General Radioactive Material (G-RAM) Radiological Survey Report for Facilities at Naval Support Activity Memphis, TN

Prepared by
Supervisor of Shipbuilding Conversion and Repair, USN
Portsmouth, Virginia
Environmental Detachment Charleston
North Charleston, South Carolina
18 May,1998

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EXECUTIVE SUMMARY

A. Purpose

This document is the General Radioactive Material (G-RAM) Radiological Final Report of surveys conducted at Naval Support Activity (NSA) Memphis, Tennessee. The document has been prepared pursuant to the Defense Base Realignment and Closure (BRAC) Act of 1993, as amended, which authorized the realignment of Naval Air Station Memphis. The purpose of this report is to catalog and present the results of the radiological survey.

This report addresses G-RAM applications of radioactivity. These include Radiological Affairs Support Program (RASP) material and unregulated consumer products. This report also addresses the individual area survey reports.

B. Plan

- Ensure removal of all G-RAM related material.
- Identify any areas containing radioactive material or elevated background radiation levels.
- Meet State and Federal radiological environmental, and safety regulations.
- Complete surveys within the allocated funding and time frame.

A radiological survey plan was developed to survey over 73,000 square feet with portable instrumentation and take and analyze solid material samples from throughout the facilities undergoing the survey process. Facilities identified for survey were identified by their work history and probability of containing any residual G-RAM.

C. Conclusions

- Building N-126 is radiologically acceptable for release to the local community for unrestricted use with respect to G-RAM radioactivity.

- Facility 885 warrants further investigation due to discrete locations with elevated background radiation levels.

SECTION 1
SUMMARY OF THE SURVEY PLAN

A. Introduction

For the Naval Support Activity (NSA) Memphis property to be released to the public for use, surveys of areas having the possibility of containing radioactivity associated with G-RAM operations had to be surveyed to confirm the property met free release criteria. Any areas containing G-RAM above release criteria was to be identified.

Consequently, extensive surveys with sensitive radiation detection, indicating and computation (RADIAC) instruments were performed over all areas where radioactive material was suspect of being handled or stored. In addition, solid material samples were obtained and radioisotopic analysis performed. The type and extent of the surveys required were based on the radiological history of the property. Areas were classified according to their potential for containing radioactivity.

B. The Process

1. The basic considerations used in the plans development were:

   - Ensure removal of all known radioactive material prior to the radiological survey of a specific site, area, or facility.

   - To divided all areas into classifications based on radiological history. (For the purpose of the plan, radiological history referred to the catalog of facts, written or oral, with respect to the handling or use of radioactive material or radioactivity),

   - The specific sites, areas or facilities were surveyed for residual radioactivity. The following techniques were used to verify the removal of radioactivity in excess of the maximum permissible limits specified for G-RAM.

     - Direct scan of surfaces using a sensitive gamma-scintillation detector (IM-253 with a SPA-3 Probe or equivalent).

- Direct scan of surfaces for beta-gamma radioactivity using a SHP-360 Geiger-Mueller frisker probe attached to an IM-247/PD or its equivalent.

- Determining the existence of loose surface alpha-beta radioactivity through the use of swipes/smears ans swabs analyzed through the use of a Eberline Corporation, Model SAC 4 Alpha Scintillation Counter.

- Analyzing potentially contaminated earth (e.g. sand or soil) through the use of gamma spectroscopy.

2. The extent of the surveys and sampling were commensurate with the potential for radioactive contamination of the area(s). Areas which had a higher potential to be radioactively contaminated received more extensive surveys.

3. Rooms and areas were classified, using the following categories, in accordance with radioactivity contamination potential:

   - Class 1: Those areas where G-RAM, or products containing G-RAM, were used or stored and radiological history indicates that the potential existed for contamination levels significantly above the limits identified in Table .

   - Class 2: Those areas where G-RAM, or products containing G-RAM were stored or used and radiological history indicates that the potential existed for contamination levels at or slightly above the limits identified in Table .

   - Class 3: Those areas where age and the availability of documented history or anecdotal information regarding previous use or storage of G-RAM, or products containing G-RAM, were inadequate or incomplete to discount the potential presence of residual contamination levels. A Class 3 area may, however, have an unknown or incomplete history of use or storage of products with trace quantities of G-RAM which were generally exempt from existing controls and regulations. Due to inadequate evidence to the contrary, prudence dictated that a survey be performed. In a Class 3 area there was no known history of radioactive spills and no documented evidence of radioactive contamination.

C. Determination of Natural Background Radiation Levels

Two primary sources contribute to natural or background radiation; terrestrial origin and cosmic. Terrestrial is the dominant component of background radiation. Rocks, soils, water, air plants and animal life contain some natural radioactivity. The most significant terrestrial radioisotopes are potassium-40, uranium-238 and thorium-232 and their decay products which include radium-226, radon-222 and their daughters.

Cosmic radiation originates from the stars in outer space and is a relatively small portion of the "natural" background. This radiation, in the form of high energy particles, originates form outer space. These particles interact with the earth's atmosphere and produce charged particles, gamma rays and neutrons.

Background radiation levels vary widely with location (as much as a factor of 10 or more). This is caused by several factors. The geology of the area can cause significant variation in the background levels. For example, areas rich in rock formations such as granite, which generally contain some quantity of uranium and its progeny, often exhibit higher natural background radiation levels tan an area where no rock formations are present. Consequently, terrestrial background is highly dependent on the composition, mix and type of soil.

Within a relatively small area, background radiation levels vary significantly, particularly in a setting where activity in the soils may not be distributed uniformly and construction materials may vary, e.g. multiple pours of concrete or asphalt, containing different aggregates from different sources with significantly differing amounts of natural radioactivity.

The protocol for background determination called for surveys to be performed in unaffected structures and areas similar in all respects to the structure or area being surveyed. The scope of the background determination surveys in these analogous areas was based on the size and physical configuration of the area. For example, an outdoor area paved with asphalt would be scanned near the perimeter and at several locations in the center and the readings would be averaged to determine the specific background value for the area. In the case of a building with a concrete floor and concrete block walls it was necessary to take more readings. In the center of the structure, background levels are generally less than near the walls.

This is because in the center, the primary contributor to the background levels is the floor, while near the walls of the structure the floors and walls contribute to the levels. In some areas, because of the differences in the levels near the walls as opposed to the interior areas of the building not directly adjacent to the walls, it was necessary to assign different background levels to the grids adjacent to the walls than to those in the interior of the building.

The analogous areas were surveyed with both the IM-247 and the IM-253 to provide background readings for all the surveys to be done in the affected areas. The characteristics of these instruments are discussed in Section . In addition, a rapid scan of the affected area was conducted prior to the actual survey to ensure that no significant differences or anomalies existed which could invalidate the survey results.

D. G-RAM Criteria NSA Memphis Surveys

1. Surface Contamination Limits: The limits used for unrestricted use of the surveyed facilities are radionuclide-specific. The surface contamination limits are consistent with those established by the Radiological Affairs Support Program (RASP) and the Nuclear Regulatory Commission (NRC). Table 1-1 lists the surface contamination limit criteria established for the radiological surveys of NSA Memphis areas addressed above.

Table 1-1. Surface Contamination Limits

Radionuclide [1]	Average [2], [3], [6], [8]	Maximum [2], [4], [6], [8]	Removable [2], [5], [8]
Natural uranium, ^{235}U, ^{238}U, and associated decay products	5,000 dpm α/100 cm² (2,250 pCi/100 cm²)	15,000 dpm α/100 cm² (6,750 pCi/100 cm²)	1,000 dpm α/100 cm² (450 pCi/100 cm²)
Transuranics, ^{226}Ra, ^{228}Ra, ^{230}Th, ^{228}Th, ^{231}Pa, ^{227}Ac, ^{125}I, ^{129}I	100 dpm/100 cm² (45 pCi/100 cm²)	300 dpm/100 cm² (135 pCi/100 cm²)	20 dpm/100 cm² (9 pCi/100 cm²)
Natural thorium, ^{232}Th, ^{90}Sr, ^{223}Ra, ^{224}Ra, ^{232}U, ^{126}I, ^{131}I, ^{133}I	1,000 dpm/100 cm² (450 pCi/100 cm²)	3,000 dpm/100 cm² (1,350 pCi/100 cm²)	200 dpm/100 cm² (90 pCi/100 cm²)
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ^{90}Sr and others noted above [7]	5,000 dpm β-γ/100 cm² (2,250 pCi/100 cm²)	15,000 dpm β-γ/100 cm² (6,750 pCi/100 cm²)	1,000 dpm β-γ/100 cm² (450 pCi/100 cm²)

[1] Where surface contamination by both alpha and beta-gamma emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should be applied independently.
[2] As used in this table, dpm (disintegrations per minute) 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.
[3] Measurements of average contaminant should not be averaged over more than one square meter. For objects of less surface area, the average should be derived for each object.
[4] The maximum contamination level applies to an area of not more than 100 cm².
[5] The amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying a 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 and the entire surface should be wiped. Except for transuranics and ^{226}Ra, ^{228}Ra, ^{227}Ac, ^{228}Th, ^{230}Th and ^{231}Pa alpha emitters, it is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.
[6] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at one centimeter and 1.0 mrad/hr at one centimeter, respectively, measured through not more than seven milligrams per square centimeter of total absorber.
[7] This category of radionuclides includes mixed fission products, including the ^{90}Sr which is present in them. It does not apply to ^{90}Sr which has been separated from the other fission products or mixtures where the ^{90}Sr has been enriched.
[8] 100 dpm = 45 pCi

2. Radioactivity Concentration Limits: The radioactivity concentration limit was 5 picocurie per gram (5 pCi/g) above natural background for ^{226}Ra and ^{232}Th in building materials. This limit also applies to solid material (sediment) samples

obtained from fluid systems and any other media. This limit is consistent with the Code of Federal Regulations, Title 40, Part 192 (40 CFR 192) for uranium and thorium mill tailings and thorium byproduct material.

E. Significant Radionuclide Considerations of The Survey Plan

Based on the history of NSA Memphis, the significant contaminants associated with the RASP and G-RAM was technologically enhanced Ra-226. It was suspected that Ra-226 was incorporated into radioluminescent products.

SECTION 2
SURVEY AND SAMPLING TECHNIQUES AND INSTRUMENTATION

A. Introduction

RADIAC instrumentation was required to perform the surveys. Environmental Detachment Charleston personnel used instruments supplied by the Naval Sea Systems Command Detachment, Radiological Affairs Support Office.

B. Radiation Equipment Used for Direct Surveys

1. Gamma Scintillation Survey Equipment

The Eberline Instrument Corporation, Model E-600 count rate meter with a Model SPA-3 scintillation probe assembly was used for the gamma scintillation surveys carried out during the survey process.

For the purpose of this report it will be referred to as the IM-253/PD. As such:

- The gamma scintillation detector probe consists of a cylindrical housing containing a 2-inch diameter by 2-inch long sodium iodide with thallium [NaI(Tl)] crystal. It has a linear scale ranging from 0 to 1,000 counts per minute (cpm). Scale multipliers of X1, X10, X100, and X1,000 are selected according to the radiation levels being measured.

- It was calibrated to respond to an energy range which includes the ^{226}Ra gamma ray of 0.1862 MeV while in the pulse height analyzer (PHA) counting mode, and to energies from 0.1 MeV to approximately 8.0 MeV while in the GROSS mode.

- Each instrument was response checked to a Ra-226 source daily prior to its use in conducting surveys.

- Typical detection characteristics of the IM-253/PD are an accuracy of ± 20% and a minimum sensitivity of 100 cpm.

2. **Beta-Gamma Survey Equipment**

Direct scan surveys for beta and gamma radioactivity were performed using a SHP-360 Geiger-Müeller frisker probe, attached to the Eberline Model E-600 rate meter. The SHP-360 probe is an unshielded probe used for performing surveys in low background areas. These instruments and probes are referred to as an ***IM-247/PD***. They were used to detect both fixed and loose surface radioactive contamination. As such:

- It has three linear scales of 0 to 500, 0 to 5,000, and 0 to 50,000 cpm.
- The SHP-360 probe consists of a 900 V, 2-inch diameter flat Geiger-Müeller tube having a window thin enough to transmit a high percentage of the low energy beta particles, less than 200 keV betas.
- Each instrument was response source checked daily prior to its use in conducting surveys. This check will consist of verifying that the indication of the meter responds correctly to a known value.
- Each instrument had been calibrated within the last year.
- Typical detection characteristics of the IM-247 are an accuracy of ± 20% and a minimum sensitivity of 25 cpm.

3. **Alpha Counting System**

An Eberline Model SAC 4 Alpha Scintillation Counter was used for counting swipes for alpha radiation.

C. **Survey Techniques**

1. **Scan Surveys**

- 100% of the surface of each grid or sub-grid (see Section 4) was monitored. Multiple detectors were mounted on a cart such that the face of the detector was within ½ inch of the surface. The cart was maneuvered such that 100%

of the surface of the grid was monitored. Areas where the cart could not go were hand monitored.

- A wide energy band, gamma scan survey was conducted with an IM-253/PD with a SPA-3 probe operating in the GROSS mode. A narrow energy band, gamma scan survey was conducted with an IM-253/PD operating in the PHA mode. In the PHA mode the instrument will detect photons from ^{214}Pb which is a decay isotope of ^{226}Ra. A reading exceeding twice background in either mode required an investigation and identification of cause.

- A beta-gamma scan survey was conducted with an IM-247/PD. Any level equal to or greater than twice background also was considered to be unsatisfactory and additional surveys were required to determine if this was a variation in background or evidence of a small amount of contamination.

- Scanning speeds (rate of probe movement) were normally one to two inches per second for gamma scintillation and beta-gamma surveys. Scan rates were reduced when surveying in areas with high background or fluctuating radiation levels wherein the detection of radioactivity above the limit is more difficult to distinguish.

- The scanning detector was held within one-half inch of the surface for gamma and beta-gamma measurements. (To ensure absolute compliance with the one-half inch distance factor the probes were mounted on the base of a survey cart which was moved over the surfaces to be monitored). The detector was held (or placed) such that its most sensitive portion was parallel to the surface. Scanning practices included using the audible response (speakers or headphones) of the RADIAC for detection and, after stabilization, using the digital display response for measurement.

2. **Walk-Through Surveys**

- Performed with a gamma scintillation meter (IM-253/PD) operating in the GROSS mode. Walk-through surveys were performed by holding the detector probe approximately six inches above the deck/floor and walking

slowly through the specific site and stopping every ten feet (approximately) or when increases in count rates were observed.

- Scanning practices included using the audible response (speakers or headphones) of the RADIAC for detection and, after stabilization, using the meter response for measurement.

- The speed of the walk-through surveys was no more than one foot per second.

- Walk-through surveys included traverse routes, tool storage areas, office spaces and work areas. Any sustained increase above background was investigated by a more detailed survey of the suspect area.

3. **Removable Surface Contamination Surveys (Swipes/Smears)**

   - Conducted as necessary to determine if radioactivity above the limit is removable (or loose).

     - Performed by wiping a 100 cm^2 surface applying moderate pressure with a dry filter paper (smear/swipe).

     - Measurements of a contaminant were not averaged over more than one square meter. For objects of less surface area, the average should be derived for each object.

   - Swipes were used to make loose surface contamination surveys of cracks and crevices where potential residual radioactivity could not be detected by other survey methods.

   - Swipes/smears were monitored in the field using the Eberline Alpha Scintillation Counter.

4. **Supplemental Surveys**

   Remaining ventilation ducts, electrical boxes, conduit or other interior surfaces of equipment in affected areas which could have contained residual

contamination, were accessed at random and surveyed by scanning or swiping.

5. **Fluid System Surveys**

Fluid systems suspected of being exposed to radioactivity were surveyed. These systems were opened at convenient locations for access and appropriate surface contamination surveys performed. In addition:

- Some system accumulators (e.g., valves, strainers, S- and U-shaped bends, traps, areas of low fluid flow, etc.) where particulate may have settled or mixed with sediment were accessed and surveyed for radioactivity.

6. **Solid Material Samples**

These refer to samples of material such as concrete, asphalt, wood, and other material retrieved from a specific site for analysis of radioactivity concentration.

- Samples were analyzed by gamma spectrometry.

- Solid material samples were obtained by coring to a depth sufficient to obtain a sample representative of the radioactivity deposited or naturally-occurring in that area.

D. **Control of Samples**

To ensure the integrity of the samples, sample identification, collection and chain of custody procedures were established.

1. To maintain and document sample possession, chain-of-custody procedures were followed.

   - Sample Custody: All samples collected were maintained under secure conditions.

