beta efficiencies were 33% and 45%, respectively, as established during instrument calibration.

ALPHA ACTIVITY					
CARRIER NUMBER	ANL #	DESCRIPTION	KNOWN ACTIVITY (pCi)	ACTUAL ACTIVITY (pCi)	% ERROR
15	1405	NIST TRACEABLE Po-210 STANDARD	559	543	3%
8	1532-A1	EPA CROSS CHECK SAMPLE A1	19	17	11%
9	1532-A2	EPA CROSS CHECK SAMPLE A2	19	19	0%
10	1532-A3	EPA CROSS CHECK SAMPLE A3	19	17	11%
BETA ACTIVITY					
CARRIER NUMBER	ANL #	DESCRIPTION	KNOWN ACTIVITY (pCi)	ACTUAL ACTIVITY (pCi)	% ERROR
7	ΔR589	NIST TRACEABLE Sr/Y-90 STANDARD	17,973	17,984	0%
8	1532-A1	EPA CROSS CHECK SAMPLE A1	42	38	10%
9	1532-A2	EPA CROSS CHECK SAMPLE A2	42	39	7%
10	1532-A3	EPA CROSS CHECK SAMPLE A3	42	37	12%

The system performance check is considered successful when the sample results are within 25% of the known values.

FIGURE 3 SAMPLE EXTRACTION APPRARTUS



ENCLOSURE 3, QUALTIY ASSURANCE OF THE LB5100 GAS PROPORTIONAL FOR THE EPA SPIKED AIR FILTER METHOD ON SHALLOW DISH PLANCHETS

1. EPA cross check samples was run in shallow dish planchets to check the accuracy of the gas proportional counter at low levels of alpha and beta activity. Alpha and beta efficiencies were 33% and 45%, respectively, as established during instrument calibration.

ALPHA ACTIVITY					
CARRIER NUMBER	ANL #	DESCRIPTION	KNOWN ACTIVITY (pCi)	ACTUAL ACTIVITY (pCi)	% ERROR
8	1562-C1	EPA CROSS CHECK SAMPLE A1	35	39	11%
9	1562-C1	EPA CROSS CHECK SAMPLE A2	35	37	6%
10	1562-C1	EPA CROSS CHECK SAMPLE A3	35	40	14%
BETA ACTIVITY					
CARRIER NUMBER	ANL #	DESCRIPTION	KNOWN ACTIVITY (pCi)	ACTUAL ACTIVITY (pCi)	% ERROR
8	1562-C1	EPA CROSS CHECK SAMPLE A1	51	62	22%
9	1562-C1	EPA CROSS CHECK SAMPLE A2	51	63	24%
10	1562-C1	EPA CROSS CHECK SAMPLE A3	51	58	14%

The system performance check is considered successful when the sample results are within 25% of the known values.

ENCLOSURE 4, ANALYSIS OF AQUEOUS AND SLUDGE SAMPLES FROM UNDERGROUND TANKS AT THE WALTER REED ARMY MEDICAL CENTER, FOREST GLEN ANNEX

	Alpha α		Beta β		Tritium H-3		Gamma γ	
	pCi/L Aqueous	pCi/g Sludge	pCi/L Aqueous	pCi/g Sludge	pCi/L Aqueous	pCi/g Sludge	pCi/L Aqueous	pCi/g Sludge
Tank #1 Sample #1	<MDA	<MDA	<MDA	<MDA	15,000		<MDA	<MDA
Sample #2	<MDA		<MDA		15,000		<MDA	
CHPPM					13,900			
Tank #2 Sample #1	<MDA	<MDA	<MDA	<MDA	25,000		<MDA	<MDA
Sample #2	<MDA		<MDA		26,000		<MDA	
CHPPM					20,200			
Tank #3 Sample #1	40	30* 10** 30***	2000	300* 300** 800***	210,000		see next chart	
Sample #2	200		5000		300,000		see next chart	
CHPPM					170,000			

* = Mass attenuation program with deep dish planchet - 2g sample
** = Generic program with deep dish planchet - no mass attenuation correction - 2g sample
*** = Shallow dish planchet with EPA spiked air filter standards - 0.4g sample

ENCLOSURE 4, ANALYSIS OF AQUEOUS AND SLUDGE SAMPLES FROM UNDERGROUND TANKS AT THE WALTER REED ARMY MEDICAL CENTER, FOREST GLEN ANNEX

		Gamma γ			
		pCi/L		PCi/g	
		Aqueous		Sludge	
		Co-57	Cr-51	Co-57	Cr-51
Tank #3	Sample #1	<MDA	3,000	3	200
	Sample #2	20	1,000		
	CHPPM Filtered	3	710		
	CHPPM Unfiltered	11	5600		

DEPARTMENT OF THE ARMY
US ARMY TEST, MEASUREMENT AND DIAGNOSTIC EQUIPMENT ACTIVITY
PROJECT DEVELOPMENT AND RADIATION RESEARCH OFFICE
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FORT BELVOIR, VIRGINIA 22060-5847

REPLY TO ATTENTION OF

AMSAM-TMD-SB (385-11d) 8 July 1998

MEMORANDUM FOR Walter Reed Army Medical Center (WRAMC)

SUBJECT: Analysis of Sludge Samples from Underground Tanks at the Walter Reed Army Medical Center, Forest Glen Annex

1. Reference conversation between Walter Brooks, WRAMC Environmental Office and Mr. Timothy Mikulski, Radiation Protection Officer, Fort Belvoir, 2 June 1998, concerning the reference subject.

2. The Project Development and Radiation Research Office (PDRRO) sampled three underground tanks that were used at one time to store radioactive materials from the DORF reactor and are currently being utilized for low level radioactive waste storage by WRAMC. A map of the reservoir and a description of how the sampling was performed are provided as Enclosure 1.

3. The sludge samples were collected in metal buckets. The buckets were transported back to the laboratory. The samples in the buckets were evaporated to dryness under the fume hoods at the PDRRO laboratory.

4. The dried sludge samples were transferred to 0.5 liter Marinelli beakers and each was counted for 12 hours on the Canberra Gamma Spectroscopy System. The results of the gamma analysis, sample MDAs and detector quality assurance data using mixed gamma NIST traceable standards are provided as Encl. 2.

5. Two grams of each sample were placed into metal deep dish planchets. Each sample planchet was counted for 30 minutes on the Tennelec LB5100 Low Level Alpha Beta Gas Proportional Counter. The results of the gas proportional analysis, sample MDAs and detector quality assurance data using alpha and beta NIST traceable standards and EPA environmental cross-check samples are provided as Encl. 3.

6. One gram of each sample was transferred to liquid scintillation vials and 10 mL of cocktail was added to each sample. Each sample vial was counted on the Wallac 1411 Liquid Scintillation Counter for 30 minutes. The results of the liquid scintillation analysis, sample MDAs and detector quality

AMSAM-TMD-SB (385-11d) 8 July 1998
SUBJECT: Analysis of Sludge Samples from Underground Tanks at the Walter Reed Army Medical Center, Forest Glen Annex

assurance data using NIST traceable standards are provided as Encl. 4.

7. Only trace levels of activity were detected in the sludge samples. The combined results of all analyses are provided as Encl. 5.

8. The POC for this action is the undersigned at DSN 654-1979/2807, commercial (703) 704-1979/2807, FAX (703) 704-2796/DSN 654-2796, e-mail rbhat@belvoir.army.mil.

FOR THE DIRECTOR:

5 Encls

RAMACHANDRA K. BHAT, Ph.D.
Chief, Project Development
and Radiation Research Office
USATA, MICOM

CF:
AMSAM-TMD-D (Chen)
AMCSF-P (Manfre)

ENCLOSURE 1, METHOD OF SAMPLING THE WATER FROM THE UNDERGROUND TANKS AT WRAMC

1. There are three underground tanks located on the WRAMC Forest Glen campus next to the DORF reactor Building 516. The tanks are located on the map see Fig 1. A sketch of the underground tanks is given as Fig 2.

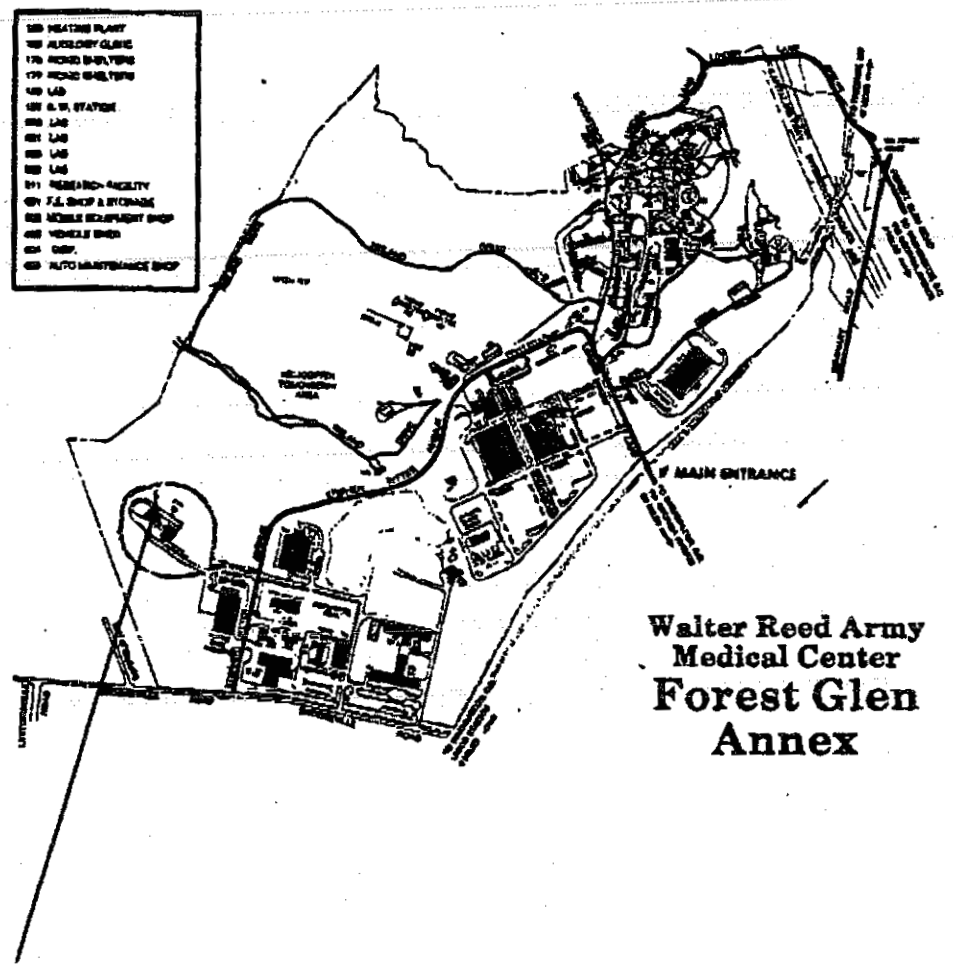
2. The PDRRO assembled a unit designed to extract the water via the sampling tube. The unit is a fifteen meter rubber tube connected to an Erlenmeyer flask connected to a vacuum pump. The pump is powered by a portable generator. The entire unit is drawn in Fig. 3. When the flask was full the pump was turned off and the sludge and aqueous material were sampled using a radiac meter to see the radioactivity of the samples. The samples were near background levels so the samples were transferred to metal buckets.