   - Transfer of Custody and Shipment: Samples were accompanied by a Chain-of-Custody Sheet. When transferring the possession of samples, the individual relinquishing and the individual receiving sign,

date, and note the time on the record. This record documents the sample custody transfer.

- Sample Packaging: Samples were collected and placed in bags at the point of generation.

2. Samples were retained in storage for as long as possible to support analysis data.

SECTION 3
RADIOLOGICAL SURVEY STRATEGY

A. Discussion

While the G-RAM survey plan was in compliance with the requirements of the RASP manual, it also followed the same general outline of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). It included:

- Review of use and work history.
- Identifying specific areas that would require a G-RAM radiological survey.
- Ensuring all radioactive material was removed prior to surveying.
- Gridding areas and survey grids.
- Conducting background radiological surveys.
- Conducting the free release surveys.
- Investigating unusual results.
- Preparing summary and providing detailed records.

B. Personnel Training

The individuals chosen to conduct the surveys were previously trained fully qualified radiological control technician (RCTs) or health physicists (HP). The RCTs met the requirement of training found in Article 106.2.b of NAVSEA 389-0288, "Radiological Controls For Shipyards." The requirements for an HP were to meet the educational requirements found in the OPM Handbook X-118. All surveys were reviewed by the Quality Assurance Branch of the Environmental Detachment Charleston.

SECTION 4
CLASSIFICATION AND SURVEY PROCEDURES

A. Area/Facility Classification and Survey Procedures

1. Specific sites were categorized into different classifications based on G-RAM contamination potential.

2. Each specific site was marked and divided in the manner outlined below. Typically, a grid system was labeled such that each grid is uniquely identified with an abscissa-ordinate coordinate as in a two-dimensional Cartesian system. The abscissa was labeled with letters, while the ordinate was labeled with numerals. The result was an alpha-numeric designator, such as A1, B2, AA1, BB2, etc., that is unique to each grid.

3. The following provides the survey requirements for each of the survey classifications.

   - Class 1 areas were those areas where G-RAM, or products containing G-RAM, were used or stored and radiological history indicated that the potential existed for contamination levels significantly above the limits identified in Table 1-1.

     - Refer to Figure 4-1 for illustrative clarity.

     - Deck/floor surfaces were divided and marked into 5-foot by 5-foot square grids. The lower 6-foot surfaces of each wall was horizontally divided into 5-foot grids to effect a pattern of grids 6-feet high and 5-feet wide.

     - Each grid was identified with a unique designation.

     - A narrow gamma energy range scintillation scan survey (IM-253/PD operating in the PHA mode) was performed over 100% of the grid surface.

     - A wide gamma energy range scintillation scan survey (IM-253/PD operating in the GROSS mode) was performed over 100% of the grid surface.

- A beta-gamma scan survey (IM-247/PD) was performed over 100% of the grid surface.

- A minimum of one swipe/smear was taken in each grid.

- Approximately 25% of accessible cracks and crevices in the specific site were surveyed via swipes. Accessibility to, the location of, and the number of cracks and crevices was determined by engineering evaluation and was based on radiological potential.

- If necessary, a solid surface material sample was taken from each grid. The location of the sample was based on the results of the radiological surveys described previously. The sample was taken from the areas of the grid having the highest potential for radioactivity (i.e., the area having the highest reading).

- The radioactive concentration (as determined by gamma spectrometry in units of pCi/g) of solid material sample(s) previously collected in each grid was mathematically equated to surface contamination (in units of dpm/100 cm^2 or pCi/100 cm^2). Calculations were based on samples collected over an approximate surface area of 250 cm^2.

- Remaining ventilation ducts, electrical boxes, conduit or other interior surfaces of equipment and services in affected areas, which may contain residual contamination, were accessed at random and surveyed by scanning, swiping or swabbing. Surveys of undisturbed surfaces was also be performed.

- Fluid systems having a potential of being radioactively contaminated were accessed and surveyed for surface contamination. Solid sediment, if available, was evaluated with an MCA.

• Class 2 areas were those areas where G-RAM, or products containing G-RAM, were used or stored and radiological history indicates that potential existed for contamination levels at or slightly above the limits identified in Table 1-1.

- Refer to Figure 4-2 for illustrative clarity.

- Deck/floor surfaces were divided and marked into 10-foot by 10-foot square grids. The lower 6-foot surfaces of each wall were horizontally divided into 10-foot grids to effect a pattern of grids 6-feet high and 10-feet wide.

- Each deck/floor grid was sub-divided into quadrants to effect four 5-foot by 5-foot square sub-grids.

- Each wall surface was sub-divided into quadrants to effect a pattern of sub-grids 3 feet high and 5 feet wide.

- Each grid and quadrant/sub-grid was identified with a unique designation.

- A narrow gamma energy range scintillation scan survey (IM-253/PD operating in the PHA mode) was performed over two diagonal quadrants to represent 50% of the grid surface.

- A wide gamma energy range scintillation scan survey (IM-253/PD operating in the GROSS mode) was performed over the other two diagonal quadrants to represent the remaining 50% of the grid surface.

- A beta-gamma scan survey (IM-247/PD) was performed over 100% of the grid surface.

- A minimum of two swipes/smears was taken in each grid.

- Approximately, 10% of accessible cracks and crevices in the specific site was surveyed via swabs. Accessibility to, the location of, and the number of cracks and crevices was determined by engineering evaluation and was based on radiological potential.

- If necessary, a solid surface material sample was taken from each grid. The location of the sample was based on the results of the radiological surveys described previously. The sample was taken from the areas of

the grid having the highest potential for radioactivity (i.e., the area having the highest reading). If no area(s) has been identified, the sample was taken near the center of the grid.

- The radioactive concentration (as determined by gamma spectrometry in units of pCi/g) of solid material sample(s) previously collected in each grid was mathematically equated to surface contamination (in units of dpm/100 cm^2 or pCi/100 cm^2). Calculations were based on samples collected over an approximate surface area of 250 cm^2.

- Remaining ventilation ducts, electrical boxes, conduit or other interior surfaces of equipment and services in affected areas, which may contain residual contamination, were accessed at random and surveyed by scanning, swiping or swabbing. Surveys of undisturbed surfaces was also performed.

- Fluid systems having a potential of being radioactively contaminated were accessed and surveyed for surface contamination. Solid sediment, if available, was evaluated with an MCA.

- Class 3 areas were those areas where age and the lack of documented history or anecdotal information regarding previous use or storage of G-RAM, or products containing G-RAM, was either inadequate or too incomplete to discount the potential presence of residual contamination levels.

  - Refer to Figure 4-3 for illustrative clarity.

  - Size of grids were determined on site.

  - No sub-grids were required.

  - Each grid was identified with a unique designation.

- A narrow gamma energy range scintillation scan survey (IM-253/PD operating in the PHA mode) was not required unless survey readings required further investigation.

- A wide gamma energy range scintillation walk-through scan survey (IM-253/PD operating in the GROSS mode) was performed over the specific site.

- Surveying was performed along transects approximately five to six feet apart such that representative measurements of potentially deposited surface contamination was obtained.

- At approximately ten-foot intervals along the survey path, wide gamma energy range scintillation point (static) measurements (IM-253/PD operating in the GROSS mode) were taken.

- Point (static) measurements were required when sustained increases in count rates were observed.

- If it were necessary to quantify surface contamination, solid (surface) material samples were collected from the suspect location for accurate assessment.

- Walk-through surveys performed in high potential areas (i.e., scrap bins) included the walk-through surveys supplemented by a more concentrated scan survey.

- Swipes were not required on outdoor surfaces such as soil or asphalt.

- Table 4-1 summarizes the requirements for each of the above survey classifications.

Figure 4-1. Typical Class 1 Grid System and Scan Survey Scheme

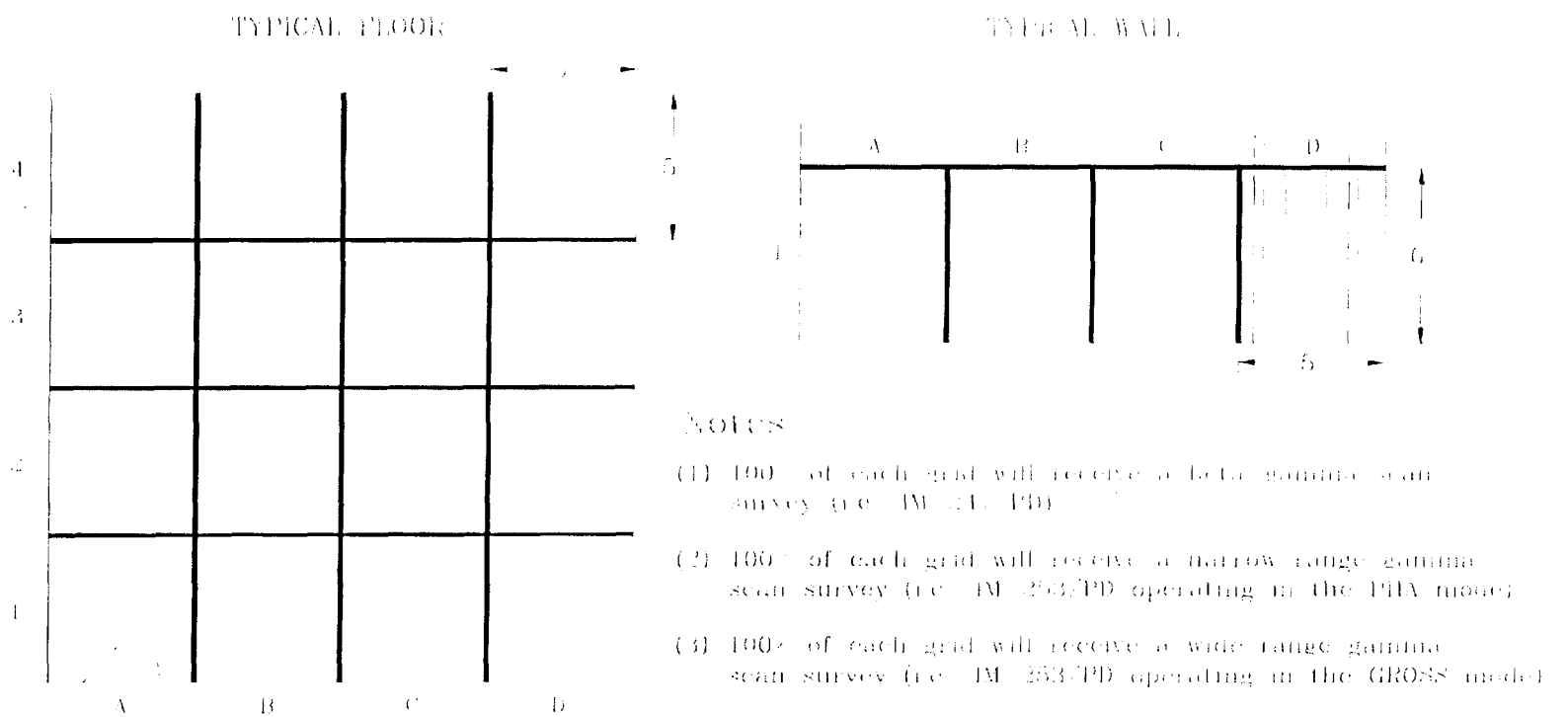
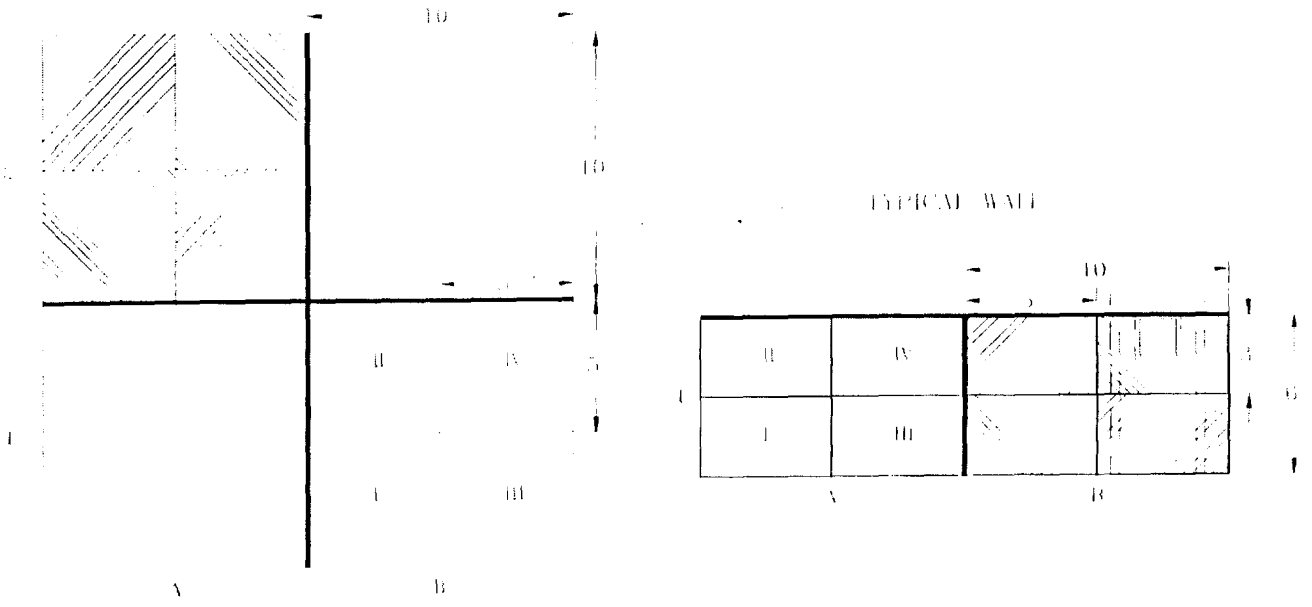


Figure 4-2. Typical Class 2 Grid System and Scan Survey Scheme



Legend:

Denotes sub grids to receive a narrow range gamma scan survey (i.e. IM 25.3 PD operating in the PHA mode). This survey scheme represents 50% survey coverage of each grid.

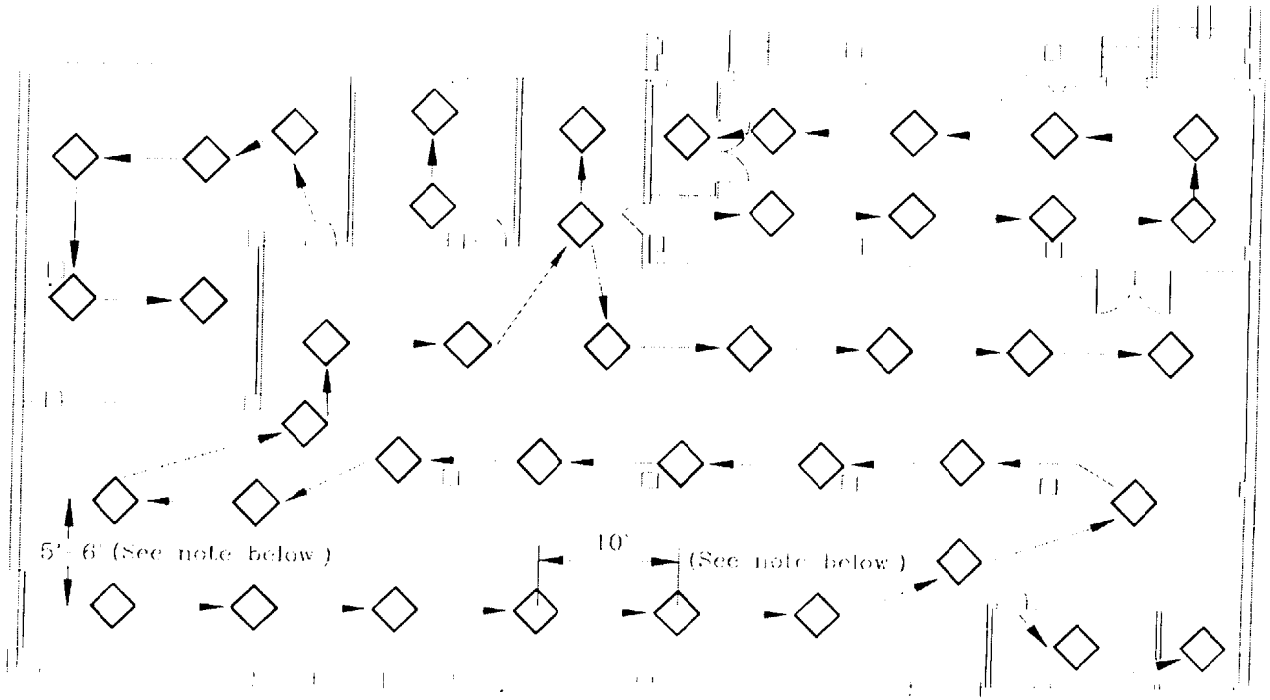
Denotes sub grids to receive a wide range gamma scan survey (i.e. IM 253 PD operating in the GROSS mode). This survey scheme represents an additional 50% survey coverage of each grid.

Notes:

(1) 100% of each grid will receive a beta gamma scan survey (i.e. IM 247 PD).

(2) The lower six feet of walls will be gridded and surveyed.

Figure 4-3. Typical Class 3 Walk-through Survey Scheme



Legend:

→ Denotes typical survey path ◇ Denotes typical location of point (static) measurements

Notes:

(1) Survey paths are typically parallel and five to six feet apart.

(2) Point (static) measurements are typically taken at ten foot intervals.

(3) Walk through surveys are performed with the IM 253/PD, gross mode.

Table 4-1. Surveying and Sampling Requirements According to Class

Requirement	Class 1 Area	Class 2 Area	Class 3 Area
Grid System	5' X 5' deck grids. Lower 6' of walls divided every 5' to effect 5'(w) X 6'(h) grids.	10' x 10' deck grids. Lower 6" of walls divided every 10' to effect 10'(w) X 6'(h) grids.	Judgmental
Sub-Grid System	Not required	5' X 5' deck quadrants 5'(w) X 3'(h) wall quadrants	Not required
Narrow γ Energy Range Scan Surveys (IM-253/PD: PHA)	100% of grid surface	50% of grid surface	Not required
Wide γ Energy Range Scan Surveys (IM-253/PD: GROSS)	100% of grid surface	Remaining 50% of grid surface	Walk-through survey
β-γ Scan Surveys	100% of grid surface	100% of grid surface	Not required
Swipes (Smears)	1 (minimum)	2 (minimum)	Not required
Swabs	See Note 1	See Note 1	Not required
Solid Material Sampling	Survey results determined the number and location of samples taken.		
Supplemental Surveys[1]	Required only for Class 1 & 2 Areas. Remaining ventilation ducts, electrical boxes, conduit or other interior surfaces of equipment and services, which may contain residual contamination, were accessed at random and surveyed by scanning, swiping or swabbing. Surveys of undisturbed surfaces were performed.		
Fluid System Surveys[1]	Required only for Class 1 & 2 Areas. Fluid systems having a potential of being radioactively contaminated were accessed and surveyed for surface contamination. Solid sediment, if available, was evaluated with an MCA.		

1. Accessibility, location and number was determined via engineering evaluation and was based on radiological potential.

SECTION 5
AREAS AND FACILITIES REQUIRING RADIOLOGICAL SURVEYS

A. Areas and Facilities Requiring Radiological Surveys

The following areas and facilities received a radiological survey.

Table 5-1
Areas/Facilities Receiving a Radiological Survey

AREA/FACILITY	CLASS OF SURVEY
BUILDING N-126, CALIBRATION AREA, ROOM 119	CLASS 1
BUILDING N-126, CALIBRATION AREA, ROOM 127	CLASS 1
BUILDING N-126, CALIBRATION AREA, ROOM 128	CLASS 1
BUILDING N-126, CALIBRATION AREA, ROOM 129B	CLASS 1
BUILDING N-126, CALIBRATION AREA, ROOM 129C	CLASS 1
BUILDING N-126, CALIBRATION AREA, ROOM 129	CLASS 1
BUILDING N-126, CALIBRATION AREA, WELDING SHOP CAGE	CLASS 3
FACILITY 885, SCRAP YARD	CLASS 3

SECTION 6
QUALITY ASSURANCE PROGRAM

A. Objectives

1. This section of the report summarizes the quality provisions used in this comprehensive survey project to assure surveys were satisfactory. The effectiveness of the survey was demonstrated by the over-sight of representatives from the USEPA and the State of Tennessee's TDEC. The quality provisions of this plan included: using qualified and trained personnel, careful review of available site specific information, multiple reviews of survey data, daily response checks of survey equipment and independent reviews.

2. The quality control/quality assurance provisions used during the survey met or exceeded the requirements of the MARSSIM or RAD-10 Manuals.

B. Training and Qualification of Personnel

1. The extent of training and qualification for the project personnel was commensurate with the education, experience and individual proficiency. Individuals held prior or current qualifications of Radiological Control Technician, Health Physicist and/or Radiation Safety Officer. The individuals utilized for this project have 30 years of radiological control experience which includes field surveying, calibration of analytical instruments, radiological project management, radiation safety, data evaluation, record keeping, and audits and surveillances.

C. Work Control

1. A detailed, written survey plan was prepared and used for this project. Trained personnel performed the work and assured the accuracy of the data recorded and performed signature certification. Regulatory representatives provided on-site work review.

2. Signature chain-of-custody was maintained on all samples to ensure that the samples taken from a specific location were counted and recorded for the proper location.

D. **Survey Data Review**

1. There were multiple reviews of survey data for completeness, validity and accuracy. They included a review by the surveyors, project leader and internal quality assurance group.

2. Computer programs were used to check data and to provide verification that all data required by the survey plan had been obtained and was within the required specifications.

3. All survey data contained in this comprehensive report was reviewed by senior management personnel.

E. **Measuring Equipment Calibration and Checks**

1. All measuring and test equipment was maintained and calibrated in accordance with the standard Navy calibration program. Additionally, field radiation detection equipment was checked on a daily basis to a known quantity of radioactivity (source) traceable to a National Institute of Standards and Technology (NIST) standard. This check ensured proper instrument response to radioactivity. Also, a quality data point was taken at the start of each survey and a second point taken at the end of the survey to verify proper operation of the equipment.

2. Solid material samples were submitted to a qualified laboratory for analysis.

F. **Audits and Reviews**

1. Numerous checks and cross-checks were included during the survey process. An independent audit by the quality assurance group which assessed the overall results was performed.

2. The USEPA and TDEC reviewed the survey plan and performed independent observations, and over-check surveys and sampling of the facilities and areas.

SECTION 7
SURVEY RESULTS

A. Building N-126

1. Introduction

Building N-126 was constructed as an aircraft hanger in 1955. It is located at or near grid 58-3B of Public Works Drawing titled, "Map of Naval Support Activity Memphis" dated 9 February 1996.

2. Description

Building N-126 is made of concrete and block and has a concrete slab. Two story office wings are located on each side of the hanger.

3. Brief History

(a) **Use:** Building N-126 has been continuously used as an aircraft hanger for maintenance and operations support. Building N-126 is currently leased to the City of Millington, Tennessee.

(b) **Radiological History:** An interview with a former employee indicated the possible use of a small amount of radioactive paint (probably radium) to mark the dials on aircraft equipment during the 1950's and early 1960's. Interviews with other individuals could not confirm this claim. The one area where this operation would have occurred was determined to be the calibration laboratory located in the southwest corner of the building. This area received a Class 1 survey. In addition, there was a welding cage area near the calibration laboratory which received a Class 3 survey.

(c) **Survey Requirements:**

1. Class 1 release survey.
2. Class 3 release survey.

4. Discussion

Class 1:

For the Class 1 survey the floor of the 6 rooms of the Calibration Laboratory was divided into a total of 86 grids with a maximum size of 5' by 5'.

The walls were horizontally divided into 100 grids with a maximum size of 6' high and 5' wide.

Each grid was identified with its own unique designator.

A beta-gamma scan survey with the IM-247/PD was performed over 100% of the grid surface.

A narrow gamma energy range scintillation scan survey with the IM-253/PD (PHA mode) was performed over 100% of the grid surface.

A narrow gamma energy range scintillation scan survey with the IM-253/PD (GROSS mode) was performed over 100% of the grid surface.

A minimum of one swipe/smear was taken in each grid.

A minimum of 25% of accessible cracks and crevices in the specific site were surveyed.

Ventilation ducts, hoods and surfaces of work benches were surveyed with swipes.

Sinks, sink traps and piping were surveyed with the IM-247/PD, and the IM-253/PD operating in the GROSS and PHA mode.

Background levels used in the calibration laboratory of Building N-126 were determined from similar materials in other areas of Building N-126.

Class 3:

A wide gamma energy range scintillation walk-through scan survey (IM-253/PD operating in the GROSS mode) was performed over the specific site.

Surveying was performed along paths approximately five to six feet apart such that representative measurements of potentially deposited surface contamination was obtained.

At approximately ten-foot intervals along the survey path, wide gamma energy range scintillation point (static) measurements (IM-253/PD operating in the GROSS mode) were taken.

5. **Summary**

Class 1 Summary:

Surveys performed in the Class 1 areas with the IM-247/PD did not detect any areas having surface radioactivity greater than or equal to twice background.

Surveys performed with the IM-253/PD (PHA) did not detect areas greater than or equal to twice background.

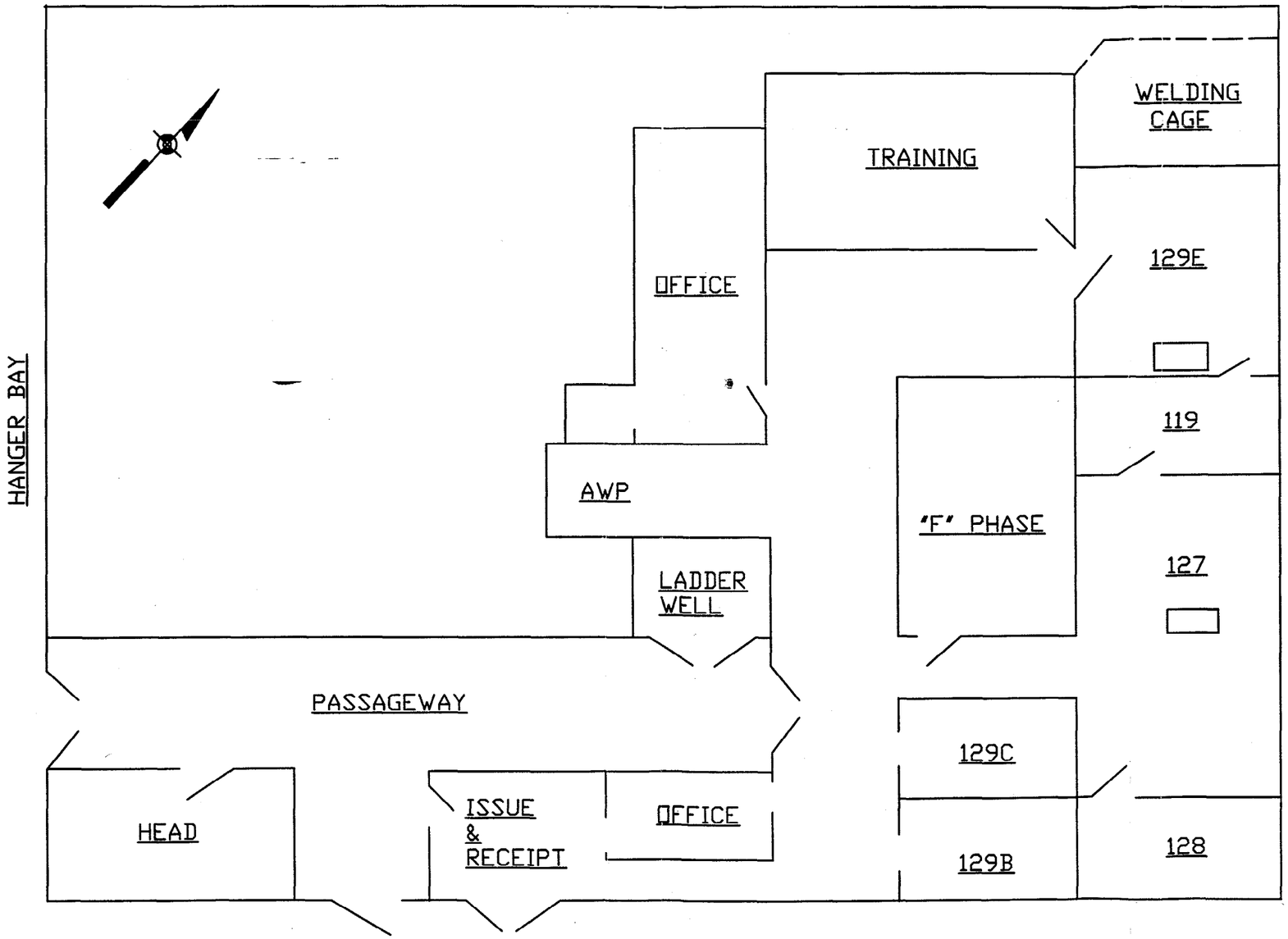
Surveys performed with the IM-253/PD (GROSS) did not detect areas greater than or equal to twice background.

Analysis of swipes with the alpha scintillation counter indicated that removable Ra-226 levels were less than 9 pCi/100cm^2. The alpha scintillation counter indicated that all removable Ra-226 levels were less than 0.9 pCi/100cm^2.

Class 3 Summary:

Surveys performed in the Class 3 area with the IM-253/PD (GROSS) did not detect areas greater than or equal to twice background.

6. **Maps**


HANGER BAY
WELDING CAGE
TRAINING
OFFICE
129E
119
AWP
"F" PHASE
127
LADDER WELL
PASSAGEWAY
129C
HEAD
ISSUE & RECEIPT
OFFICE
129B
128

00611FBIZ

ROOM 119

W-1

	1	2	3	4	5
A	1- 33 2- 8 3- 1000 4- 900 5- 8000 6- 7300 7- <0.9	1- 33 2- 2 3- 1000 4- 800 5- 8000 6- 7200 7- <0.9	1- 33 2- 6 3- 1000 4- 950 5- 8000 6- 7300 7- <0.9	1- 33 2- 10 3- 1000 4- 800 5- 8000 6- 7800 7- <0.9	1- 33 2- 15 3- 1000 4- 1000 5- 8000 6- 8500 7- <0.9
B	1- 33 2- 10 3- 1000 4- 950 5- 8000 6- 8000 7- <0.9	1- 33 2- 8 3- 1000 4- 850 5- 8000 6- 8200 7- <0.9	1- 33 2- 6 3- 1000 4- 950 5- 8000 6- 8000 7- <0.9	1- 33 2- 10 3- 1000 4- 1000 5- 8000 6- 8300 7- <0.9	1- 33 2- 15 3- 1000 4- 1300 5- 8000 6- 9000 7- <0.9

W-4 (left) W-2 (right)

W-3

FLOOR

DATA LEGEND:

1- IM-247/PD [bkg.]
2- IM-247/PD [cpm]
3- IM-253/PD (PHA) [bkg.]
4- IM-253/PD (PHA) [cpm]
5- IM-253/PD (GROSS) [bkg.]
6- IM-253/PD (GROSS) [cpm]
7- Ra-226 Removable Radioactivity [pCi/100cm2]; Regulator value <9

WALL-1

	1	2	3	4	5
A	1- 33 2- 10 3- 1000 4- 1000 5- 8000 6- 8900 7- <0.9	1- 33 2- 8 3- 1000 4- 900 5- 8000 6- 7000 7- <0.9	1- 33 2- 8 3- 1000 4- 950 5- 8000 6- 7500 7- <0.9	1- 33 2- 6 3- 1000 4- 1000 5- 8000 6- 7400 7- <0.9	1- 33 2- 12 3- 1000 4- 1050 5- 8000 6- 9000 7- <0.9

	1	2	3	4	5
A	1- 33 2- 10 3- 1000 4- 1300 5- 8000 6- 10200 7- <0.9	1- 33 2- 12 3- 1000 4- 1250 5- 8000 6- 9400 7- <0.9	1- 33 2- 15 3- 1000 4- 1200 5- 8000 6- 8700 7- <0.9	1- 33 2- 12 3- 1000 4- 1200 5- 8000 6- 9000 7- <0.9	1- 33 2- 10 3- 1000 4- 1250 5- 8000 6- 9500 7- <0.9