3. The samples were labeled and again checked with the radiac meter. The samples were let sit overnight at the DORF reactor facility. The aqueous material was skimmed off the top leaving the sludge that settled out at the bottom of the bucket. The metal buckets were sealed and transported to the PDRRO laboratory for analysis.

4. The samples were given the analysis number ANL 1687-B and the samples are identified as below.

ANL 1687-B-0	Background soil collected near the PDRRO laboratory.
ANL 1687-B-1	Sludge Sample of Tank #1
ANL 1687-B-2	Sludge Sample of Tank #2
ANL 1687-B-3	Sludge Sample of Tank #3

FIGURE 1 MAP OF WALTER REED ARMY MEDICAL CENTER (WRAMC), FOREST GLEN ANNEX



Location of the Three
Under Ground Tanks

FIGURE 2 UNDERGROUND TANKS AT WRAMC

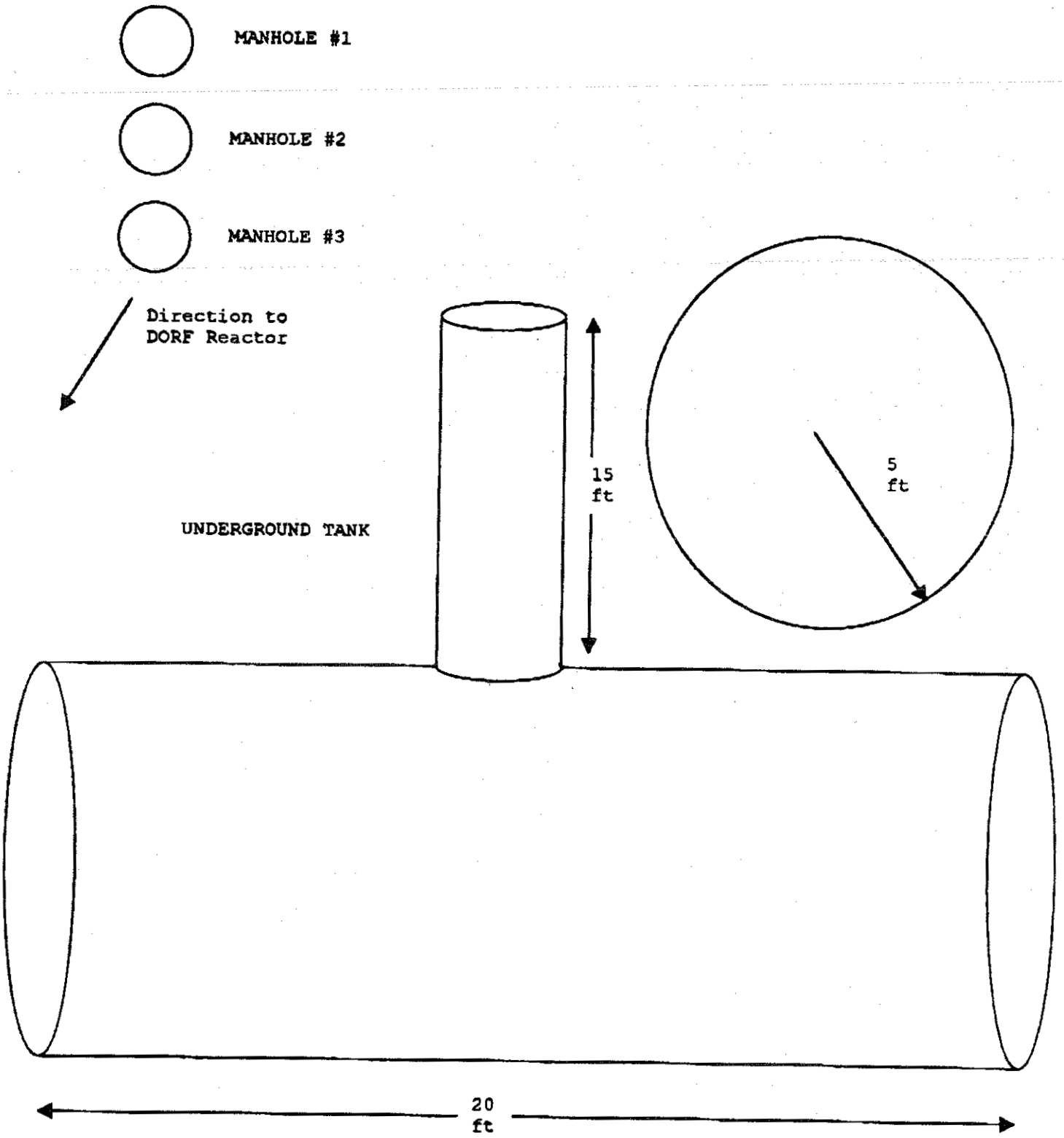
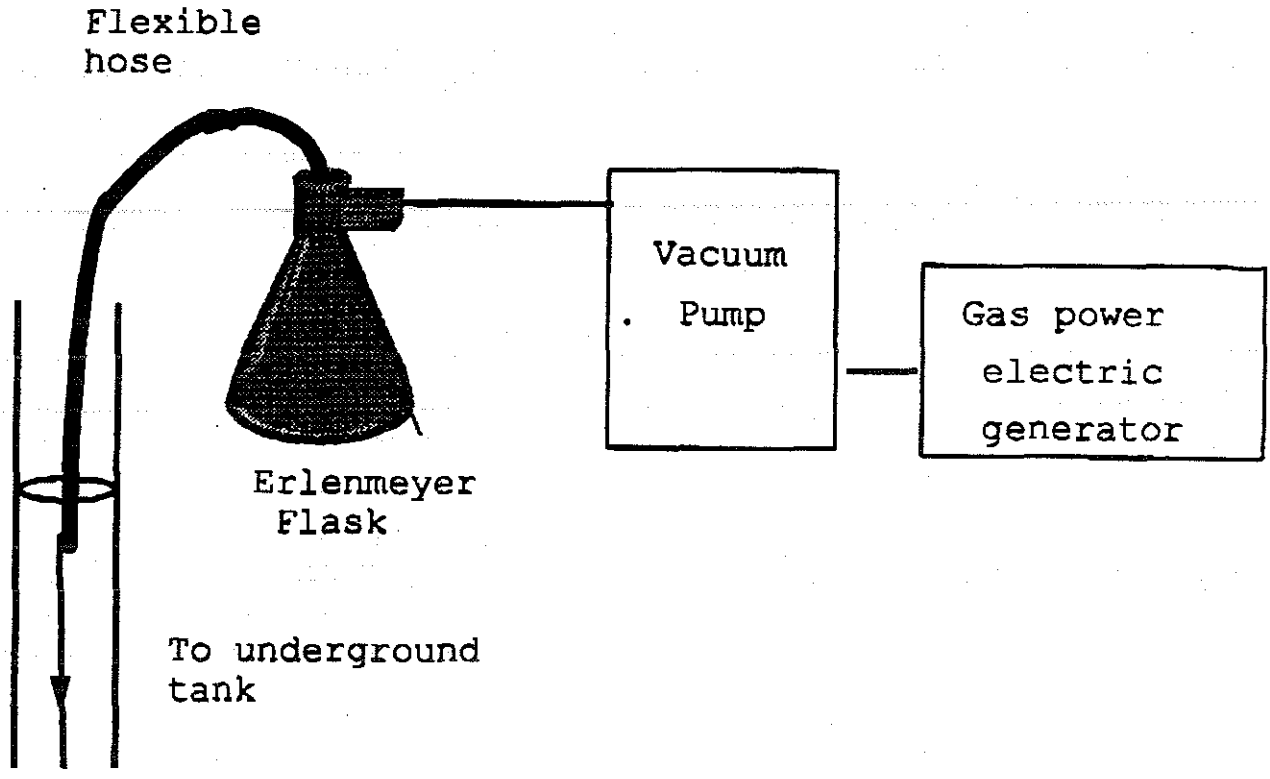


FIGURE 3 SAMPLE EXTRACTION APPRARTUS



ENCLOSURE 2, CANBERRA GAMMA SPECTROSCOPY SYSTEM RESULTS RESULTS OF WRAMC UNDERGROUND TANKS

1. The sludge samples were transferred to a 0.5 liter Marinelli beaker and counted for 12 hours on the Canberra Gamma Spectroscopy Systems.

2. The results of the samples and the MDA determined by the Sampo 90 software package are given below:

RESULTS OF THE MIXED GAMMA SURVEY - CANBERRA

ANL #	DESCRIPTION	Cr-51 ACTIVITY (pCi/g)	Co-57 ACTIVITY (pCi/g)	Co-60 ACTIVITY (pCi/g)	Cs-137 ACTIVITY (pCi/g)
1687-B-1	WRAMC Tank 1	200 ± 5%	3 ± 4%	0.1 ± 9%	0.2 ± 10%
1687-B-2	WRAMC Tank 2	< MDA	< MDA	0.1 ± 15%	0.3 ± 13%
1687-B-3	WRAMC Tank 3	< MDA	< MDA	0.1 ± 8%	0.2 ± 8%
	MDA	0.9	0.1	0.09	0.09

SYSTEM PERFORMANCE CHECK OF THE CANBERRA

3. The performance check of the system was done by analyzing an NIST traceable Amersham 0.5 liter mixed gamma standard.

AMERSHAM MIXED GAMMA STANDARD ANL# 1606(1 Nov 95) - CANBERRA

NUCLIDE	KNOWN ACTIVITY (mCi)	ACTUAL ACTIVITY (mCi)	PERCENT ERROR
Co-57	0.01495	0.0152	2%
Co-60	0.08919	0.0895	0%
Cd-109	0.41892	0.4295	3%
Cs-137	0.08216	0.0825	0%

The system performance check is considered successful when the sample results are within 25% of the known values.

ENCLOSURE 3, LB5100 GAS PROPORTIONAL COUNTER RESULTS
RESULTS OF TOTAL ALPHA AND BETA ACTIVITY

1. Two grams of the WRAMC tank sludge samples were placed onto planchets and counted for 30 minutes on the LB5100 Gas Proportional Counter (GPC) to detect the amount of alpha and beta activity in the samples.