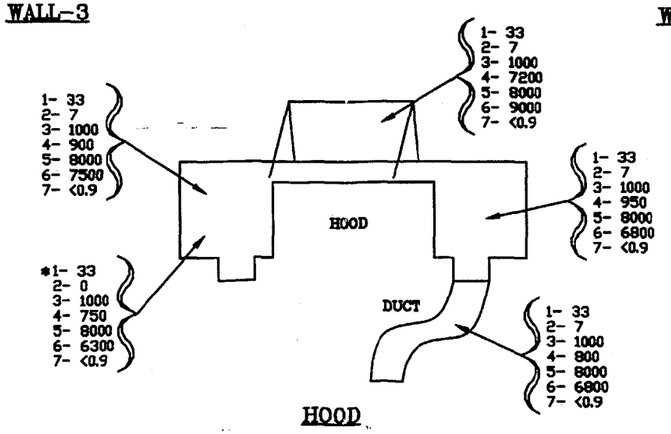
WALL-2

	1	2
A	1- 33 2- 10 3- 1000 4- 1250 5- 8000 6- 10000 7- <0.9	1- 33 2- 12 3- 1000 4- 1300 5- 8000 6- 10000 7- <0.9

	1	2
A	1- 33 2- 12 3- 1000 4- 950 5- 8000 6- 9600 7- <0.9	1- 33 2- 15 3- 1000 4- 950 5- 8000 6- 9200 7- <0.9

WALL-3

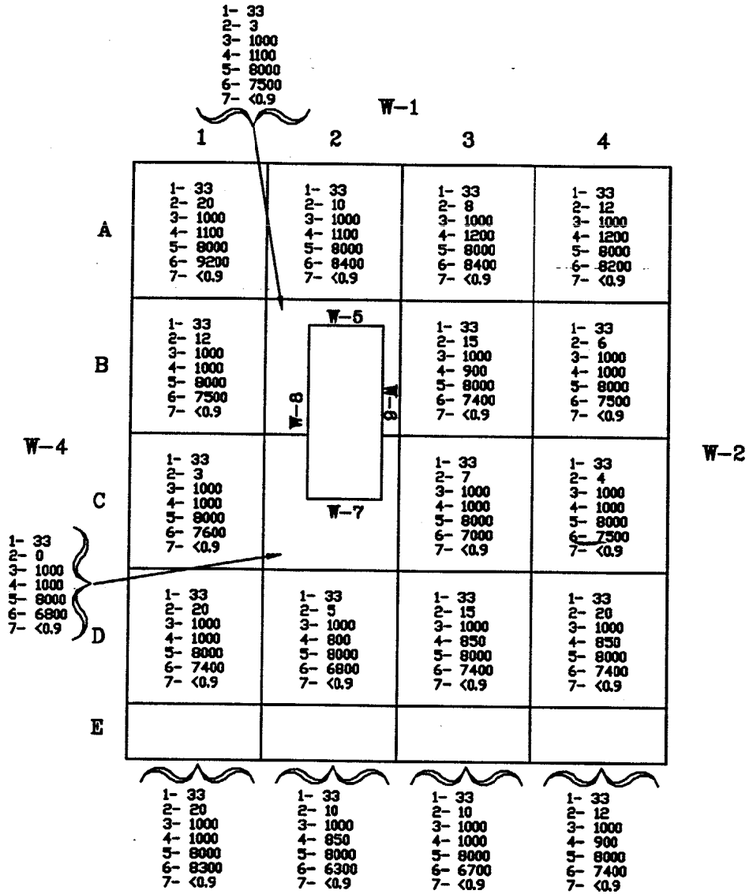
WALL-4



HOOD

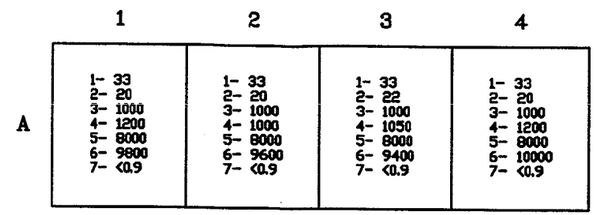
NOT TO SCALE
* = INSIDE HOOD

ROOM 127

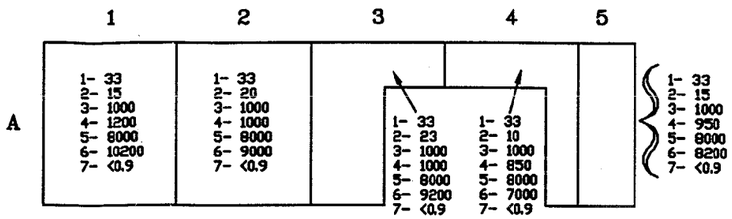


W-3

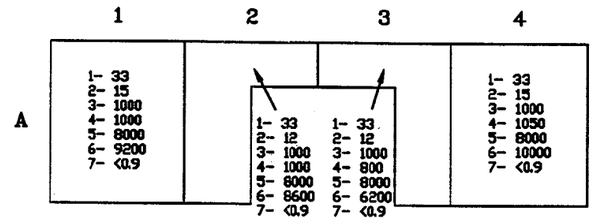
FLOOR



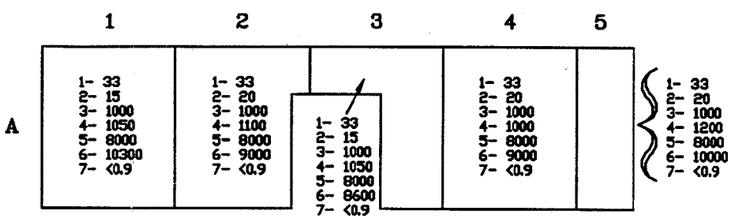
WALL-1



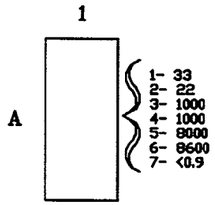
WALL-2



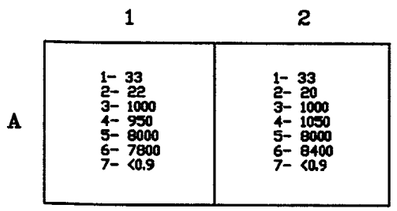
WALL-3



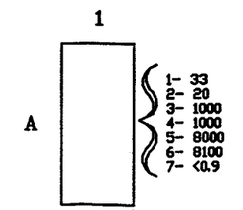
WALL-4



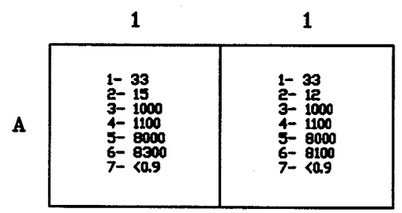
WALL-5



WALL-6



WALL-7

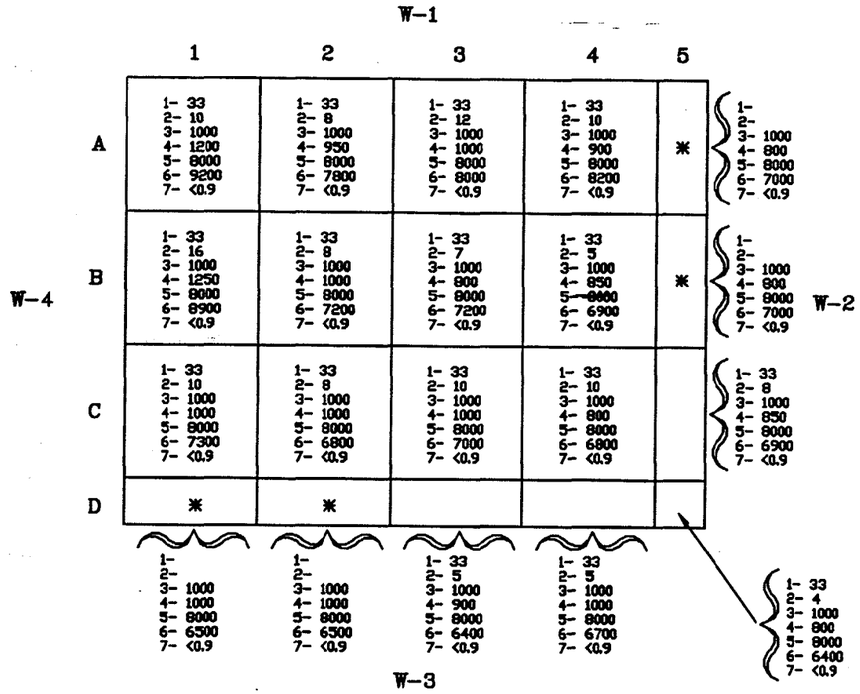


WALL-8

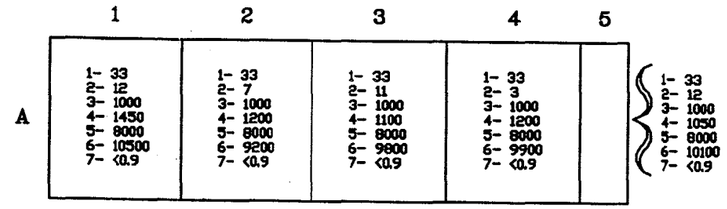
DATA LEGEND:

1- IM-247/PD [bkg.]
2- IM-247/PD [cpm]
3- IM-253/PD (PHA) [bkg.]
4- IM-253/PD (PHA) [cpm]
5- IM-253/PD (GROSS) [bkg.]
6- IM-253/PD (GROSS) [cpm]
7- Ra-226 Removable Radioactivity [pCi/100cm2]; Regulator value <9

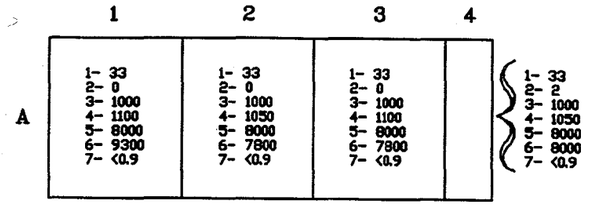
ROOM 128



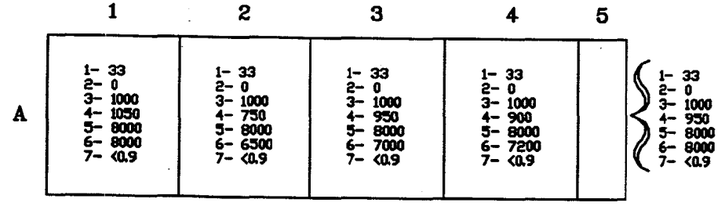
FLOOR



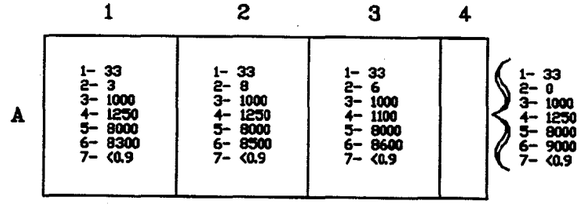
WALL-1



WALL-2



WALL-3



WALL-4

DATA LEGEND:

1- IM-247/PD [bkg.]
2- IM-247/PD [cpm]
3- IM-253/PD (PHA) [bkg.]
4- IM-253/PD (PHA) [cpm]
5- IM-253/PD (GROSS) [bkg.]
6- IM-253/PD (GROSS) [cpm]
7- Ra-226 Removable Radioactivity [pCi/100cm2]; Regulator value <9

* NOTE:
FLOOR SURFACE WAS INACCESSIBLE. DATA SHOWN IS THE HIGHEST LEVELS FROM A SCAN SURVEY OF WORK BENCHES. NO IM-247/PD READINGS WERE TAKEN.

ROOM 129B

W-1

	1	2	
A	1- 33 2- 5 3- 1000 4- 1000 5- 8000 6- 7500 7- <0.9	1- 33 2- 12 3- 1000 4- 1000 5- 8000 6- 7700 7- <0.9	1- 33 2- 10 3- 1000 4- 1400 5- 8000 6- 8200 7- <0.9
B	1- 33 2- 7 3- 1000 4- 900 5- 8000 6- 6500 7- <0.9	1- 33 2- 10 3- 1000 4- 900 5- 8000 6- 7000 7- <0.9	1- 33 2- 11 3- 1000 4- 1100 5- 8000 6- 9000 7- <0.9
C	1- 33 2- 8 3- 1000 4- 985 5- 8000 6- 5500 7- <0.9	1- 33 2- 12 3- 1000 4- 900 5- 8000 6- 9000 7- <0.9	1- 33 2- 10 3- 1000 4- 1200 5- 8000 6- 9000 7- <0.9
D			1- 33 2- 12 3- 1000 4- 1200 5- 8000 6- 8200 7- <0.9
	1- 33 2- 0 3- 1000 4- 800 5- 8000 6- 5300 7- <0.9	1- 33 2- 0 3- 1000 4- 850 5- 8000 6- 5800 7- <0.9	

W-4 W-2

W-3

FLOOR

	1	2	3	
A	1- 33 2- 10 3- 1000 4- 1300 5- 8000 6- 8000 7- <0.9	1- 33 2- 8 3- 1000 4- 1200 5- 8000 6- 8900 7- <0.9		1- 33 2- 10 3- 1000 4- 1500 5- 8000 6- 9300 7- <0.9

WALL-1

	1	2	3	4
A	1- 33 2- 15 3- 1000 4- 1600 5- 8000 6- 10000 7- <0.9	1- 33 2- 8 3- 1000 4- 1100 5- 8000 6- 8500 7- <0.9	1- 33 2- 9 3- 1000 4- 1000 5- 8000 6- 7800 7- <0.9	1- 33 2- 12 3- 1000 4- 1000 5- 8000 6- 7900 7- <0.9

WALL-2

	1	2	3	
A	1- 33 2- 3 3- 1000 4- 800 5- 8000 6- 5300 7- <0.9	1- 33 2- 0 3- 1000 4- 800 5- 8000 6- 5800 7- <0.9		1- 33 2- 5 3- 1000 4- 800 5- 8000 6- 5200 7- <0.9

WALL-3

	1	2	3	4
A	1- 33 2- 0 3- 1000 4- 800 5- 8000 6- 5000 7- <0.9	1- 33 2- 8 3- 1000 4- 850 5- 8000 6- 5100 7- <0.9	1- 33 2- 10 3- 1000 4- 850 5- 8000 6- 5500 7- <0.9	1- 33 2- 8 3- 1000 4- 1000 5- 8000 6- 5900 7- <0.9

WALL-4

DATA LEGEND:

1- IM-247/PD [bkg.]
2- IM-247/PD [cpm]
3- IM-253/PD (PHA) [bkg.]
4- IM-253/PD (PHA) [cpm]
5- IM-253/PD (GROSS) [bkg.]
6- IM-253/PD (GROSS) [cpm]
7- Ra-226 Removable Radioactivity [pCi/100cm2]; Regulator value <9

ROOM 129C

W-1

	1	2	3
A	1- 33 2- 7 3- 1000 4- 1000 5- 8000 6- 6300 7- <0.9	1- 33 2- 8 3- 1000 4- 1100 5- 8000 6- 7200 7- <0.9	1- 33 2- 10 3- 1000 4- 1000 5- 8000 6- 6500 7- <0.9
B	1- 33 2- 3 3- 1000 4- 850 5- 8000 6- 5500 7- <0.9	1- 33 2- 10 3- 1000 4- 800 5- 8000 6- 5700 7- <0.9	1- 33 2- 4 3- 1000 4- 850 5- 8000 6- 5600 7- <0.9
C	1- 33 2- 9 3- 1000 4- 800 5- 8000 6- 5600 7- <0.9	1- 33 2- 6 3- 1000 4- 800 5- 8000 6- 5400 7- <0.9	
D			

W-4 W-2

1	2	3
1- 33 2- 8 3- 1000 4- 800 5- 8000 6- 5300 7- <0.9	1- 33 2- 2 3- 1000 4- 800 5- 8000 6- 5400 7- <0.9	1- 33 2- 9 3- 1000 4- 750 5- 8000 6- 5400 7- <0.9

W-3

FLOOR

	1	2	3
A	1- 33 2- 4 3- 1000 4- 1100 5- 8000 6- 7800 7- <0.9	1- 33 2- 15 3- 1000 4- 1100 5- 8000 6- 7600 7- <0.9	1- 33 2- 15 3- 1000 4- 1000 5- 8000 6- 7600 7- <0.9

WALL-1

	1	2	3	4
A	1- 33 2- 3 3- 1000 4- 1000 5- 8000 6- 7200 7- <0.9	1- 33 2- 4 3- 1000 4- 850 5- 8000 6- 5800 7- <0.9	1- 33 2- 4 3- 1000 4- 850 5- 8000 6- 5400 7- <0.9	1- 33 2- 5 3- 1000 4- 800 5- 8000 6- 5500 7- <0.9

WALL-2

	1	2	3
A	1- 33 2- 3 3- 1000 4- 850 5- 8000 6- 4900 7- <0.9	1- 33 2- 4 3- 1000 4- 750 5- 8000 6- 5200 7- <0.9	1- 33 2- 5 3- 1000 4- 750 5- 8000 6- 5200 7- <0.9

WALL-3

	1	2	3	4
A	1- 33 2- 6 3- 1000 4- 750 5- 8000 6- 5200 7- <0.9	1- 33 2- 4 3- 1000 4- 700 5- 8000 6- 5300 7- <0.9	1- 33 2- 4 3- 1000 4- 700 5- 8000 6- 5200 7- <0.9	1- 33 2- 3 3- 1000 4- 750 5- 8000 6- 5800 7- <0.9

WALL-4

DATA LEGEND:

1- IM-247/PD [bkg.]
2- IM-247/PD [cpm]
3- IM-253/PD (PHA) [bkg.]
4- IM-253/PD (PHA) [cpm]
5- IM-253/PD (GROSS) [bkg.]
6- IM-253/PD (GROSS) [cpm]
7- Ra-226 Removable Radioactivity [pCi/100cm2]; Regulator value <9

NOTE:
FLOOR GRID C3 WAS INACCESSIBLE.