ALPHA ACTIVITY

2. A Po-210 standard is used to determine the alpha efficiency of the GPC. The GPC alpha efficiency is 34%.

RESULTS OF TOTAL ALPHA ACTIVITY BY LB5100 GPC

ANL #	DESCRIPTION	ACTIVITY (pCi/g)	MDA (pCi/g)
1687-B-0	WRAMC Background	< MDA	0.3
1687-B-1	WRAMC Tank 1	30 ± 5	0.3
1687-B-2	WRAMC Tank 2	< MDA	0.3
1687-B-3	WRAMC Tank 3	< MDA	0.3

BETA ACTIVITY

3. A Sr/Y-90 standard is used to determine the beta efficiency of the GPC. The GPC beta efficiency is 45%.

RESULTS OF TOTAL BETA ACTIVITY BY LB5100 GPC

ANL #	DESCRIPTION	ACTIVITY (pCi/g)	MDA (pCi/g)
1687-B-0	WRAMC Background	< MDA	0.5
1687-B-1	WRAMC Tank 1	300 ± 30	0.5
1687-B-2	WRAMC Tank 2	< MDA	0.5
1687-B-3	WRAMC Tank 3	< MDA	0.5

MINIMUM DETECTABLE ACTIVITY - LB5100 GPC

4. The determination of the Minimum Detectable Activity (MDA) from NUREG/CR-5849 is:

$$MDA = \frac{2.71 + 4.65(B_R * t)^{\frac{1}{2}}}{t * E * S * Y * 2.22}$$

where:

- MDA = activity in pCi/g
- B_R = background rate in counts/minute
- t = counting time in minutes
- E = detector efficiency in counts/disintegration (efficiency using NIST Sr/Y-90 standard)
- S = sample size in g
- Y = other factors such as percent chemical recovery and number of emissions per disintegration of the radionuclide (assume Y = 1)
- 2.22 = conversion from disintegrations/minute to pCi

MDA of Alpha Activity:
Determination of MDA using the Project Development and Radiation Research Office alpha background of 0.2 cpm.

$$MDA_\alpha = \frac{2.71 + 4.65(0.2 \text{ cpm} * 30 \text{ min})^{\frac{1}{2}}}{30 \text{ min} * 0.34 * 2g * 1 * 2.22}$$

$MDA_\alpha = 0.31$ pCi/g $\approx$ 0.3 pCi/g

MDA of Beta Activity:
Determination of MDA using the Project Development and Radiation Research Office beta background of 1.2 cpm.

$$MDA_\beta = \frac{2.71 + 4.65(1.2 \text{ cpm} * 30 \text{ min})^{\frac{1}{2}}}{30 \text{ min} * 0.45 * 2g * 1 * 2.22}$$

$MDA_\beta = 0.51$ pCi/g $\approx$ 0.5 pCi/g

ENCLOSURE 4 DETERMINATION OF TRITIUM (H-3) USING THE WALLAC 1411 LIQUID SCINTILLATION COUNTER

1. One gram samples of the WRAMC sludge samples were transferred to glass liquid scintillation vials that contained 10 mL of Atomlight liquid scintillation cocktail. The outside of the vials were cleaned with isopropyl alcohol and then counted on the Wallac 1411 Liquid Scintillation Counter for 30 minutes the results are given below.

2. A system performance check of the LSC was done using NIST traceable standards. The results given below were within acceptable laboratory limits.

3. The Minimum Detectable Activity (MDA) of the LSC is

LSC Tritium MDA = 5 pCi/g.

4. The LSC test was inconclusive because of the high quench of the samples.

RESULTS OF BUILDING 358 WATER SAMPLING WALLAC 1411 LIQUID SCINTILLATION COUNTER

The LSC was run to determine the levels of Tritium (H-3)

ANL #	DESCRIPTION	H-3 ACTIVITY (pCi/g)	MDA (pCi/g)
1687-B-0	WRAMC Background	< MDA	5
1687-B-1	WRAMC Tank 1	ND	5
1687-B-2	WRAMC Tank 2	ND	5
1687-B-3	WRAMC Tank 3	ND	5

ND ≡ Not detected due to high quench of the samples.

SYSTEM PERFORMANCE CHECK OF THE WALLAC 1411 LSC

1. The performance check of the LSC using H-3 NIST traceable standards is as follows:

ANL #	Description	Known Activity (pCi)	Measured Activity (pCi)	% Error
1470-C-3	H-3 STD #3	156,067	155,164	1%
1470-C-7	H-3 STD #7	156,067	152,823	2%

The system performance check is considered successful when the sample results are within 25% of the known values.

Encl. 4c

DETERMINATION OF THE MINIMUM DETECTABLE ACTIVITY (MDA)

1. MDA for the Liquid Scintillation Counter:
The determination of the Minimum Detectable Activity (MDA) from NUREG/CR-5849 is:

$$MDA = \frac{2.71 + 4.65(B_R * t)^{\frac{1}{2}}}{t * E * S * Y * 2.22X10^6}$$

where:

MDA = activity in µCi/ml
B_R = background rate in counts/minute
t = counting time in minutes
E = detector efficiency in counts/disintegration (efficiency using NIST traceable standards)
S = sample size in ml
Y = other factors such as percent chemical recovery and number of emissions per disintegration of the radionuclide (assume Y = 1)
2.22 = conversion from disintegrations/minute to pCi

a. MDA of LSC for Tritium:
Determination of MDA and using the Project Development and Radiation Research Office background of 10.9 cpm for tritium with an efficiency of 26%.

$$MDA_{LSC} = \frac{2.71 + 4.65(10.9 \text{ cpm} * 30 \text{ min})^{\frac{1}{2}}}{30 \text{ min} * .26 * 1 \text{ g} * 1 * 2.22 \text{ dpm/pCi}}$$

MDA_{LSC} = 5 pCi/g

Encl. 4[D]

ENCLOSURE 5 ANALYSIS OF WRAMC UNDERGROUND TANKS ANL 1687

Analysis Number	LSC (pCi/g)	GPC (pCi/g)	GPC (pCi/g)	Gamma Spectroscopy (pCi/g)			
1687	H-3	Alpha	Beta	Cr-51	Co-57	Co-60	Cs-137
B-0 Background	< MDA	< MDA	< MDA	< MDA	< MDA	< MDA	< MDA
B-1 Tank 1	ND	30 ± 5	300 ± 30	200 ± 5%	3 ± 4%	0.1 ± 9%	0.2 ± 10%
B-2 Tank 2	ND	< MDA	< MDA	< MDA	< MDA	0.1 ± 15%	0.3 ± 13%
B-3 Tank 3	ND	< MDA	< MDA	< MDA	< MDA	0.1 ± 8%	0.2 ± 8%

MDA_{LSC} = 5 pCi/g

$MDA_{GPC\alpha}$ = 0.3 pCi/g $MDA_{GPC\beta}$ = 0.5 pCi/g

Co-57 $MDA_{\lambda Spec}$ = 0.1 pCi/g Cr-51 $MDA_{\lambda Spec}$ = 0.9 pCi/g Co-60 $MDA_{\lambda Spec}$ = 0.09 pCi/g
Cs-137 $MDA_{\lambda Spec}$ = 0.09 pCi/g

ND ≡ Not Detected

MDA ≡ Minimum Detectable Activity

Encl. 5

USACHPPM
Readiness thru Health

U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE

MEDICAL HEALTH PHYSICS PROGRAM

FACSIMILE TRANSMITTAL SHEET

TO: MR. Burton / CPT. Morten	DATE AND TIME: 28 Oct 98
OFFICE OR DEPARTMENT: Health Physics	ORGANIZATION: WRAMC
FAX NUMBER: 202-356-0086	PHONE NUMBER: 202-356-0058
FROM: John Collins	SENDER'S PHONE NUMBER: 410-436-7155
NUMBER OF PAGES: 14	CLASSIFICATION: ———

☐ URGENT ☐ FOR REVIEW ☐ PLEASE COMMENT ☐ PLEASE REPLY ☒ AS REQUESTED

NOTES/COMMENTS:

Attached is the interpretation of sludge analyzed by the USACHPPM Laboratory. An electronic copy was sent to your office on 23 Oct. 98. If you have any further comments or questions, please let me know.

John

ATTENTION!
DO NOT PROCESS, STORE, OR TRANSMIT CLASSIFIED INFORMATION ON UNSECURED TELECOMMUNICATIONS SYSTEMS. OFFICIAL DOD TELECOMMUNICATIONS SYSTEMS, INCLUDING FACSIMILE MACHINES, ARE SUBJECT TO MONITORING FOR TELECOMMUNICATIONS SECURITY PURPOSES AT ALL TIMES. USE OF THIS SYSTEM CONSTITUTES CONSENT TO TELECOMMUNICATIONS SECURITY MONITORING.

USACHPPM
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ABERDEEN PROVING GROUND, MARYLAND 21010-5422

PHONE: 410.436.3548 OR DSN 584.3548
FAX: 410.436.8263 OR DSN 584.8263

John C.

DEPARTMENT OF THE ARMY
U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND, MARYLAND 21010-5422

REPLY TO ATTENTION OF

MCHB-TS-OMH (40) 22 October 1998

MEMORANDUM FOR Commander, Walter Reed Army Medical Center, ATTN: MCHLP-HP, Washington, D.C. 20307-5001

SUBJECT: Interpretation of Analysis of Sludge Collected From the DORF Reactor Holding Tank 1687-B-3, 22 June - 23 September 1998

1. REFERENCES.

a. Eisenbud, M., and T. Gesell. Environmental Radioactivity from Natural, Industrial, and Military Sources. Fourth edition. New York, NY: Academic Press; 1997:134-200.

b. Taylor, J.R. An Introduction to Error Analysis - The Study of Uncertainties in Physical Measurements. Mill Valley, CA: Oxford University Press; 1982:150.

RC

2. KEYWORDS. Sludge, Underground Tank, Gross Alpha, Uranium, Thorium, Radium.

3. SCOPE. The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) received a request from the Walter Reed Army Medical Center (WRAMC) Health Physics Office to perform radiochemical analysis on a sludge sample collected from an underground tank located under the former DORF reactor at the WRAMC Forest Glen Annex. The USACHPPM was further requested to provide an explanation of the laboratory analysis of the sludge.

4. PURPOSE. The purpose of analyzing the sludge sample from the underground tank 1687-B-3 was twofold:

a. To determine if elevated gross alpha activity was present in the sludge sample.

b. To determine which radionuclides contribute to the gross alpha activity.

MCHB-TS-OMH
SUBJECT: Interpretation of Analysis of Sludge Collected From the DORF Reactor Holding Tank 1687-B-3, 22 June - 23 September 1998

$$1.96\sigma = 1.96 * \sqrt{\frac{(A_1 - \bar{A})^2 + (A_2 - \bar{A})^2 + (A_3 - \bar{A})^2}{2}}$$

(c) If all uncertainties are equal, then the weighted mean calculated in paragraph (a) is the same as the mean value calculated in paragraph (b) above.

(4) The sample's weighted mean alpha activity ± 1.96σ was calculated to be 6.1 ± 2.6 pCi/g. The sample's mean uranium concentration ± 1.96σ was calculated to be 0.26 ± 0.03 µg/g. The sample's mean thorium concentration ± 1.96σ was calculated 0.14 ± 0.01 µg/g. The sample's weighted mean Ra-226 activity was calculated to be 0.59 ± 0.04 pCi/g.

b. The U.S. average radionuclide soil concentration of uranium-238 (U-238) is approximately 1.8 µg/g, and the average soil concentration of thorium-232 (Th-232) is 9 µg/g. The Ra-226 activity in soil is usually in secular equilibrium with U-238 (this is especially true in undisturbed soil) (Eisenbud and Gessell, 1997).

c. Interpretation of laboratory data. The USACHPPM Medical Health Physics and Industrial & Environmental Health Physics Programs reviewed the laboratory data for the sludge sample. Several comparisons between the various laboratory results were made and are discussed below. The following assumptions were made concerning the isotopic abundance in natural uranium and natural: Natural uranium contains the isotopes of U-238 (99.2745%), U-234 (0.0055%), and U-235 (0.72%); and natural thorium is 100% thorium-232 (Th-232).

(1) The weighted mean Ra-226 activity was compared to an U-238 activity that was calculated from the mean uranium concentration. The uranium was assumed to be natural uranium. The calculated U-238 mean ± 1.96σ was 0.088 ± 0.02 pCi/g. Assuming equilibrium has been reached with U-238 and its progeny, the U-238 activity should be approximately equal to the

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Report ID: RA6015v1 Page: 1 of 1
Report Seq #: 369716 Run Date: 01-Oct-98 15:07
Date Sent: 1 Oct 98

TRANSFER OF RESULTS RECEIPT

U.S. ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
DIRECTORATE OF LABORATORY SCIENCES
ATTN: MCHB-TS-LID (SAMPLE MANAGEMENT LABORATORY), Bldg E2100
ABERDEEN PROVING GROUNDS, MD 21010-5422

(LIMS Generated by REPORT2)

Project Officer: JOHN COLLINSI
USACHPPM, MHPP
ATTN: MCHB-TS-OMH
BLDG E5158
APG-EA, MD 21010

INSTALLATION: WALTER REED
DLS JOB: 8B0702
PROJECT NUMBER: 79-21-1236
LAB REPORTING: RAD

DLS SAMPLES REPORTED: P2121
NUMBER OF SAMPLES: 1
ANALYSIS REPORTED: Gross alpha, Radium, Uranium, Thorium

LAB REMARKS: _____

Please sign and return the attached Results Receipt to the Sample Management Laboratory. Agency carbon copy on file.

Signature of Receipt _____ Date _____ Title _____

CUSTOMER REMARKS: _____

MCHB-TS-OMH
SUBJECT: Interpretation of Analysis of Sludge Collected From the DORF Reactor Holding Tank 1687-B-3, 22 June - 23 September 1998

U.S. Army Center for Health Promotion and Preventive Medicine

USCHPPM

01 OCT 1998

DIRECTORATE OF LABORATORY SCIENCES (DLS)
FINAL ANALYTICAL REPORT
PROJECT NO. 79-21-1236
REPORT SERIAL NO. 369089
DLS JOB ID. 8B0702
PROJECT SITE: WALTER REED AMC

30-Sep-98

Readiness Thru Health

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SUBJECT: Interpretation of Analysis of Sludge Collected From the DORF Reactor Holding Tank 1687-B-3, 22 June - 23 September 1998

DLS Final Analytical Report, WALTER REED AMC

Project No. 79-21-1236, DLS JOB ID 8B0702, Report Serial No. 369089, 9/30/98

CASE NARRATIVE

1. Provided are results of analyzing one soil sample, 1687-B-3 (laboratory number P2121), for gross alpha concentration, total uranium and thorium concentration by inductively coupled plasma mass spectrometry (ICP-MS) analysis, and radium-226 concentration. The sample was analyzed in triplicate for all parameters by this laboratory as an indication of sample inhomogeneity. All replicate results will be reported appropriately.

2. A qualitative gamma spectral analysis was performed on the sample with a high purity n-type germanium detector to help identify the unknown alpha/gamma emmiters present in the sample based upon identification of gamma emmitting isotopes. The suspected alpha emmiters were identified as uranium, thorium, and radium-226.

3. An aliquot of sample was dried at 105 degrees Celsius for twenty-four (24) hours to remove all free pore water from the sample and ensure stable aliquot weights. This aliquot was ground in a mortar and pestle to ensure homogenization of the sample. All subsequent analyses were done on portions of this original processed aliquot.

4. Three replicate sample aliquots, and two internal standardization standards from the dried aliquot were placed on planchet for analysis but not ashed. The gross alpha concentration was calculated using an internal standardization method to compensate for sample matrix effects. A sample aliquot was measured and a known quantity of thorium-230 standard was added to it to calculate the alpha particle efficiency for the sample result calculations. Results list the concentration ± 1.96 standard deviations due to counting uncertainty, in units of microcurie per gram, (µCi/g).

5. Three replicate sample aliquots, one quality control sample (EPA diluted pitchblend ore, #S41), and one reagent blank were ashed at 500 degrees Celsius in a muffle furnace and completely dissolved in a concentrated acid solution. The dissolved samples were diluted in deionized water and analyzed for total uranium and thorium concentration by inductively coupled plasma mass spectrometry (ICP-MS) analysis. The concentrations are listed in units of microgram per gram, (µg/g).

6. Three replicate sample aliquots, and two quality control matrix spike samples were ashed at 500 degrees Celsius in a muffle furnace and completely dissolved in a concentrated acid solution. The dissolved samples were diluted with deionized water and placed in flasks for ingrowth. The samples were purged with helium, sealed to allow radon-222, the progeny of radium-226, to ingrow to equilibrium with radium-226. The radon-222 gas was collected and analyzed to determine their radium-226 concentration in accordance with the standard operating procedure for drinking water. Results lists the concentration ± 1.96 standard deviations due to counting uncertainty, in units of picocurie per gram, (pCi/g).

7. Point of contact for additional information is Mr. Thomas Beegle, extension 5-3983.

List of the report contents:

Section	Number of Pages
Cover Sheet	1
Cover Letter	1
Case Narrative	2
Sample Summary	1
Analytical Data Report	1
Quality Control Data Report	1
Raw Data	0
Terminology/Abbreviations	1

Report Point-of-Contact: Thomas Beegle TBD

Reviewer: GWW/RJS 10/01/98

List of all tests used:

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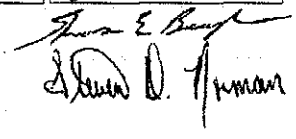
DLS Test	Description	Method

Number of samples included in the report, by matrix:

Matrix	Quantity
Sludges (Sediments)	1

Analyst(s):

Analyst Code	Analyst Name	Signature



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DLS Final Analytical Report, WALTER REED AMC

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SAMPLE SUMMARY

1687-B-3	P2121		Sludges (Sediments)

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QUALITY CONTROL REPORT

A Laboratory Control Sample, LCS, is analyzed to verify both the efficiency of the digestion and the accuracy of the analytical procedure. For ICP-MS, the aliquot was diluted 1 to 1000 to bring the expected results within the calibration range of the instrument. The following results and recoveries for uranium were obtained for the EPA diluted pitchblend ore, #541, with this procedure. The following results and recoveries for radium-226 were obtained for the NIST standard SRM 4953-C, with this procedure. There was no LCS available for the thorium analysis.

Laboratory Control Sample- U-EPA Diluted Pitchblend Ore, #541, Ra-226-NIST standard SRM 4953-C

Parameter	Theoretical Value	Observed Value	% Recovery
U	752 µg/g	801 µg/g	106%
U	752 µg/g	1,047 µg/g	139%
Ra-226	8.5745 pCi	8.3310 pCi	97.2%
Ra-226	8.5745 pCi	7.7344 pCi	90.2%

An Instrument Control Sample is an independent standard used to verify the instrument calibration curve. The results of these checks are provided:

Instrument Quality Control Sample- U-NIST lot #791402, Th-NIST lot #691507

Parameter	Theoretical Value	Observed Value	% Recovery
U	10 µg/l	9.98 µg/l	99.8%
U	10 µg/l	9.95 µg/l	99.5%
Th	10 µg/l	9.64 µg/l	96.4%
Th	10 µg/l	10.4 µg/l	104%

An Instrument Spike is a matrix interference check performed at the instrument. The results of these check are provided:

Instrument Spike Data

Parameter	Sample ID	Unspiked Value	Spiked Value	Amount Added	%Recovery
U	U2	2.77µg/l	7.07µg/l	5µg/l	86%
Th	U3	1.51µg/l	4.02µg/l	2µg/l	125%

All of the quality control parameters were within acceptable limits for this procedure.

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TERMINOLOGY/ABBREVIATIONS

Term	Description
A2LA	American Association for Laboratory Accreditation

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SUBJECT: Interpretation of Analysis of Sludge Collected From the DORF Reactor Holding Tank 1687-B-3, 22 June - 23 September 1998

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Project No. 79-21-1236, DLS JOB ID 8B0702, Report Serial No. 369089, 9/30/98

Date Samples Collected: 22 June 1998
Date of Sample Receipt: 01 September 1998
Extraction Date: N/A
Counting Date: Gross Alpha- 13-14 September 1998
Radium-226- 22-23 September 1998
Instrument: Gross Alpha- Gas-Flow Proportional Counter, Tennelec 3
Radium-226- Automated Lucas Flask Scintillation Counter, Autochanger
Uranium/Thorium- Elan 6000 ICP-MS
Count Time: 100.0 minutes
Minimum Detectable Concentration: gross alpha, 6 X 10^{-6} µCi/g
Radium-226, 0.02 pCi/g
Uranium, 0.1 µg/g
Thorium, 0.1 µg/g
Variations to Accepted Method: Non-standard method - see case narrative for details
Method Name and Number: Determination of Gross Alpha and Beta Activity in Soil, AB003.003

Results of Analyzing Soil Samples

Sample Identification	Lab Number	Microcurie Per Gram ± 1.96 Standard Deviations Gross Alpha
1687-B-3 #1	P2121	(8 ± 5) X 10^{-6}
1687-B-3 #2	P2121	(6 ± 5) X 10^{-6}
1687-B-3 #3	P2121	(5 ± 4) X 10^{-6}

Sample Identification	Lab Number	Microgram per Gram Uranium	Thorium
1687-B-3 #1	P2121	0.29	0.13
1687-B-3 #2	P2121	0.27	0.13
1687-B-3 #3	P2121	0.23	0.15

Sample Identification	Lab Number	Picocurie Per Gram ± 1.96 Standard Deviations Radium-226
1687-B-3 #1	P2121	0.59 ± 0.08
1687-B-3 #2	P2121	0.60 ± 0.08
1687-B-3 #3	P2121	0.59 ± 0.07

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PROJECT SITE: WALTER REED AMC
PROJECT NUMBER: 79-21-1236
DLS JOB ID: 8B0702
REPORT SERIAL NUMBER: 369089

REPORT RELEASE AUTHORIZATION:

Signature: Ronald Loth **Date:** 1 oct 98

NVLAP

NLLAP

AIHA Industrial Hygiene ACCREDITED LABORATORY

ISO 9002 CERTIFIED

DLS HOLDS ACCREDITATION FROM AIHA, AALA, NLLAP, COLA AND IS ISO 9001 REGISTERED

Readiness thru Health

DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010

2LT Davis/ldr/AUTOVON
584-3526

HSE-RH/WP

6 [illegible] 1980

SUBJECT: Radiation Protection Special Study No. 28-43-0982-80, Close-Out Survey of Diamond Ordnance Radiation Facility (DORF), 25-28 February 1980

Commander
US Army Materiel Development and
Readiness Command
ATTN: DRCSG
5001 Eisenhower Avenue
Alexandria, VA 22333

1. AUTHORITY.

a. AR 40-5, Health and Environment, 25 September 1974.

b. Letter, DELHD-N-RBI, Harry Diamond Laboratories, 2 November 1979, subject: Request for a Radiological Health Special Study, and indorsements thereto.