ROOM 129E

W-1

	1	2
A	1- 33 2- 15 3- 1000 4- 1250 5- 8000 6- 9400 7- <0.9	1- 33 2- 12 3- 1000 4- 1250 5- 8000 6- 9300 7- <0.9
B	1- 33 2- 10 3- 1000 4- 1000 5- 8000 6- 7000 7- <0.9	1- 33 2- 8 3- 1000 4- 850 5- 8000 6- 6800 7- <0.9
C	1- 33 2- 8 3- 1000 4- 800 5- 8000 6- 7300 7- <0.9	1- 33 2- 2 3- 1000 4- 850 5- 8000 6- 6900 7- <0.9
D	1- 33 2- 4 3- 1000 4- 950 5- 8000 6- 7200 7- <0.9	1- 33 2- 5 3- 1000 4- 900 5- 8000 6- 7100 7- <0.9
E	1- 33 2- 6 3- 1000 4- 850 5- 8000 6- 7200 7- <0.9	1- 33 2- 4 3- 1000 4- 850 5- 8000 6- 7000 7- <0.9
F		
	1- 33 2- 8 3- 1000 4- 800 5- 8000 6- 7300 7- <0.9	1- 33 2- 6 3- 1000 4- 1000 5- 8000 6- 7200 7- <0.9

W-4 W-2

W-3

FLOOR

	1	2
A	1- 33 2- 10 3- 1000 4- 1250 5- 8000 6- 10000 7- <0.9	1- 33 2- 12 3- 1000 4- 1200 5- 8000 6- 9800 7- <0.9

WALL-1

	1	2
A	1- 33 2- 15 3- 1000 4- 900 5- 8000 6- 8200 7- <0.9	1- 33 2- 12 3- 1000 4- 1000 5- 8000 6- 8700 7- <0.9

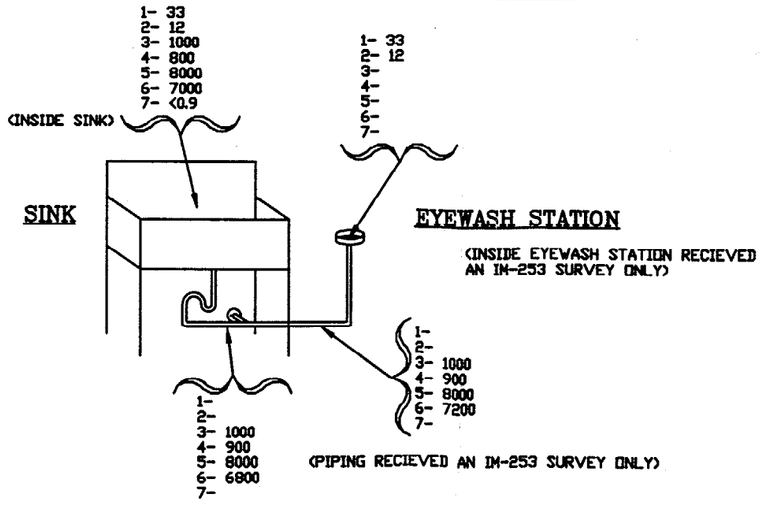
WALL-3

	1	2	3	4	5	
A	1- 33 2- 2 3- 1000 4- 900 5- 8000 6- 9600 7- <0.9	1- 33 2- 0 3- 1000 4- 900 5- 8000 6- 7200 7- <0.9	1- 33 2- 4 3- 1000 4- 850 5- 8000 6- 6800 7- <0.9	1- 33 2- 0 3- 1000 4- 900 5- 8000 6- 6900 7- <0.9	1- 33 2- 4 3- 1000 4- 900 5- 8000 6- 7000 7- <0.9	1- 33 2- 6 3- 1000 4- 900 5- 8000 6- 8000 7- <0.9

WALL-2

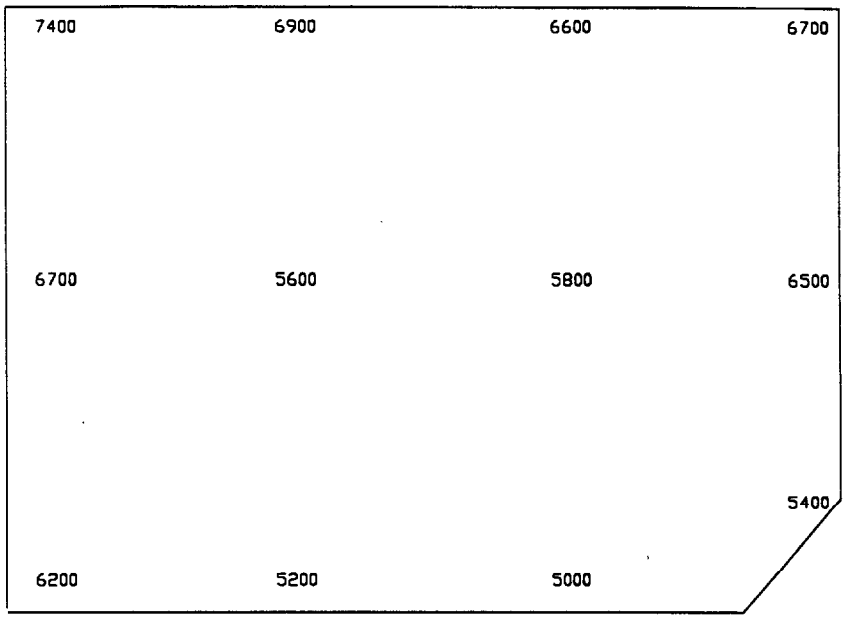
	1	2	3	4	5	
A	1- 33 2- 10 3- 1000 4- 1000 5- 8000 6- 7800 7- <0.9	1- 33 2- 12 3- 1000 4- 1000 5- 8000 6- 7600 7- <0.9	1- 33 2- 15 3- 1000 4- 950 5- 8000 6- 8000 7- <0.9	1- 33 2- 15 3- 1000 4- 1000 5- 8000 6- 8700 7- <0.9	1- 33 2- 12 3- 1000 4- 1100 5- 8000 6- 8600 7- <0.9	1- 33 2- 15 3- 1000 4- 1200 5- 8000 6- 9800 7- <0.9

WALL-4



DATA LEGEND:

1- IM-247/PD [bkg.]
2- IM-247/PD [cpm]
3- IM-253/PD (PHA) [bkg.]
4- IM-253/PD (PHA) [cpm]
5- IM-253/PD (GROSS) [bkg.]
6- IM-253/PD (GROSS) [cpm]
7- Ra-226 Removable Radioactivity [pCi/100cm2]; Regulator value <9



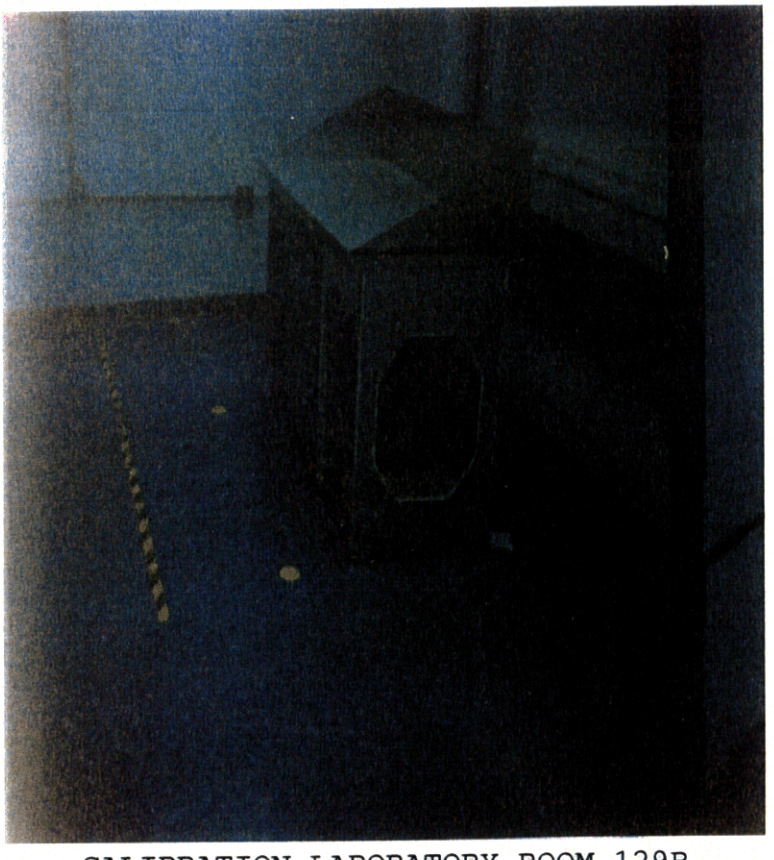
WELDING CAGE

DATA LEGEND:

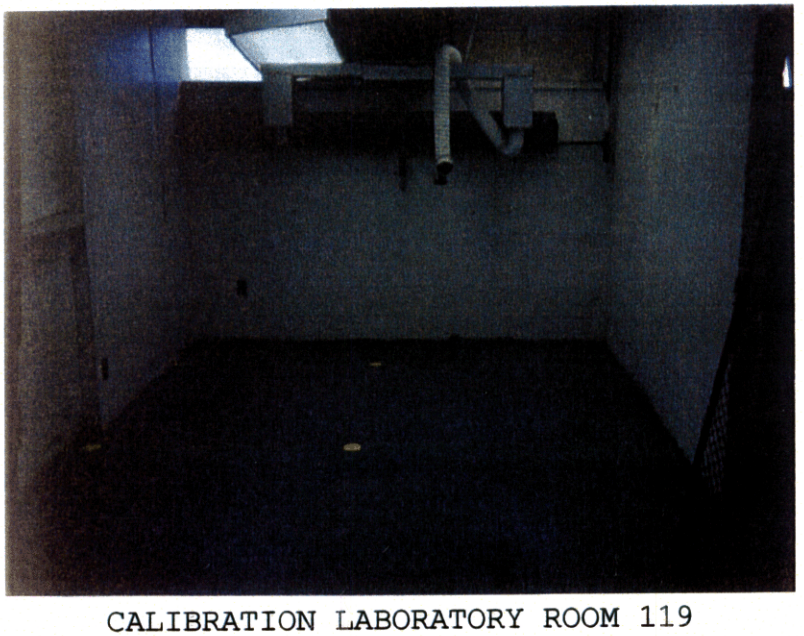
IM-253/PD (GROSS) [cpm]

NOTE: BACKGROUND READING FOR THE IM-253/PD (GROSS) IS 6080 cpm.

6.(i) Photographs

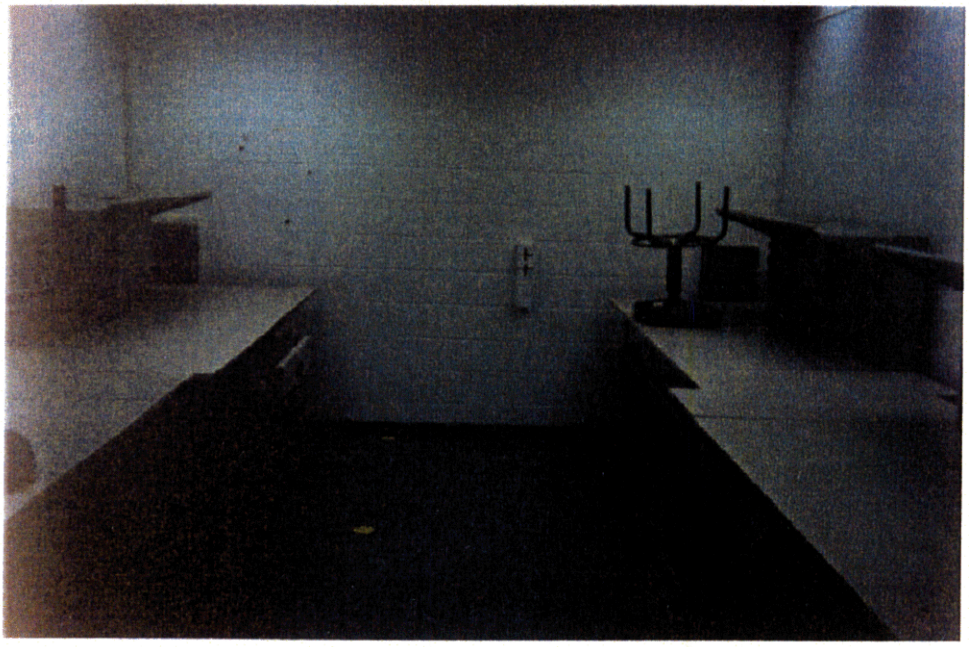


CALIBRATION LABORATORY ROOM 129B

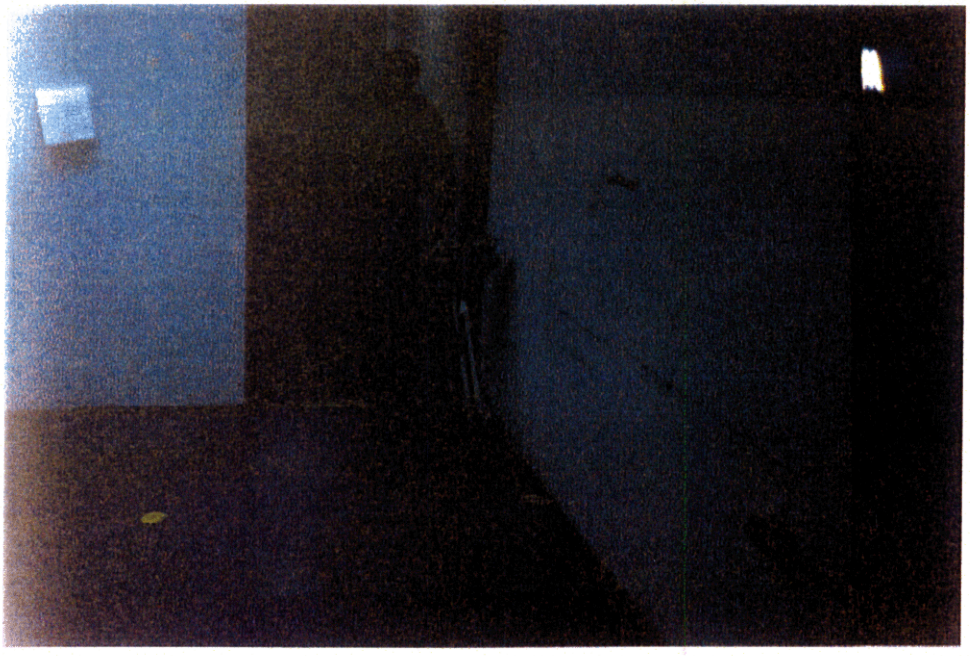


CALIBRATION LABORATORY ROOM 119

6.(i) Photographs

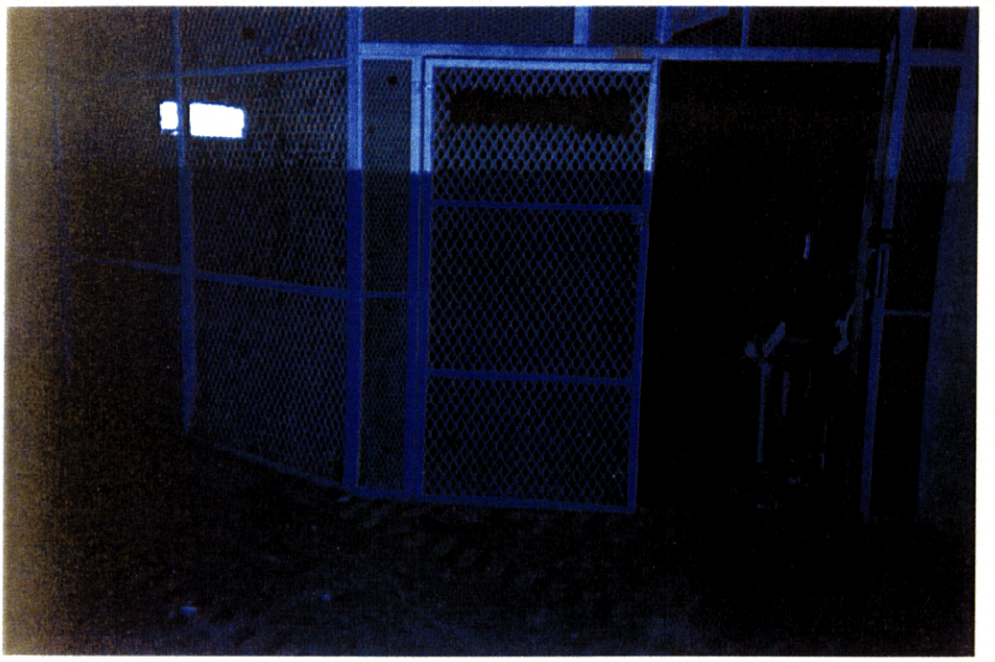


CALIBRATION LABORATORY ROOM 129C



CALIBRATION LABORATORY ROOM 129B

6.(i) Photographs



WELDING SHOP AREA CAGE

B. Facility 885

1. Introduction:

Facility 885 was constructed in 1944 and operated as a scrap yard. Facility 885 is located at or near grid 56-P of Public Works Drawing titled, "Map of Naval Support Activity Memphis" dated 9 February 1996.

2. Description:

Facility 885 is an open area surrounded by a chain linked fence. The middle area of the yard is asphalt connected to an asphalt driveway, the east and west ends of the yard are gravel. Three sets of scrap metal bins with concrete floors are located in the scrap yard.

3. Brief History:

(a) **Use:** The yard is used to store scrap metal, computers, machinery, and old uniforms. The facility is currently operated by the Morale, Welfare and Recreation Department as a metal recycling storage area.

(b) **Radiological History:** There is no know radiological history. The facility was used as a Defense Reutilization and Marketing Office (DRMO) salvage yard and the potential material stored (i.e., electrical and electronic components containing radioluminescent dials, electron tubes, etc.) may have contained mildly radioactive elements. Since radiological contamination has been found in other DRMOs, a survey is necessary for "free" release. The DRMO received a Class 3 release survey.

(c) **Survey Requirements:**

(1) Class 3 release survey.

4. Discussion:

Class 3:

For the Class 3 survey, the facility was divided into four areas, each approximately 100' by 178'.

Each area was identified with an alphabetic letter.

A wide gamma energy range scintillation walk-through scan survey (IM-253/PD operating in the GROSS mode) was performed over each area.

Surveying was performed along transects approximately five to six feet apart such that representative measurements of potentially deposited surface contamination was obtained.

At approximately ten-foot intervals along the survey path, wide gamma energy range scintillation point (static) measurements (IM-253/PD operating in the GROSS mode) were taken.

Point (static) measurements were taken when sustained increases in count rate were observed.

Solid material samples were collected from suspect locations.

Concentrated surveys with the IM-253/PD (PHA) and IM-247/PD were conducted in suspect locations.

Swipes were not required on outdoor surfaces such as soil or asphalt.

Background levels used for the facility were determined from similar areas located outside the fenced area adjacent to the site.

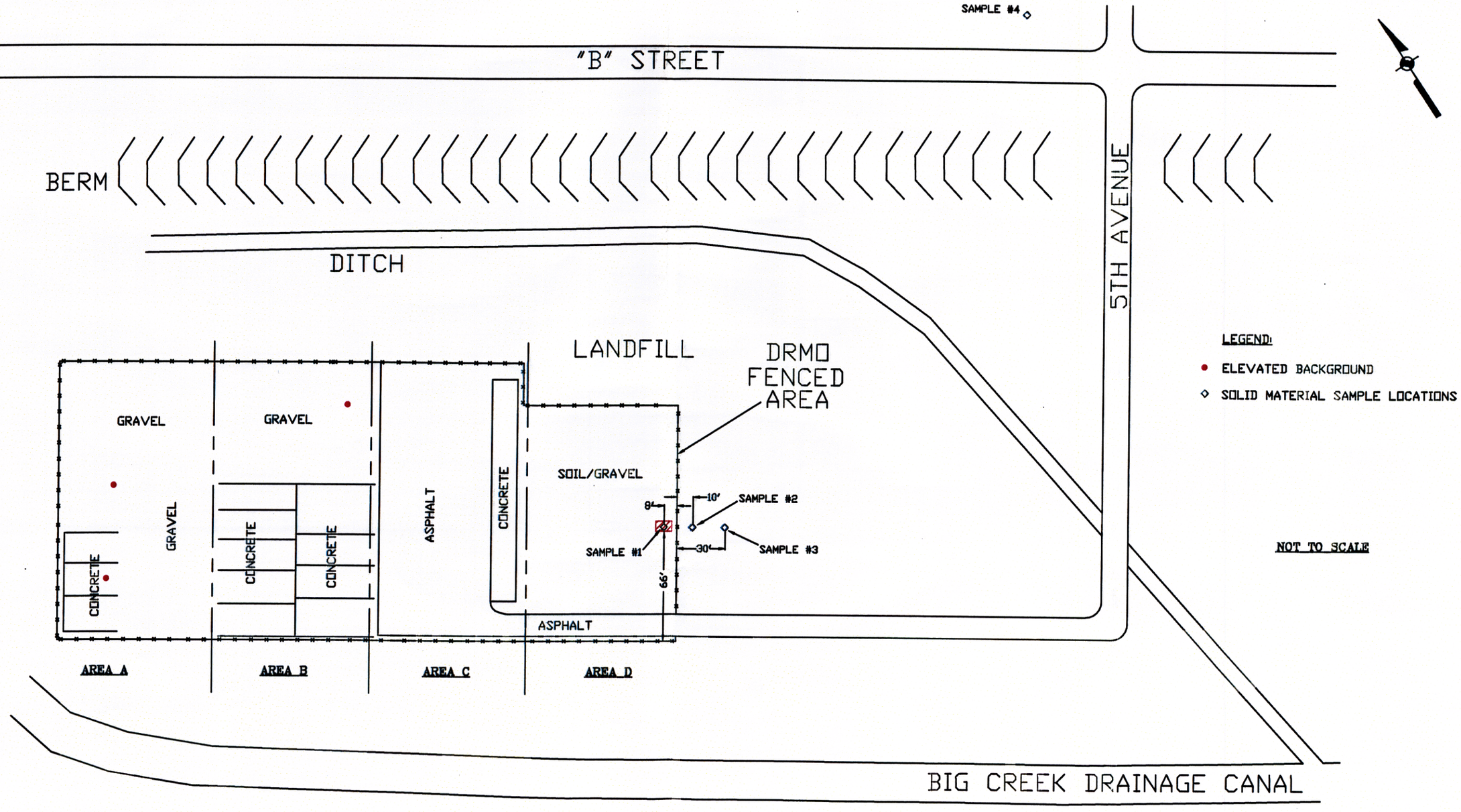
5. **Summary:**

Class 3 Summary:

Surveys performed in the Class 3 areas with the IM-253/PD (GROSS) detected four areas having radiation levels greater than or equal to background. See Figure 7-1 for locations.

The two elevated readings in Area A and one in Area B are small points (less than 1 foot square). These areas do not present a whole body radiological hazard.

The elevated reading in Area D indicates an area of approximately 8' x 8'. A solid material sample was taken from the affected site. Additionally, three other


SAMPLE #4
"B" STREET
BERM
DITCH
5TH AVENUE
LANDFILL
DRMO FENCED AREA
GRAVEL
GRAVEL
GRAVEL
CONCRETE
CONCRETE
CONCRETE
ASPHALT
CONCRETE
SOIL/GRAVEL
8'
10'
SAMPLE #2
SAMPLE #1
30'
SAMPLE #3
66'
ASPHALT
AREA A
AREA B
AREA C
AREA D
LEGEND:
ELEVATED BACKGROUND
SOLID MATERIAL SAMPLE LOCATIONS
NOT TO SCALE
BIG CREEK DRAINAGE CANAL

00611F01Y

solid material samples were taken outside the fenced area of DRMO to establish the background radiation concentrations. Analysis results indicate that the sample from Area D contains 12.4 pCi/g of Radium-226. Samples taken from the three areas outside the fenced DRMO facility indicated background radiation concentrations at approximately 1 pCi/g. Subtracting background gives a concentration of Radium-226 at 11.4 pCi/g.

See Appendix B for sample analysis results.

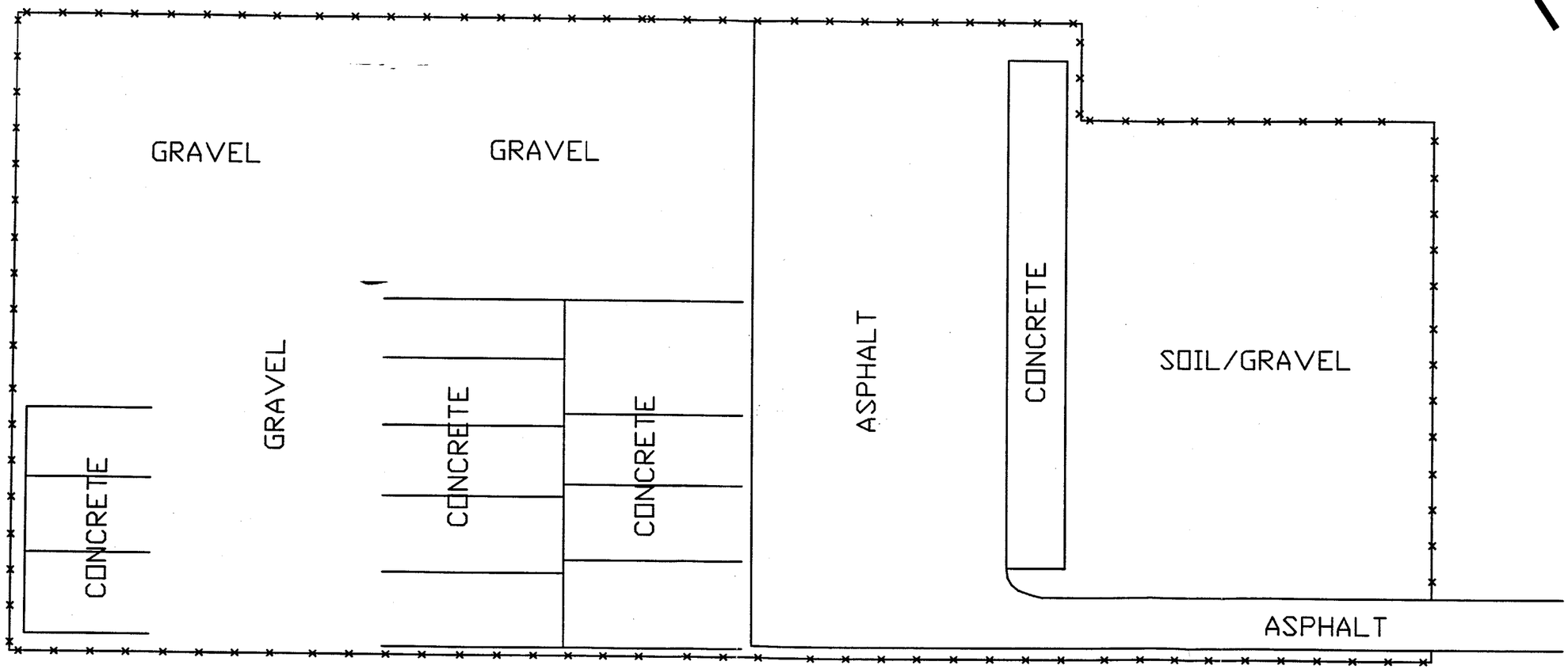
Recommendations:

Because radioactive materials were discovered the following recommendation is made concerning the affected area in DRMO:

- Perform a Class 1 survey in accordance with the MARSSIM to better define the area, and remove and dispose affected soil.

6. **Maps**

FACILITY 885

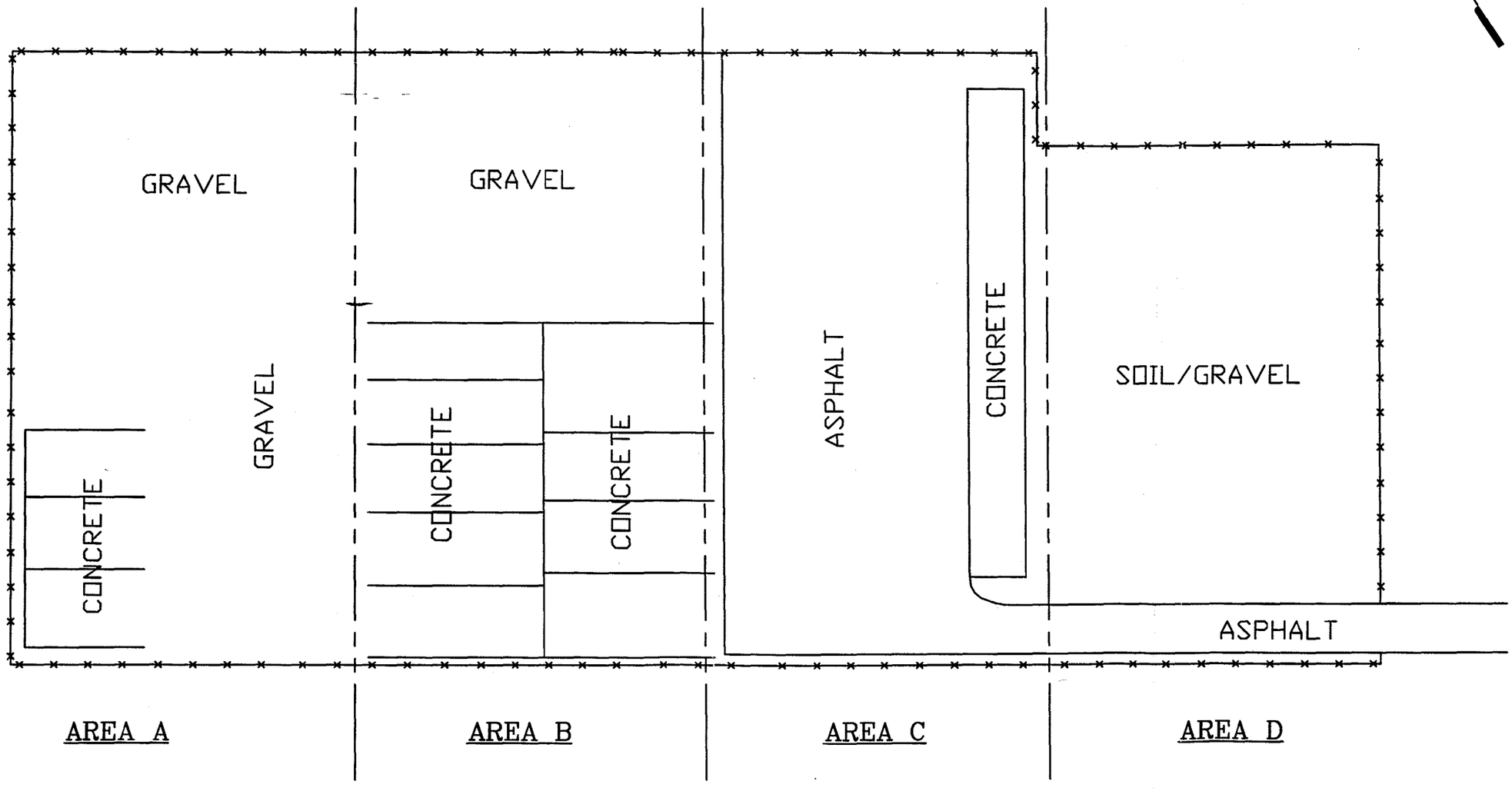


GRAPHIC SCALE

20' 10' 0 20' 40'