2. REFERENCES.

a. Nuclear Regulatory Commission (NRC) Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors, June 1974.

b. Letter, HSE-RH/WP, this Agency, 3 April 1980, subject: Preliminary Report, Radiation Protection Special Study No. 28-43-0982-80, Close-Out Survey of Diamond Ordnance Radiation Facility (DORF), 25-28 February 1980.

3. PURPOSE. This special study was performed to determine the presence and extent of radioactive contamination and whether the facility met the radioactive contamination levels stated in NRC Regulatory Guide 1.86, following decontamination.

4. GENERAL.

a. This radiation protection special study was conducted by Mr. Gordon M. Lodde, DAC, Health Physicist, and 2LT Roger M. Davis, Jr., MSC, Health Physics Division, this Agency, during the period 25-28 February 1980.

b. An entrance interview and an exit briefing were provided to Mr. Charles Ware, Contracting Officer's Representative, Harry Diamond Laboratories.

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SUBJECT: Radiation Protection Special Study No. 28-43-0982-80, Close-Out Survey of Diamond Ordnance Radiation Facility (DORF), 25-28 February 1980

RESULTS OF ANALYZING HIPE TEST SAMPLES

Sample Identification	RCB Lab No.	Disintegrations per Minute ±2 Standard Deviations/100 cm^2: Gross Alpha Activity	Gross Beta Activity
1	L244	< 1.4	4.4 ± 2.5
2	L245	< 1.4	< 2.5
3	L246	< 1.4	< 2.5
4	L247	< 1.4	< 2.5
5	L248	< 1.4	< 2.5
6	L249	< 1.4	< 2.5
7	L250	< 1.4	< 2.5
8	L251	< 1.4	2.8 ± 2.0
9	L252	< 1.4	< 2.5
10	L253	< 1.4	6.0 ± 2.7
11	L254	< 1.4	2.6 ± 2.0
12	L255	< 1.4	< 2.5
13	L256	< 1.4	< 2.5
14	L257	< 1.4	< 2.5
15	L258	< 1.4	< 2.5
16	L259	< 1.4	3.6 ± 1.9
17	L260	< 1.4	< 2.5
18	L261	< 1.4	< 2.5
19	L262	< 1.4	14.6 ± 3.7
20	L263	4.7 ± 2.4	14.0 ± 3.6
21	L264	< 1.4	< 2.5
22	L265	< 1.4	6.2 ± 2.3
23	L266	< 1.4	7.0 ± 2.6
24	L267	3.2 ± 1.9	< 2.5
25	L268	< 1.4	5.2 ± 2.4
26	L269	< 1.4	< 2.5
27	L270	< 1.4	3.0 ± 2.0
28	L271	< 1.4	< 2.5
29	L272	< 1.4	< 2.5

Encl 1

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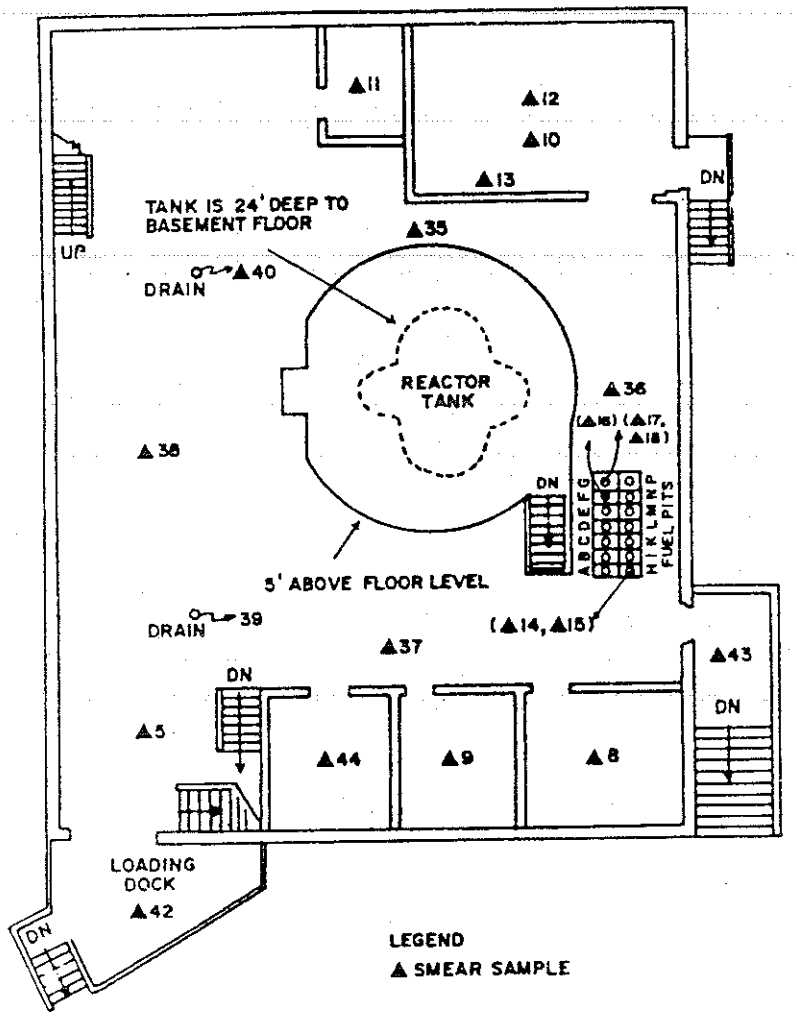


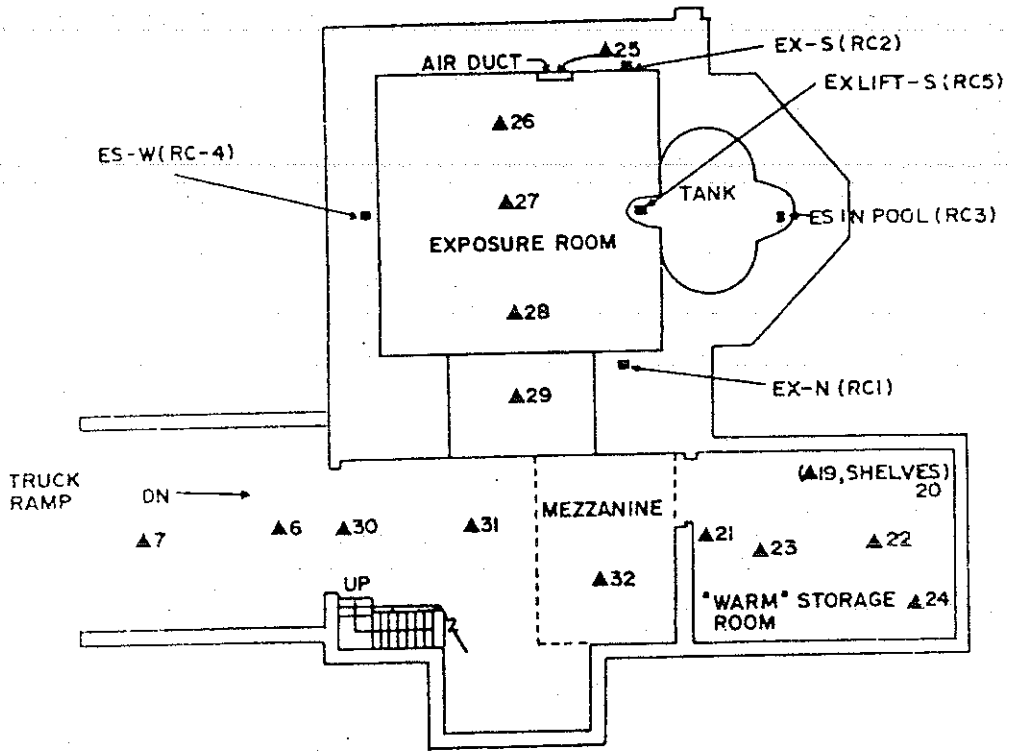
FIRST FLOOR PLAN

Figure 1

3

Incl 1
3

HSE-RH/WP
SUBJECT: Radiation Protection Special Study No. 28-43-0982-80, Close-Out Survey of Diamond Ordnance Radiation Facility (DORF), 25-28 February 1980



BASEMENT PLAN

LEGEND
▲ SMEAR SAMPLE
● CONCRETE SAMPLE

Figure 3

5

Incl 1

INTERIM RESULTS OF ANALYZING CONCRETE SAMPLES

Sample Identification	RCB Lab No.	Europium-152 Activity	Europium-154 Activity	Cobalt-60 Activity
		Microcurie per Gram ±2 Standard Deviations		
EX-N	RC1	$3.5 \times 10^{-5} \pm 0.1 \times 10^{-5}$	$2.8 \times 10^{-6} \pm 0.6 \times 10^{-6}$	$1.0 \times 10^{-5} \pm 0.4 \times 10^{-6}$
EX-S	RC2	$5.9 \times 10^{-5} \pm 0.1 \times 10^{-5}$	$4.5 \times 10^{-6} \pm 0.8 \times 10^{-6}$	$3.4 \times 10^{-5} \pm 0.1 \times 10^{-5}$
ES In Pool	RC3	$1.6 \times 10^{-5} \pm 0.1 \times 10^{-5}$	$1.4 \times 10^{-6} \pm 0.4 \times 10^{-6}$	$5.4 \times 10^{-6} \pm 0.3 \times 10^{-6}$
ES-W	RC4	$2.8 \times 10^{-5} \pm 0.1 \times 10^{-5}$	$2.2 \times 10^{-6} \pm 0.5 \times 10^{-6}$	$1.4 \times 10^{-5} \pm 0.1 \times 10^{-5}$
EX LIFT-S	RC5	$1.1 \times 10^{-4} \pm 0.2 \times 10^{-5}$	$7.9 \times 10^{-6} \pm 0.9 \times 10^{-6}$	$3.0 \times 10^{-5} \pm 0.1 \times 10^{-5}$

ALPHUS L. JONES, Chief
Radl & Biol Chem Div, USAEHA

HSE-RH/WP
SUBJECT: Radiation Protection Special Study No. 28-43-0982-80, Close-Out Survey of Diamond Ordnance Radiation Facility (DORF), 25-28 February 1980

RESULTS OF ANALYZING WATER SAMPLES

Sample Identification	RCB Lab No.	Microcurie per Milliliter ±2 Standard Deviations Cobalt-60 Activity	Tritium Activity
1	W229	$< 2.8 \times 10^{-8}$	$< 4.2 \times 10^{-7}$
2 A-3-B	W230	$< 2.1 \times 10^{-8}$	$< 4.2 \times 10^{-7}$
3 A-2-B	W231	$< 2.1 \times 10^{-8}$	$3.9 \times 10^{-6} \pm 0.3 \times 10^{-6}$
4 A-1-B	W232	$< 2.4 \times 10^{-8}$	$1.4 \times 10^{-6} \pm 0.3 \times 10^{-6}$
WA-1-AA	W233	$< 2.1 \times 10^{-8}$	$1.3 \times 10^{-6} \pm 0.3 \times 10^{-6}$
WA-2-AA	W234	$< 1.6 \times 10^{-8}$	$4.5 \times 10^{-7} \pm 2.6 \times 10^{-7}$
WA-3-AA	W235	$< 1.8 \times 10^{-8}$	$< 4.2 \times 10^{-7}$
W-505	W236	$< 1.8 \times 10^{-8}$	$< 4.2 \times 10^{-7}$

ALPHUS L. JONES
Chief, Radiological & Biological Chemistry Division

(See Figures 1 and 2 for water sampling locations.)