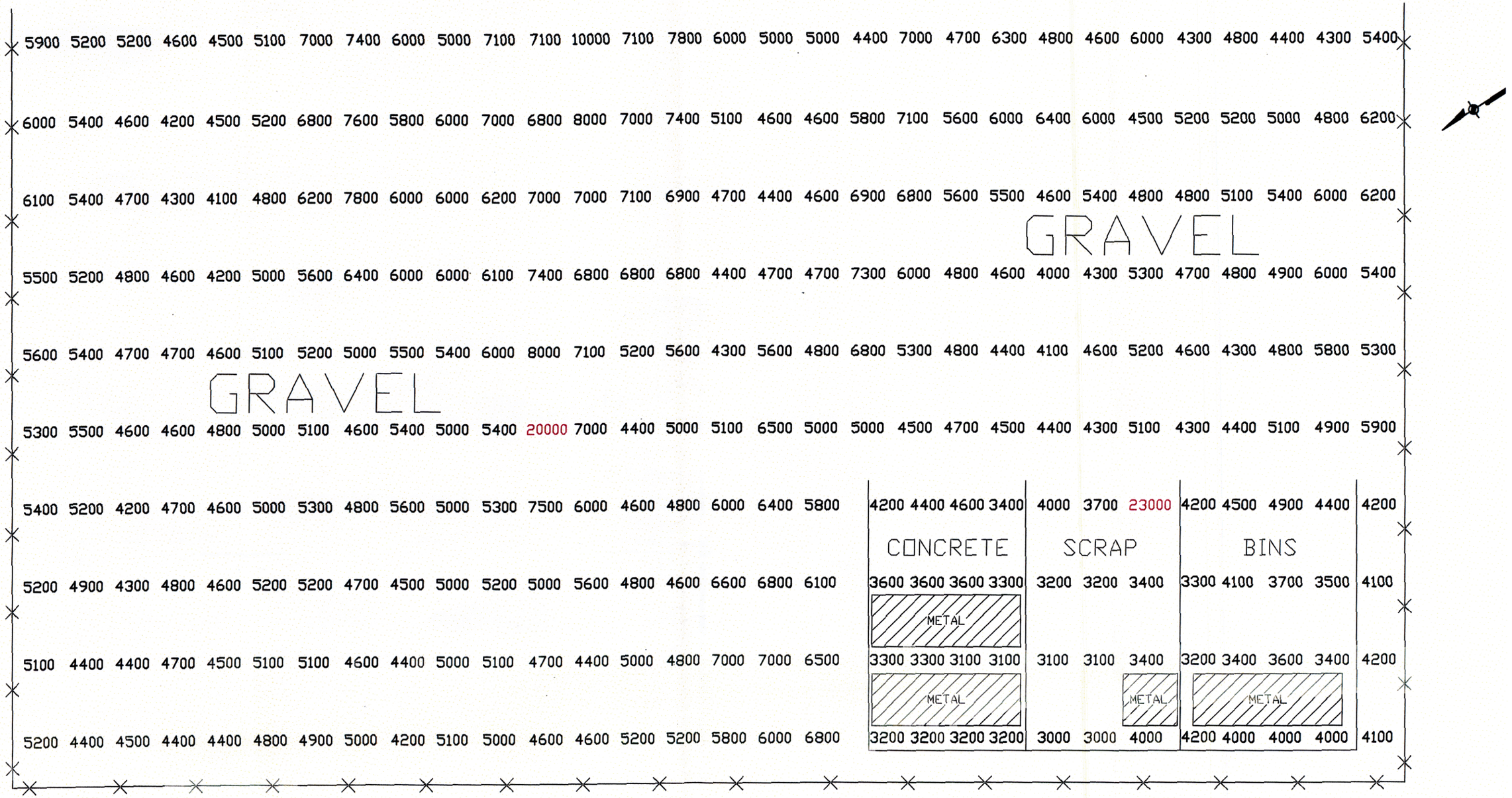
00611FB3Z

FACILITY 885



GRAPHIC SCALE

20' 10' 0 20' 40'



GRAPHIC SCALE

10′ 5′ 0 10′ 20′

AREA A

DATA LEGEND:
IM-253/PD (GROSS) [cpm]

00611FB4Y

4900	5000	4400	4400	4600	4700	4100	3900	4300	4700	3900	4100	4800	4600	4500	4400	4200	
5100	5400	4400	4400	4600	4500	3900	4000	3700	4000	4500	4200	4600	4700	4300	4300	6600	
5800	6200	5200	5100	4700	5300	5200	5600	3800	4300	3500	4000	4800	3400	4100	4500	4200	4300	4400	4300	5700
6300	7500	5800	5500	XXXX	5300	6000	4600										
7900	20000	5900	5500	5600	5700	6200	4400	4000	3900	3600	4100	4500	3200	3400	4700	3700	4100	4000	3600	5400
6100	5500	6000	6400	6100	5800	6900	4800										
XXXX	5900	5900	6100	6400	5500	6200	4300	3900	4000	3600	3300	3500	3700	3300	3800	4200	3500	4200	3700	5700
XXXX	XXXX	5700	6100	7600	7800	5200	5900										
XXXX	5800	6100	6400	8100	6100	6800	5200	3200	3500	4000	3500	2800	2600	2800	2500	2300	2200	2800	3000	6500
XXXX	XXXX	5800	6300	6300	7800	6400	5200	2900	3400	3300	3200	3100	2900	INTERFERENCE			3000	3000	3600	INTERFERENCE			4600
XXXX	XXXX	5800	5600	7000	6600	5800	4700																
5800	6000	5900	5900	7200	7400	5700	5000	3000	4000	3400	3700	3400	3800				3400	3700	3200				6000
6200	5600	5800	6100	7700	7500	6300	4900																
XXXX	6600	5900	5600	5300	8200	7800	4800	3600	4000	4000	5800	4100	3600	3700	4100	4000	4000	3900	3600	3700	3800	3800	5400
XXXX	5700	5800	5200	7100	7500	6400	4600																
XXXX	5900	6100	6000	7400	7500	5000	4800																
6800	6000	6300	5500	5900	8400	6700	5100	3500	3900	4200	4100	4400	4000	4000	4300	4200	4400	4500	3900	3600	4500	3700	5800

GRAVEL

CONCRETE

INTERFERENCE

INTERFERENCE

CONCRETE

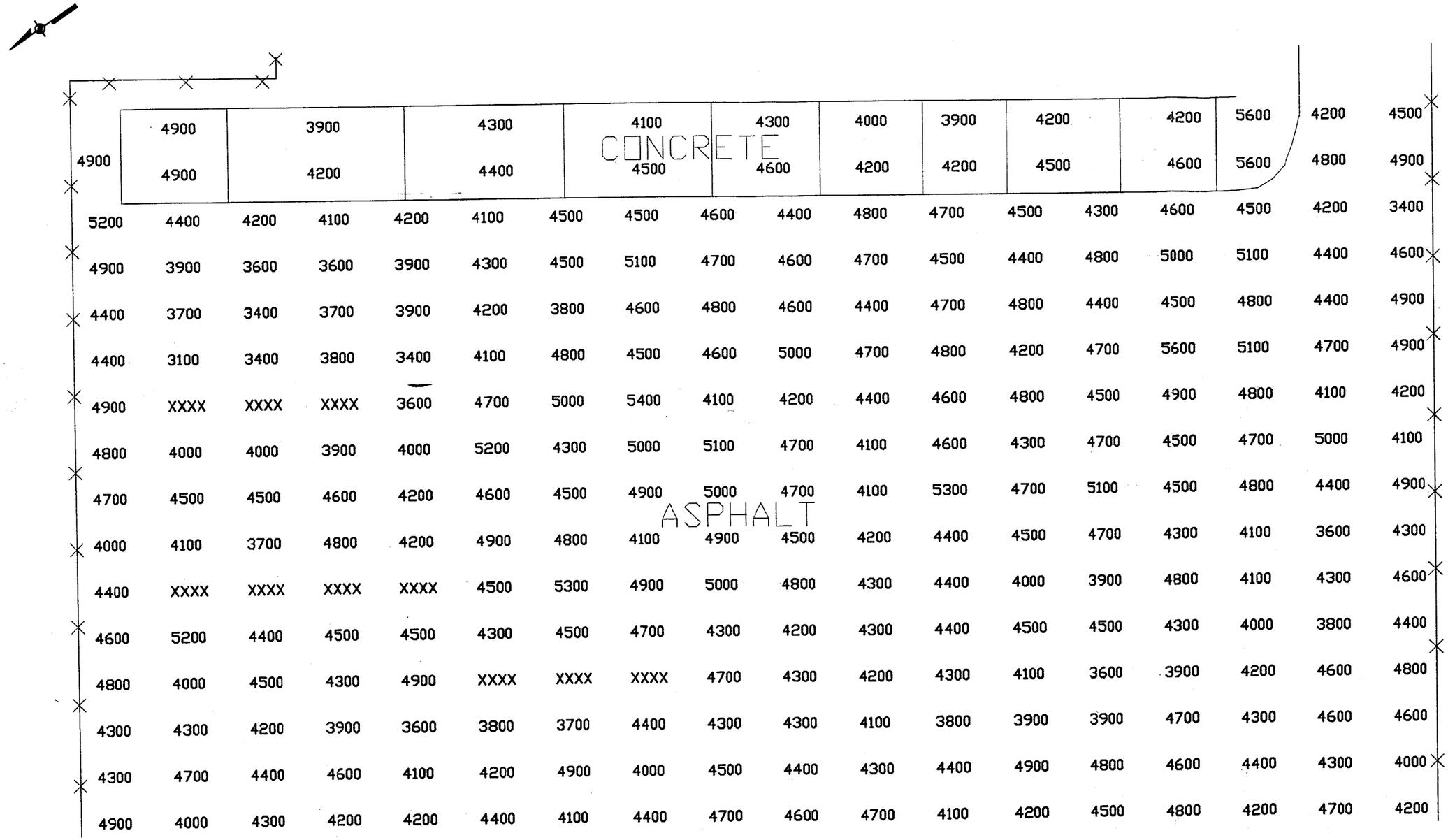
GRAPHIC SCALE

10′ 5′ 0 10′ 20′

AREA B

7-21

DATA LEGEND:
IM-253/PD (GROSS) [cpm]
XXXX INDICATES AREAS WITH INTERFERENCE



GRAPHIC SCALE

10' 5' 0 10' 20'

AREA C

7-22

DATA LEGEND:
IM-253/PD (GROSS) [cpm]
XXXX INDICATES AREAS WITH INTERFERENCE

00611F02Z

6500	6100	6300	6200	7000	6900	7100	6400	5500	6300	7000	8000	7200	8000	18000	10000	7500	7200	7400	5500	4100	4000	4700	7000	7100
6000	5500	5500	5700	6000	6100	5600	5600	4600	6000	6500	5800	5800	5600	5900	56000	6500	7000	6800	5400	4000	4100	4400	6800	7200
5500	6600	5500	5200	5400	6000	5100	5200	5300	5100	5300	5000	5000	5000	5800	5000	5300	8000	5400	5300	4100	4100	4300	6800	6000
5700	5700	5300	5000	5500	5300	6300	5100	5200	5000	5300	5000	5300	5100	5600	4800	6800	5100	5500	5200	4000	4200	4200	5400	6300
5800	5400	5100	5400	5600	5600	5400	5300	5400	5200	4700	5200	5700	4800	5400	5200	5100	5300	5600	5000	4200	4100	4100	5700	6000
5000	5000	5000	5600	5300	5400	5300	5400	5200	5300	4900	5000	5300	5200	5300	5300	5400	5500	5400	4700	4100	4100	4000	5600	6800
5500	5200	5500	5200	5300	5200	5600	5900	5400	5100	5300	5200	5200	5200	5200	5500	5200	5400	5500	4700	4200	4000	4000	6000	6900
5600	5400	5500	5700	5600	5300	5400	5300	5000	5200	5000	5400	5200	5500	5400	5600	5400	5500	4800	5000	4100	4100	4100	5500	6500
5600	5700	5800	5200	5500	5300	5000	5000	5000	5900	4900	5300	5100	5400	5300	5700	5500	5600	5000	4900	3800	3800	4200	5100	5200
5700	5900	5600	5800	5400	5400	6200	6800	6100	4500	XXXX	XXXX	XXXX	XXXX	6000	5800	5800	5800	5000	4400	3700	4000	4100	4600	5000

SOIL/GRAVEL

GRAPHIC SCALE

10′ 5′ 0 10′ 20′

AREA D

7-23

DATA LEGEND:
IM-253/PD (GROSS) [cpm]
XXXX INDICATES AREAS WITH INTERFERENCE

00611FB5Y

6.(g) **Photographs**

DRMO ENTRANCE, VIEWING WEST

STORAGE BINS, VIEWING NORTHEAST

6.(g) **Photographs**

STORAGE BINS, VIEWING WEST

STORAGE BINS, VIEWING SOUTHWEST CORNER

6.(g) Photographs

STORAGE AREA, VIEWING NORTHWEST

STORAGE BINS, VIEWING SOUTH

APPENDIX A

APPENDIX A
LIST OF ABBREVIATIONS AND ACRONYMS

^{227}Ac - Actinium-227
^{228}Ac - Actinium-228
^{241}Am - Americium-241
^{133}Ba - Barium-133
^{212}Bi - Bismuth-212
^{214}Bi - Bismuth-214
^{7}Be - Beryllium-7
^{137}Cs - Cesium-137
^{14}C - Carbon-14
^{109}Cd - Cadmium-109
^{36}Cl - Chlorine-36
^{60}Co - Cobalt-60
^{3}H - Hydrogen-3 (Tritium)
^{125}I - Iodine-125
^{126}I - Iodine-126
^{129}I - Iodine-129
^{131}I - Iodine-131
^{133}I - Iodine-133
^{85}Kr - Krypton-85
^{40}K - Potassium-40
^{22}Na - Sodium-22
^{62}Ni - Nickel-62
^{63}Ni - Nickel-63
^{231}Pa - Protactinium-231
^{212}Pb - Lead-212
^{214}Pb - Lead-214
^{147}Pm - Promethium-147
^{210}Po - Polonium-210
^{238}Pu - Plutonium-238
^{223}Ra - Radium-223
^{224}Ra - Radium-224
^{226}Ra - Radium-226
^{228}Ra - Radium-228
^{219}Rn - Radon-219 (actinon)
^{220}Rn - Radon-220 (thoron)
^{222}Rn - Radon-222 (radon)
^{90}Sr - Strontium-90
^{99}Tc - Technetium-99
^{208}Tl - Thallium-208
^{228}Th - Thorium-228
^{230}Th - Thorium-230
^{232}Th - Thorium-232
^{232}U - Uranium-232
^{235}U - Uranium-235
^{238}U - Uranium-238
^{90}Y - Yttrium-90

LIST OF ABBREVIATIONS AND ACRONYMS (continued)

100 cm^2 - one hundred square centimeters
α - alpha, lower case Greek character
β - beta, lower case Greek character
γ - gamma, lower case Greek character
cpm - counts per minute
dpm - disintegration per minute
keV - kilo-electron volt
MeV - mega-electron volt
ml - milliliter
mrad/hr - millirad per hour
μCi/100 cm^2 - microcurie per one hundred square centimeters
μR/hr - microroentgens (microröntgen) per hour
pCi - picocurie
pCi/g - picocurie per gram
pCi/100 cm^2 - picocurie per one hundred square centimeters
$T_{1/2}$ - radioactive half-life

BUMED - Bureau of Medicine and Surgery
CFR Code of Federal Regulations
CNO - Chief of Naval Operations
DRMO - Defense Reutilization and Marketing Office
DON - Department of Navy
EPA - Environmental Protection Agency
G-RAM - general radioactive material
HI-247/PD - beta-gamma survey meter
HI-253/PD - gamma scintillation survey equipment

LIST OF ABBREVIATIONS AND ACRONYMS (continued)

LLRW - low level radioactive waste
MARSSIM - Multi-Agency Radiation Survey and Site Investigation Manual
MDA - minimum detectable activity
NaI(Tl) - sodium iodide with thallium (crystal)
NSN - National Stock Number
NAVRAMP - Navy Radon Assessment and Mitigation Program
NARM - naturally-occurring and accelerator-produced radioactive material
NAVSEADET RASO - Naval Sea Systems Command Detachment, Radiological Affairs Support Office (RASO, SEA 07R1)
NIST - National Institute of Standards and Technology
NNPP - Naval Nuclear Propulsion Program
NORM - naturally-occurring radioactive material
NRC - Nuclear Regulatory Commission
NRMP - Navy Radioactive Materials Permit
NRSC - Navy Radiation Safety Committee
NWRCP - Nuclear Weapons Radiological Controls Program
RAD-010 - S0420-AA-RAD-010, Radiological Affairs Support Program Manual
RADIAC - radiation, detection, indicating and computation instrument
RASP - Radiological Affairs Support Program
S0420-AA-RAD-010 - Radiological Affairs Support Program Manual (RAD-010)
SEA 07R1 - Naval Sea Systems Command Detachment, Radiological Affairs Support Office (NAVSEADET RASO, RASO)
SODIVNAVFACENGCOM - Southern Division Naval Facilities Engineering Command

APPENDIX B

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND DETACHMENT
RADIOLOGICAL AFFAIRS SUPPORT OFFICE (RASO)
NWS P.O. DRAWER 260
YORKTOWN, VA 23691-0260

5104
Ser: 02F/0254
04 May 1998

From: Officer in Charge, Naval Sea Systems Command Detachment, Radiological Affairs Support Office (RASO)
To: Director, Supervisor of Shipbuilding, Conversion and Repair, USN, Portsmouth VA, Environmental Detachment Charleston

Subj: ANALYSIS OF SOIL SAMPLES

Encl: (1) Datasource 98-10-01 for Sample NSA 1
(2) Datasource 98-10-02 for Sample NSA 2
(3) Datasource 98-10-03 for Sample NSA 3
(4) Datasource 98-10-04 for Sample NSA 4