Encl 3

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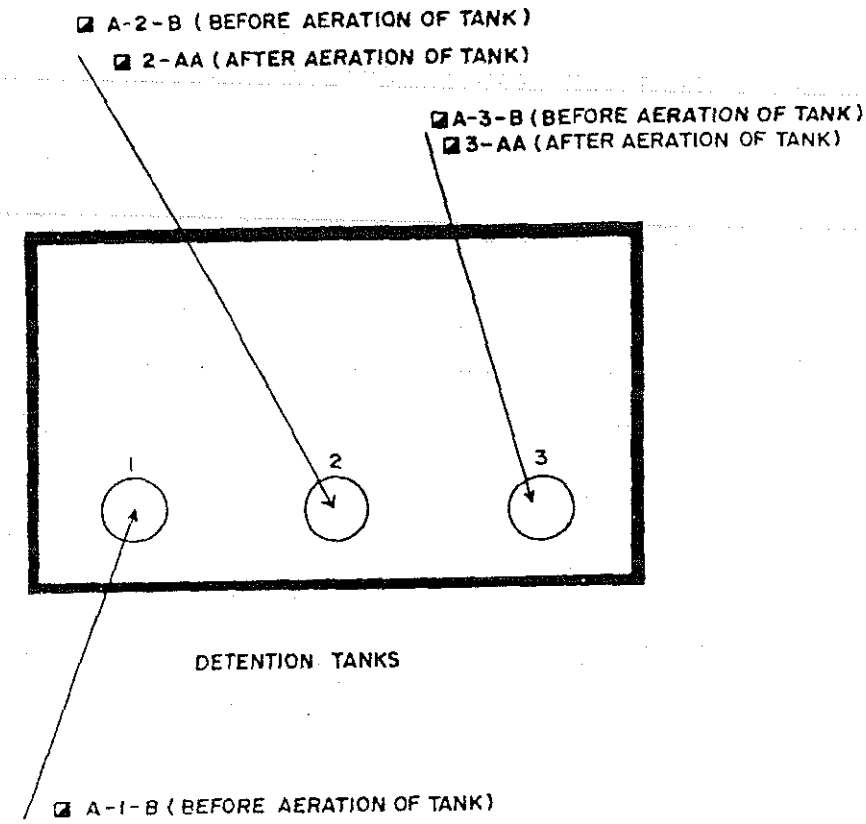

WATER SAMPLING AT DETENTION TANKS

Figure 2

Incl 3

3

Encl 4

HSE-RN/NP
SUBJECT: Radiation Protection Special Study No. 28-43-0982-80, Close-Out Survey of Diamond Ordnance Radiation Facility (DORF), 25-28 February 1980

RESULTS OF ANALYZING SOIL SAMPLES (East of Stack Approx. 57 Ft. Outside of Fence)

Sample Identification	RCB Lab No.	Microcurie per Gram ±2 Standard Deviations Lead-212	Lead-214	Potassium-40	Bismuth-214
#1 Bottom, 7" Depth	S5	$1.3 \times 10^{-6} \pm 0.2 \times 10^{-6}$	$9.7 \times 10^{-7} \pm 2.3 \times 10^{-7}$	$1.7 \times 10^{-5} \pm 0.3 \times 10^{-5}$	$8.1 \times 10^{-7} \pm 3.0 \times 10^{-7}$
#2, 6" Depth	S5	$1.2 \times 10^{-6} \pm 0.2 \times 10^{-6}$	$7.8 \times 10^{-7} \pm 2.5 \times 10^{-7}$	$1.4 \times 10^{-5} \pm 0.2 \times 10^{-5}$	$9.7 \times 10^{-7} \pm 2.6 \times 10^{-7}$
#3, 5" Depth	S5	$1.2 \times 10^{-6} \pm 0.2 \times 10^{-6}$	$1.0 \times 10^{-6} \pm 0.2 \times 10^{-6}$	$1.6 \times 10^{-5} \pm 0.3 \times 10^{-5}$	$1.3 \times 10^{-6} \pm 0.3 \times 10^{-6}$
#4, 4" Depth	S5	$1.1 \times 10^{-6} \pm 0.1 \times 10^{-6}$	$1.3 \times 10^{-6} \pm 0.5 \times 10^{-6}$	$1.8 \times 10^{-5} \pm 0.2 \times 10^{-5}$	$7.2 \times 10^{-7} \pm 2.1 \times 10^{-7}$
#5, 3" Depth	S5	$8.1 \times 10^{-7} \pm 1.2 \times 10^{-7}$	$8.8 \times 10^{-7} \pm 1.8 \times 10^{-7}$	$1.6 \times 10^{-5} \pm 0.2 \times 10^{-5}$	$6.0 \times 10^{-7} \pm 1.8 \times 10^{-7}$
#6, 2" Depth	S5	$8.6 \times 10^{-7} \pm 1.2 \times 10^{-7}$	$9.4 \times 10^{-7} \pm 1.6 \times 10^{-7}$	$1.4 \times 10^{-5} \pm 0.2 \times 10^{-5}$	$7.3 \times 10^{-7} \pm 1.9 \times 10^{-7}$
#7, Top, 1" Depth	S5	$8.8 \times 10^{-7} \pm 1.2 \times 10^{-7}$	$7.4 \times 10^{-7} \pm 2.0 \times 10^{-7}$	$1.3 \times 10^{-5} \pm 0.2 \times 10^{-5}$	$7.2 \times 10^{-7} \pm 1.9 \times 10^{-7}$

Sample Identification	RCB Lab No.	Actinium-228	Radium-226	Cesium-137
#1, Bottom, 7" Depth	S5	$1.3 \times 10^{-6} \pm 0.5 \times 10^{-6}$	$< 4.1 \times 10^{-6}$	$2.2 \times 10^{-7} \pm 1.1 \times 10^{-7}$
#2, 6" Depth	S5	$1.2 \times 10^{-6} \pm 0.4 \times 10^{-6}$	$5.3 \times 10^{-6} \pm 1.7 \times 10^{-6}$	$1.4 \times 10^{-7} \pm 1.1 \times 10^{-7}$
#3, 5" Depth	S5	$9.0 \times 10^{-7} \pm 5.1 \times 10^{-7}$	$< 4.2 \times 10^{-6}$	$2.3 \times 10^{-7} \pm 1.0 \times 10^{-7}$
#4, 4" Depth	S5	$9.0 \times 10^{-7} \pm 4.0 \times 10^{-7}$	$2.0 \times 10^{-6} \pm 1.6 \times 10^{-6}$	$2.5 \times 10^{-7} \pm 0.9 \times 10^{-7}$
#5, 3" Depth	S5	$5.2 \times 10^{-7} \pm 4.0 \times 10^{-7}$	$3.7 \times 10^{-6} \pm 1.5 \times 10^{-6}$	$2.4 \times 10^{-7} \pm 0.7 \times 10^{-7}$
#6, 2" Depth	S5	$5.8 \times 10^{-7} \pm 3.4 \times 10^{-7}$	$< 3.0 \times 10^{-6}$	$1.8 \times 10^{-7} \pm 1.2 \times 10^{-7}$
#7, Top, 1" Depth	S5	$< 6.0 \times 10^{-7}$	$< 2.8 \times 10^{-6}$	$2.5 \times 10^{-7} \pm 1.1 \times 10^{-7}$

ALPHUS L. JONES
Chief, Radiological & Biological
Chemistry Division

HSE-RH/WP
SUBJECT: Radiation Protection Special Study No. 28-43-0982-80, Close-Out Survey of Diamond Ordnance Radiation Facility (DORF), 25-28 February 1980

RESULTS OF ANALYZING VEGETATION SAMPLES

Sample Identification	RCB Lab No.	Microcurie per Gram Dry Vegetation ±2 Standard Deviations Cesium-137 Activity
S-1-N	V1	$< 2.5 \times 10^{-6}$
S-1-S	V2	$2.3 \times 10^{-6} \pm 1.1 \times 10^{-6}$
S-1-E	V3	$< 1.6 \times 10^{-6}$
S-1-W	V4	$< 1.9 \times 10^{-6}$
Off-Site	V5	$< 1.8 \times 10^{-6}$

ALPHUS L. JONES
Chief, Radiological & Biological Chemistry Division

(See Figures 1 and 3 Inclosure 3, for vegetation sampling locations.)

Table 5

an Army dosimeter, dust mask, and anti-c clothing. No air monitoring or bioassay will be required. As a precaution, the workers exiting the tanks will be monitored with a pancake probe for contamination upon exiting the tank. OHSA requirements that apply to a confined space will be met.

2. The soil above and around the tanks will then be excavated to expose the outer walls of the tank. Every so often, digging will cease, and soil samples will be collected from against the sides, ends, and bottom of the tank outer surface, to total approximately 30 samples for tank # 3, and 15 each for tanks 2 and 3. These samples will serve as indicators as to whether the tank ever leaked. Also, before the tanks are removed, the sides, ends and bottom of the tank will be monitored for contamination, and smear samples will be taken. Once the tanks are found to be clean, the tanks will be released for recycling or disposal. If the tanks are multi-walled, it will be necessary (by cutting access ports) to gain access to the space between to ensure there is no contamination between the layers. Once the limits in the NRC April 1993 document entitled "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material" are met, the tanks will be release for recycling or disposal. If the tanks are found to contaminated, they will be left in the excavation for decontamination before they are removed. For the purposes of soil analysis, the soil contamination values tabulated in NRC DRAFT NUREG-1549 may be applied. To help ensure the state and EPA will be satisfied with the limits applied to the soil, if and when they have concern as during base closure or realignment, it might be advisable to discuss limits with the state and EPA, and meet them if technically and economically feasible to do so. EPA's risk criteria applied to CERCLA sites can correspond (through modeling) to dose limits much lower than the NRC's 25 mrem/yr limit.

3. Once the tanks are removed, the excavation will remain open to allow sampling of the soil. The samples taken from against the sides, ends, and bottom surfaces of the tank will serve as scoping survey samples. If these samples are clean, the excavations will be surveyed as Class 3 areas, using approximately 15 random sample locations in the tank 1 excavation, 15 in the tank 2 3 excavations, and 30 in the tank 3 excavation. Once the excavation is shown to be clean, the excavation will be back filled. If soil contamination beyond the release limit is found, the contaminated soil will be removed and containerized for proper disposal.

4. In the unlikely event that contamination exceeding unrestricted area limits is found on the tank or in the

Cr-51 activity detected is well below the 20,000 pCi/gm NRC license exempt limit. Alpha activity was again detected in tank 3.

(3) Alpha spectroscopy was performed on the sludge from tank 3 to determine the radionuclide present. Is it naturally occurring, or from license exempt uranium nitrate solutions discharged down the drain?

d. To ensure that there is no gross contamination in the soil surrounding the tank that could create a hazard, a BICRON microrem/hr meter was lowered into each tank. A reference below-grade background measurement was also taken by lowering the instrument into a manhole. The measurement in each tank was approximately the same as that in the reference manhole, namely about 15 urem/hr. Experience shows the surveyor would have easily been able to discern an increase of 5 urem/hr, and considering the tank diameter is 6 feet, and using the gamma factors for Cr-51, Co-57, Co-60, and Cs-137, a 5 urem/hr increase would correspond roughly to activity levels of 313 uCi, 55 uCi, 3.8 uCi, and 15 uCi, respectively, assuming the activity is 1 meter from the detector, and no significant shielded by soil or the tank. If these activities were distributed into only 7.6 kg, 3 kg, 11 kg, and 15 kg of soil, they would meet the NRC's license exempt concentration, and therefore would not constitute a significant health and safety hazard from either internal or external exposure. This is admittedly a rough estimate, but it scopes the potential for a health hazard from contamination at the outside surface of the tank. This examples illustrates that the presence of any potentially dangerous gamma emitting contamination outside the tank would probably be visible on the urem/hr meter when placed inside the tank.

2. Tank Removal Plan. Based upon the measurements presented above, removal of the tank is not expected to involve a significant radiation safety hazard. Nonetheless, precautions will be taken as described. Following removal of the tanks, the surveying and sampling of the excavations will be performed as a separate effort, to document the condition of the soil, and allow back filling.

1. To remove the small amount of residual contamination measured in the tank, and to facilitate disposal of the tank as non-radioactive, before the tanks are removed, the sludge will be removed from the tanks and be containerized for disposal as appropriate. The inner tank surfaces will then be flushed with water. This will not present a radiological hazards to the worker because of the license exempt level of radioactivity in the tanks. Nonetheless, workers entering the tank will be instructed of radiological conditions, and may be equipped with

RADIOANALYSIS REPORT - General

Sample Information

Sample ID: Waste tank liquid/sludge samples **Control Number:** W- 36055
Submitter: WRAMC
Date: 15-sep-1998
Time: 09:00
Assay: drydown planchet counted 20 min, alpha then beta, Tennelec II

Analysis Parameters

	Tennelec I		Tennelec II		Beckman I		Beckman II		LKB
	Alpha	**Beta**	**Alpha**	**Beta**	**H-3**	**C-14**	**H-3**	**C-14**	**I-129**
BKG (cpm):	n/a	n/a	0.07	0.89	n/a	n/a	n/a	n/a	n/a
Efficiency:	0.301	0.432	0.374	0.574	0.437	0.573	0.373	0.550	0.642
Source ID:	A-375	B-009	Al-801	M-306	HGI1611	CGI2909	HGI1611	CGI2909	94-542

Analysis Results

Sample Number	Volume (ml)	Residue (mg)	Analysis Type	Gross Counts	Net cpm	Eff	Trans Factor	Activity (pCi)	+/- Error 2- Sigma	LLD (pCi)
1 *	5	393	Gross Alpha	3	0.05	0.376	0.50	<LLD		9.38E-01
1	5	393	Gross Beta	6895	344.22	0.571	0.50	7.76E+02	1.87E+01	
2	20	7	Gross Alpha	5	0.15	0.376	0.97	<LLD		4.84E-01
2	20	7	Gross Beta	31	1.02	0.571	0.99	8.13E-01	4.59E-01	
3	20	39	Gross Alpha	10	0.40	0.376	0.80	5.99E-01	4.83E-01	
3	20	39	Gross Beta	28	0.87	0.571	0.90	7.63E-01	4.81E-01	
4 *	5	321	Gross Alpha	3	0.05	0.376	0.50	<LLD		9.38E-01
4	5	321	Gross Beta	5896	294.27	0.571	0.50	5.42E+02	1.41E+01	
blank	1	1	Gross Alpha	1	< 0	0.376	1.00	<LLD		4.69E-01
blank	1	1	Gross Beta	14	0.17	0.571	1.00	<LLD		5.72E-01

* NOTE: assayed as infinite thick sample - activity values normalized to full sample ~~aliquot~~.

NIST Standard Counts

Nuclide Type:	Am-241	Sr-90	I-129	H-3	C-14
CPM:	64863	28598	31948	57679	88742
Min Counted:	20	20	10	10	10

Analysis by: DM **Date:** 16-SEPT-98

Sm. 11 γ peaks Q
63.4 Kev
76.9 Kev

Iron oxide residue

alpha in solution?

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▸ 2

To	From
Dave Burton	DAVE MCKOWN
Dept./Agency	Phone #
WRAMC	AFRRI
Fax #	Fax #
(202) 356-0086	(301) 295-6567

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

15-SEPT-1998 STANDARDS QC CHECK

WED SEP 15, 1998
GROUP A ROUTINE SMEARS

	SAMPLE SN	CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	TOD CLOCK HR:MN:SEC
α STD	16	TENN 2	2.00	129453	43691	64726.50	21845.50	07:14:54
β STD	83	TENN 2	2.00	1	56903	0.50	28451.50	07:19:12
BKG	61	TENN 2	2.00	0	2	0	1.00	07:23:30

OPERATION COMPLETE

WRAMC SAMPLES - DRYDOWNS @ 20min α then β

WED SEP 15, 1998
GROUP D AIR SAMPLES, WT

	SAMPLE SN	CODE	TIME (MIN.)	ALPHA COUNTS	BETA COUNTS	ALPHA CPM	BETA CPM	TOD CLOCK HR:MN:SEC
1	67	SPL#1	20.00	3	6895	0.15	344.75	09:08:43
2	3	#2	20.00	5	31	0.25	1.55	09:48:58
3	75	#3	20.00	10	28	0.50	1.40	10:29:12
4	34	#4	20.00	3	5896	0.15	294.80	11:09:27
5	50	blank	20.00	1	14	0.05	0.70	11:49:42

OPERATION COMPLETE

OPERATION COMPLETE

SPL #1 — TANK CLOSEST TO DORF
SPL #2 — CENTER TANK
SPL #3 - TANK FARTHEST FROM DORF
SPL #4 — Duplicate SPL #1 - TANK CLOSEST TO DORF

DRAFT

ANALYSIS OF WRAMC UNDERGROUND TANKS
ANL 1687
PROJECT DEVELOPMENT AND RADIATION RESERCH OFFICE
USATA, AMCOM

Analysis Number	LSC (pCi/L)	GPC (pCi/L)	Gamma Spectroscopy (pCi/L)		
	H-3	Beta other than H-3	Co-57	Cr-51	K-40
T-0-1	< MDA	< MDA	< MDA	< MDA	< MDA
T-1-1	14,600	< MDA	< MDA	< MDA	< MDA
T-1-2	15,000	< MDA	< MDA	< MDA	< MDA
T-2-1	24,700	< MDA	< MDA	< MDA	< MDA
T-2-2	25,800	< MDA	< MDA	< MDA	< MDA
T-3-1	211,000	1,730	< MDA	3,370	< MDA
T-3-2	297,000	5,160	20	1,470	110

MDA_{LSC} = 343 pCi/L

MDA_{GPC} = 7 pCi/L

NRC Release Limit 1×10^7 pCi/L 3×10^5 pCi/L (for C-14 or S-35) 6×10^5 pCi/L 5×10^6 pCi/L 4×10^4 pCi/L

Co-57 $MDA_{\lambda Spec}$ = 4 pCi/L Cr-51 $MDA_{\lambda Spec}$ = 36 pCi/L K-40 $MDA_{\lambda Spec}$ = 21 pCi/L

to Sanitary Sewer

DRAFT

Table 1

Surface Contamination Levels

Nuclide[a]	Average[b,c,f]	Maximum[b,d,f]	Removable[b,e,f]
U-nat, U-235, U-238, and associated decay products	5000 dpm α/100 cm^2	15000 dpm α/100 cm^2	1000 dpm α/100 cm^2
Transuranics, Ra-226,Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, & I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, and I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modesother than alpha emission or spontaneous fission) except Sr-90 and others noted above	5000 dpm $\beta\gamma$/100 cm^2	15000 dpm $\beta\gamma$/100 cm^2	1000 dpm $\beta\gamma$/100 cm^2

[a] Where surface contamination by both alpha- and beta-gamma emitting nuclide exists, the limits established for alpha- and beta-gamma emitting nuclide should apply independently.

[b] As used in this table, disintegrations per minute (dpm) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.e The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally. The entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

Reference: Guidelines for Decontamination of lities and Equipment Prior to Release for Unrestricted Use of Termination of Licenses for Byproducts, Source, or Special Nuclear Material, U.S. Nuclear Regulatory Commission, Nov 1976

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

August 16, 2000

Lt. Colonel Trent Moxley
The U. S. Army at Walter Reed Medical Center
Environmental Division
6825 16th St., NW
Washington, DC 20307-5001

SUBJECT: SAMPLE RECEIVING REPORT FOR WALTER REED SAMPLES COLLECTED SEPTEMBER 28, 1999.

Dear Lt. Colonel Moxley:

Attached is the Sample Receiving Report and copies of the Chain of Custody for the samples that were received by ESSAP from Walter Reed on August 4, 2000. The samples were received in good condition.

If you have any questions, please call me at (865) 241-3242 or Wade Ivey at (865) 576-9184.

Sincerely,

Dale Condra

Dale Condra
Laboratory Manager
Environmental Site Survey
Assessment Program

DC:dkh

Enclosures

cc: W. Beck, ORISE/ESSAP
E. Abelquist, ORISE/ESSAP
Wade Ivey, ORISE/ESSAP
File/923

SAMPLE RECEIVING REPORT

Date Received: 8/4/2000

Received by: Wade Ivey

ESSAP Sample ID	Walter Reed Sample ID	Collection Date
0923S001	Tank C, bottom, exhaust end	28-Sep-99
0923S002	Tank C, top, inlet side	28-Sep-99
0923S003	Tank C, pipe, inlet	28-Sep-99
0923S004	Tank C, pipe, exhaust	28-Sep-99
0923S005	Tank C, bottom, middle	28-Sep-99
0923S006	Tank C, bottom, inlet end	28-Sep-99
0923S007	Tank B, bottom, inlet end	28-Sep-99
0923S008	Tank B, bottom exhaust end	28-Sep-99
0923S009	Tank B, pipe exhaust	28-Sep-99
0923S010	Tank B, pipe inlet	28-Sep-99
0923S011	Tank B, bottom, middle	28-Sep-99
0923S012	Tank C, top exhaust	28-Sep-99
0923S013	Tank B, top exhaust	28-Sep-99
0923S014	Tank A, bottom, exhaust end	28-Sep-99
0923S015	Tank A, pipe inlet	28-Sep-99
0923S016	Tank B, top inlet	28-Sep-99
0923S017	Tank A, pipe exhaust	28-Sep-99
0923S018	Tank A, top exhaust	28-Sep-99
0923S019	Tank A, bottom inlet	28-Sep-99
0923S020	Tank A, top inlet	28-Sep-99

All samples received in good condition.

Reviewed by: Ann Payne

ORISE/ESSAP
P.O. BOX 117
OAK RIDGE, TN 37830

CHAIN-OF-CUSTODY RECORD

EMERGENCY CONTACTS
(423) 576-3561
(423) 576-3180
(423) 241-3242

Site 923 Walter Reed Sample Type Soil

Samplers Lt. Colonel Moxley

NOTE: If more than one name is listed, circle the sample custodian.

ESSAP SAMPLE NUMBER	Sample Information	Collected		Remarks
		Date	Time	
S001	Tank C, Bottom, exhaust end	9/28/99	NA	
S002	Tank C, Top, inlet side	9/28/99	NA	
S003	Tank C, pipe, inlet	9/28/99	NA	
S004	Tank C, pipe, exhaust	9/28/99	NA	
S005	Tank C bottom, middle	9/28/99	NA	
S006	Tank C bottom, inlet end	9/28/99	NA	
S007	Tank B bottom, inlet end	9/28/99	NA	
S008	Tank B bottom exhaust end	9/28/99	NA	
S009	Tank B pipe exhaust	9/28/99	NA	
S010	Tank B pipe inlet	9/28/99	NA	
S011	Tank B bottom, middle	9/28/99	NA	
S012	Tank C Top exhaust	9/28/99	NA	
S013	Tank B Top exhaust	9/28/99	NA	
S014	Tank A bottom exhaust end	9/28/99	NA	
S015	Tank A pipe inlet	9/28/99	NA	
S016	Tank B Top inlet	9/28/99	NA	
S017	Tank A pipe exhaust	9/28/99	NA	
S018	Tank A Top exhaust	9/28/99	NA	
S019	Tank A Bottom, inlet	9/28/99	NA	
S020	Tank A top inlet	9/28/99	NA	

Transport Method Fed Ex Seal No. None

	Date	Time	
1. Relinquished by: Courier	8/4/00	900	*Received in good condition by: Wade P. Ivey
2. Relinquished by:	Date	Time	*Received in good condition by:
3. Relinquished by:	Date	Time	*Received in good condition by:
4. Relinquished by:	Date	Time	*Received in good condition by:

*For sample received in unacceptable condition explain in Remarks column.

Distribution: Original to individual having custody
Copy filed with field data

Department of Energy

Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831—

JUN 02 2000

Lt. Colonel Moxley
Walter Reed Army Medical Center
Environmental Division
6825 16th Street, N.W.
Washington, D.C. 20307-5001

Dear Lt. Col. Moxley:

DEPARTMENT OF ENERGY (DOE) PROJECT "RADIOLOGICAL ENVIRONMENTAL SAMPLE ANALYSIS" (DOE PROPOSAL NO. 1134-1134-00)

We are pleased to provide the enclosed proposal entitled "Radiological Environmental Sample Analysis" for your consideration. The budget for this effort through FY 2000 is $7,680. You may fund the entire proposal or, if more consistent with your agency's priorities, choose to fund only specific tasks. Any funded work will be assigned to our contractor, Oak Ridge Associated Universities (ORAU), for performance.

The enclosed Administrative Instructions for Interagency Acquisitions contain specific DOE requirements applicable to interagency acquisitions and provide details on such matters as authorities, funding, invoicing, etc. Your attention is called to paragraph I.B. of the Administrative Instructions as this item is required by DOE Order on all funding authorizations. Suggested wording is highlighted below:

> *This agreement for DOE Proposal 1134-1134-00 is entered into pursuant to the authority of the Economy Act of 1932, as amended (31 USC § 1535) [or cite here another statutory reference] and adheres to Federal Acquisition Regulation 6.002. To the best of our knowledge the work requested will not place DOE and its contractor in direct competition with the domestic private sector.*

Please ensure that the person issuing the funding document is aware of this requirement. We encourage you to read all the Administrative Instructions as they are important in your consideration of the DOE proposal. **Please note that by placing work with us, you agree that the enclosed Administrative Instructions govern this work.**

All correspondence should be addressed to DOE. For questions concerning the proposal or DOE procedures, contact either the DOE or ORAU personnel listed in Section XI of the enclosed Administrative Instructions.

Sincerely,

James A. Reafsnyder, Director
Office of Partnerships and
Program Development

M-6:Cooper-05/2000

Enclosure:
Proposal w/Administrative Instructions

cc w/encl:
L. C. M. Roddye, LM-111, ORO

cc w/o encl:
Janice R. Grindstaff, ORISE

Proposal

from

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

for

Walter Reed Army Medical Center
Environmental Division
Radiological Environmental Sample Analysis

Jack Beck, CHP
Dale Condra, Laboratory Manager

Environmental Survey & Site Assessment Program
Radiological Safety, Assessments and Training
P.O. Box 117
Oak Ridge, TN 37831

(865) 576-5031

- Chain of Custody (COC) management of samples and results according to an approved quality assurance (QA) program for all laboratory analytical facilities;

- radiological analyses of sample media for gross alpha/beta and gamma spectral analyses;

- hard copy of analysis results in accordance with specified format and QA requirements. Further details on the analytical and QA requirements in support of this effort are listed below:

4.1 Analytical Services

Analysis shall be conducted in accordance with the specified EPA-600/4-80-032 *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, August 1980; EPA SW-846 *Test Methods for Evaluating Solid Waste Physical/Chemical Methods*, December 1987; EPA 520/5-84-006 *Eastern Environmental Radiation Facility Radiochemistry Procedures Manual*, August 1984; EML HASL-300 *Environmental Measurements Laboratory Procedure Manual*, 26th or 27th editions; and EPA standards in 40 CFR 192 and NRC Standards in SECY 81-576, or any additional project-approved methods, such as, ORISE/ESSAP Laboratory Manual. Maximum holding times, quality control (QC) measures, detection limits, preservation of samples, and data reporting shall comply strictly with that found in Attachment 1 of this SOW. All laboratory analyses must be performed within the allowable holding times established by the applicable analytical procedure and in the SOW.

All results for environmental soil and sediment samples will be reported on a dry-weight basis. The percent moisture will be reported for all solid samples.

Upon receipt at the laboratory, the samples will be examined immediately to determine damage or loss during transport. If problems with samples are determined, this shall be noted on the COC form; otherwise, the COC form shall be marked "RECEIVED IN GOOD CONDITION." The sample condition will be indicated on a sample receiving report (SRR). If samples are damaged or otherwise compromised, the laboratory immediately shall notify the Walter Reed Medical Center, Environmental Division. The samples will be logged into the laboratory and appropriately maintained until submitted for analyses. After the appropriate laboratory information and required signatures have been added to the COC and SRR, the laboratory will return signed copies to Walter Reed within 10 days.

Samples will be returned to the Walter Reed Medical Center, Environmental Division at the end of the project.

4.2 Quality Control and Data Reduction Requirements

The following is a description of the minimum QC requirements for laboratory analyses.

Acceptable tolerances shall be established for each background region of interest. When tolerance limits are exceeded for any detector, that detector shall not be used until such time that root cause(s) has been evaluated and corrected.

4.3.1 Reporting Times

Routine analytical service turnaround, including QA documentation, shall be 45 working days, beginning the day of sample receipt at the laboratory and ending the day of data package receipt at the Walter Reed Army Medical Center Environmental Division office. Dates of receipt and shipment shall be documented by the laboratory.

BUDGET DATA

These estimated costs for the sample radioanalytical laboratory analyses are based on receiving the 20 samples indicated and include the analysis of each sample.

Activity	Estimated Cost
Sample Analysis (GAB & GS)	$6,500
Sample Disposal (Prep for return to WRAMC)	$ 200
Report	$ 980

Total Estimated Costs $7,680

The total estimated costs includes 3% for the Federal Administrative Charge

III. Funds Management

A. Funds Obligation:

The Treasury appropriation account symbol must be added to the funding authorization, along with the obligational expiration date and the date the appropriation closes for payment purposes. Funds shall be considered obligated upon DOE's acceptance of the funds and issuance of direction to the Contractor.

NOTE: DOE is unable to accept direct cite funds.

B. Full Funding:

Work performed for other Federal agencies shall be fully funded for the current fiscal year plus the first three months of the following fiscal year for work that transcends fiscal years. If your agency is unable to provide full funding due to internal budget allocation processes, you must submit a request to waive this full funding requirement to the DOE Work for Others Coordinator shown in Section XI.

C. Financial Policy:

DOE will account for and control funds by individual funding document unless specific written instructions to the contrary are received from a certifying official of the Sponsor. Multiple funding documents for the same scope of work under this agreement will be fully costed on a first-in, first-out basis utilizing cost transfers if authorized.

IV. Invoicing Procedures

All billings, collections and payments related to work performed by DOE for other federal agencies will be recorded through the U. S. Department of Treasury's On-Line Payment and Collection (OPAC) System or Electronic Data Interchange Payment and Collection (EDIPAC) System. As expenditures are incurred against a customer agency's funding authorization, monthly billings will be issued on behalf of DOE by the Contractor's Accounts Receivable Department through the OPAC or EDIPAC System. Chargebacks to DOE should not occur unless the customer agency has agreement with DOE to do so. **The customer agency must include its agency location code (ALC) on all funding authorizations forwarded to DOE.** In addition, sufficient accounting classification or other funding information required by the customer agency to properly identify the charges should be provided.

V. Intellectual Property Rights

Inventions made in performance of this work may fall within the DOE-issued Class Patent Waiver to the Contractor and the Contractor may elect to retain title to such inventions subject to retention by the Federal Government of march-in-rights and a non-exclusive, non-transferrable, irrevocable, paid-up license to practice or have practiced for or on behalf of the U.S. the invention throughout the world.

IX. Audits of Projects

The Defense Contract Audit Agency (DCAA) audits DOE Contractors and subcontractors including those who perform Work for Others projects. These audits may disclose a need for adjustments to overhead rates or other applicable charges. Should this occur, the Sponsor would be responsible for any additional costs as a result thereof.

X. Environmental, Safety, and Health Compliance

All DOE work activities, including Work for Other Federal Agencies conducted by DOE and DOE Contractors, shall comply with applicable environmental, safety, and health (ES&H) statutes, regulations, standards, etc.

XI. Points of Contact

A. Department of Energy, Oak Ridge Operations Office:

1. Mac Roddye

Program Manager
Department of Energy
Oak Ridge Operations Office
Post Office Box 2008
Building 4500-N, Mailstop 6269
Oak Ridge, Tennessee 37831-6269
Commercial or FTS (423) 576-7705

2. Darlene Cooper

Work for Others Coordinator
Department of Energy
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M-6, Room G209
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Oak Ridge, Tennessee 37831-8650
Commercial or FTS (423) 576-0646

B. Oak Ridge Associated Universities Contacts:

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1. Dale Condra

Program Manager
Radiological Safety, Assessments and Training
Oak Ridge Associated Universities
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Administrative/Fiscal:

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