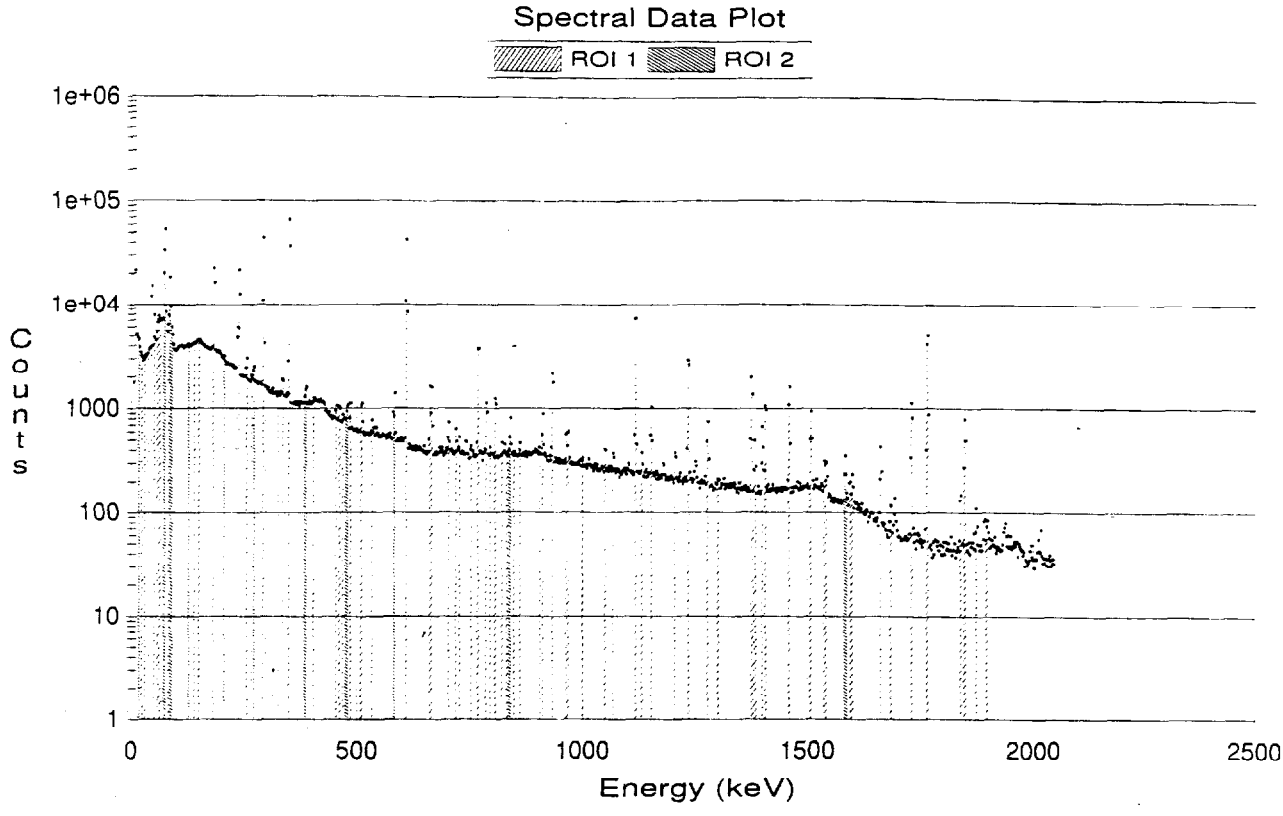
1. Four soil samples were received from Mr. Danny Hughes of SSPORTS Charleston for quantitative and qualitative analysis. The samples were taken from the DRMO activity at Naval Support Activity, Memphis TN. Results of the analysis are provided in enclosures (1) through (4).

2. The samples were analyzed using a high purity germanium detector in conjunction with Canberra's analysis program. The detector was calibrated, at the time of analysis, using a NIST traceable gamma standard of the same geometry used for the samples.

3. The radionuclides in samples NSA 2 through NSA 4 have specific activities comparable to background levels. Sample NSA 1 has an elevated level of 12.4 pCi/g of Ra-226. The area from which this sample was obtained warrants further investigation.

4. NAVSEADET RASO point of contact for the analysis is Mr. Troy R. Blanton, DSN 953-4692 or commercial (757) 887-4692.

S. W. Doremus
S. W. DOREMUS



Datasource: ~~DET01~~ 98-10-01
Live Time: 50000 sec
Real Time: 50365 sec
Acq. Start: 4-29-98 4:08:36 PM
Start: 1 : 0.47 (keV)
Stop: 4096 : 2047.90 (keV)

Enclosure (1)

****
***** INTERFERENCE CORRECTED REPORT *****
****

	Nuclide Name		Nuclide Id Confidence	Wt mean Activity (Bq/gms)	Wt mean Activity Uncertainty
	Ann		0.986	1.574648E-03	4.518388E-04
	sum		0.995	3.084449E-04	2.553309E-04
	Be-7		0.999	1.142926E-02	2.024371E-03
	K-40		1.000	1.495490E-01	1.897014E-02
	CS-137		0.990	7.493389E-03	4.424633E-04
	TL-208	@	0.887	5.108855E-03	4.369644E-04
	Pb-210		0.995	3.793948E-01	1.900071E-02
	PB-211	@	0.518	1.591086E-03	4.427292E-03
	BI-212		0.600	1.314231E-02	3.613965E-03
	PB-212		0.978	1.930793E-02	3.845014E-03
	BI-214		0.997	4.691873E-01	7.912569E-03
	PB-214		0.994	4.800642E-01	1.510025E-02
	RA-223		0.534	1.132753E-03	1.971127E-03
	RA-224		0.899	4.863540E-01	3.701283E-01
	RA-226		0.905	4.577484E-01	1.653905E-01
	AC-228	@	0.693	1.468194E-02	9.803542E-04
	TH-228		0.665	2.163460E-03	4.628542E-02
	TH-230		0.976	9.740849E-02	4.947601E-02
	TH-231	@	0.787	1.130799E-02	7.792717E-03
	TH-232		0.966	2.173496E-01	1.070952E-01
	PA-234m		0.971	4.983534E-02	3.695375E-02
	TH-234		0.960	1.553558E-02	3.315977E-03
X	U-234		0.996		
	U-235	@	0.704	4.631307E-03	2.697679E-03

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

********** U N I D E N T I F I E D P E A K S **********

Peak Locate Performed on: 4-30-98 8:58:10 AM
Peak Locate From Channel: 20
Peak Locate To Channel: 4096

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 1.000 sigma

Enclosure (1)

****
***** NUCLIDE IDENTIFICATION REPORT *****
****

ample Title: 98-10-01, NAS Memphis
Nuclide Library Used: C:\GENIEPC\CAMFILES\50000.NLB

..... IDENTIFIED NUCLIDES .....

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
Ann	0.986	511.00*	100.00	2.72925E-03	4.40915E-04
sum	0.995	16.07*	100.00	1.79529E-01	6.83734E-02
		19.15*	100.00	1.70767E-02	6.25535E-03
		846.80*	100.00	2.77957E-04	2.55546E-04
Be-7	0.999	477.59*	10.42	1.17333E-02	2.03441E-03
K-40	1.000	1460.75*	10.67	1.49549E-01	1.89701E-02
CS-137	0.990	32.00*	5.89	2.00693E-02	7.27970E-03
		36.40*	1.39	4.17267E-02	1.71065E-02
		661.66*	85.21	7.42372E-03	4.43432E-04
TL-208	0.887	72.80	2.02		
		74.97*	3.41	1.05440E+00	9.01313E-02
		84.90	1.51		
		211.40*	0.18	2.59564E-01	1.15205E-01
		233.36	0.31		
		252.61	0.69		
		277.36*	6.31	4.78769E-03	2.40661E-03
		510.77* a	22.60	1.20763E-02	1.95753E-03
		583.19*	84.50	5.13537E-03	4.58168E-04
		722.04	0.20		
		763.13	1.81		
		860.56*	12.42	5.03140E-03	1.96485E-03
		927.60	0.13		
		982.70	0.20		
		1093.90	0.40		
Pb-210	0.995	46.52*	4.00	3.79395E-01	1.90007E-02
PB-211	0.518	74.81* a	0.22	1.65691E+01	1.69206E+00
		77.11*	0.37	1.68595E+01	1.80269E+00
		87.30*	0.16	1.31068E+01	1.67215E+00
		404.84*	3.83	2.09618E-02	7.71875E-03
		426.99	1.72		
		704.50	0.48		
		766.34	0.71		
		831.83*	3.81	4.97212E-03	5.41187E-03
		1109.50	0.15		
BI-212	0.600	39.86*	1.02	4.03880E-02	1.80396E-02
		288.07	0.31		
		327.96*	0.14	1.67434E-01	1.44449E-01
		452.83	0.31		
		727.18*	6.65	1.34738E-02	3.71700E-03
		785.42*	1.11	5.12563E-01	4.08041E-02
		893.39	0.37		
		952.10	0.18		

Enclosure (1)

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
BI-212	0.600	1078.62	0.54		
		1512.75	0.31		
		1620.56	1.51		
		1806.00	0.11		
PB-212	0.978	74.81*	10.50	3.42429E-01	3.00825E-02
		77.11*	17.60	3.49644E-01	3.25960E-02
		87.30*	7.90	2.70432E-01	3.23229E-02
		115.18	0.59		
		238.63*	43.60	1.84614E-02	4.95322E-03
		300.09*	3.34	1.62999E-02	6.52466E-03
BI-214	0.997	76.86*	0.45	1.35844E+01	1.17675E+00
		79.29*	0.76	4.72345E-01	4.55010E-02
		89.80*	0.34	2.51594E+00	2.96621E-01
		273.70*	0.17	1.61009E+00	4.83826E-01
		387.00*	0.29	5.64407E-01	1.47817E-01
		389.10*	0.37	5.86107E-01	1.41923E-01
		405.74*	0.18	4.46021E-01	1.91318E-01
		454.77*	0.28	5.83471E-01	1.39398E-01
		469.69*	0.14	6.69709E-01	2.26439E-01
		474.38*	0.12	4.48832E-01	1.17249E-01
		609.31*	44.80	5.07019E-01	3.37220E-02
		665.45*	1.29	4.64164E-01	3.15264E-02
		703.11*	0.37	6.85180E-01	8.18931E-02
		719.86*	0.42	3.45551E-01	6.74933E-02
		752.84*	0.14	4.90610E-01	2.21710E-01
		768.36*	4.80	4.85238E-01	2.91926E-02
		786.10*	0.30	1.89648E+00	5.25288E-01
		806.17*	1.12	5.15235E-01	4.25314E-02
		821.18*	0.18	4.28270E-01	1.52368E-01
		934.06*	3.03	4.70503E-01	3.91752E-02
		964.08*	0.38	6.37064E-01	1.10088E-01
		1051.96*	0.34	5.09662E-01	9.34418E-02
		1069.96*	0.28	3.45564E-01	1.07858E-01
		1120.29*	14.80	4.78533E-01	3.09326E-02
		1133.66*	0.28	4.21926E-01	8.79214E-02
		1155.19*	1.64	4.92555E-01	3.55173E-02
		1207.68*	0.49	3.56888E-01	5.98329E-02
		1238.11*	5.86	4.68326E-01	2.05579E-02
		1280.96*	1.44	4.64874E-01	3.12926E-02
		1303.76*	0.11	2.56233E-01	2.82219E-01
		1377.67*	3.92	5.64190E-01	4.34495E-02
		1385.31*	0.89	4.58905E-01	6.99638E-02
		1401.50*	1.55	4.16150E-01	6.15036E-02
		1407.98*	2.80	4.03987E-01	6.92860E-02
		1509.23*	2.12	4.75458E-01	7.83424E-02
		1538.50*	0.51	4.29046E-01	1.08028E-01
		1543.32*	0.33	6.46621E-01	1.62543E-01
		1583.22*	0.70	4.73774E-01	1.09509E-01
		1594.73*	0.31	3.48978E-01	1.14990E-01
		1599.31*	0.38	3.36864E-01	1.11197E-01
		1661.28*	1.14	4.16988E-01	1.23388E-01

Enclosure (1)

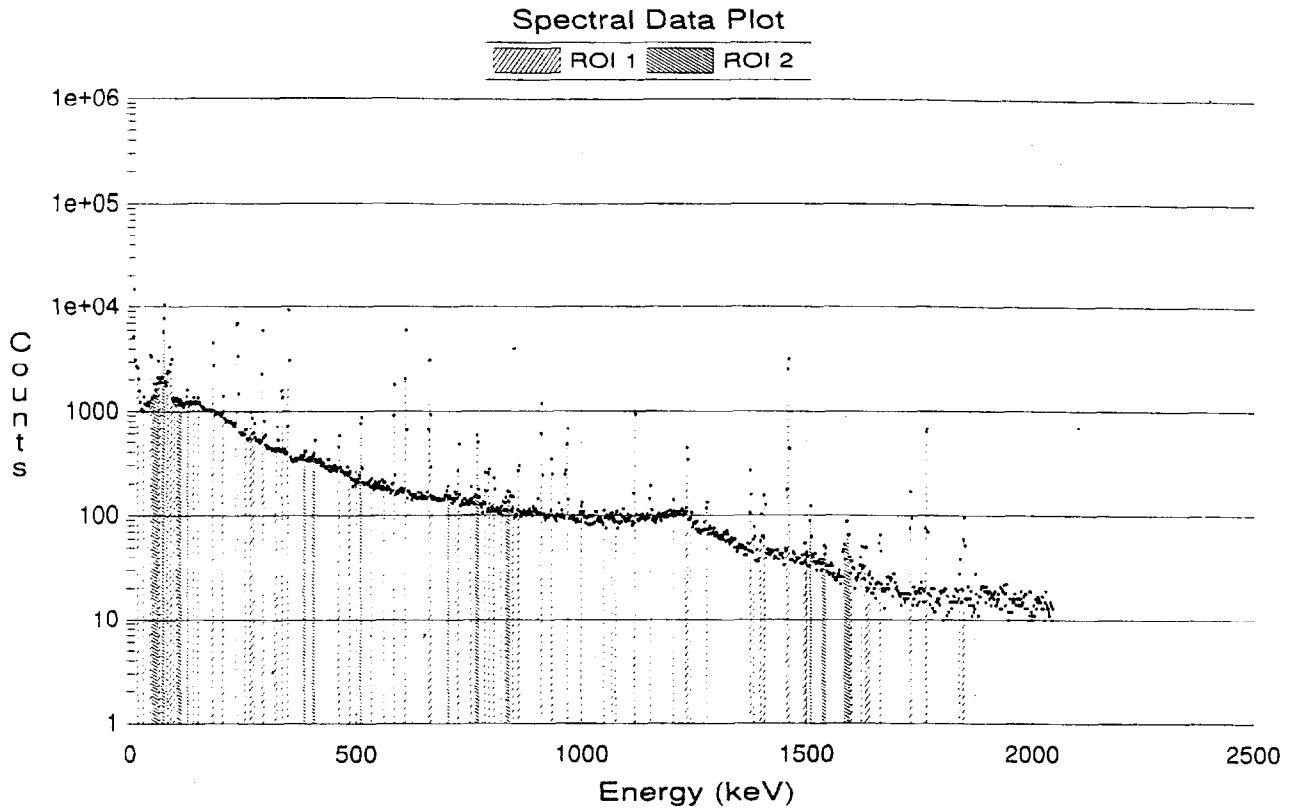
Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
BI-214	0.997	1683.99*	0.25	3.48556E-01	1.44682E-01
		1729.59*	2.88	6.03230E-01	2.16680E-01
		1764.49*	15.36	5.09116E-01	2.01099E-01
		1838.36*	0.40	3.85891E-01	1.95332E-01
		1847.42*	2.04	5.64709E-01	2.75569E-01
		1873.16*	0.25	3.73646E-01	2.12944E-01
		1896.30*	0.17	4.36609E-01	2.78763E-01
		2118.55	1.14		
		2204.21	4.86		
PB-214	0.994	53.23*	1.11	3.78649E-01	2.90435E-02
		74.81*	5.90	6.09407E-01	5.73358E-02
		77.11*	9.90	6.21589E-01	6.10931E-02
		87.30*	4.41	4.84447E-01	5.72994E-02
		241.98*	7.50	7.37508E-01	1.95586E-01
		258.79*	0.55	6.00357E-01	1.74051E-01
		274.53*	0.35	7.91242E-01	3.12086E-01
		295.21*	18.50	7.31989E-01	1.85037E-01
		351.92*	35.80	6.73298E-01	1.50870E-01
		462.10*	0.23	8.36705E-01	2.09626E-01
		480.42*	0.33	6.19133E-01	1.13560E-01
		487.08*	0.44	5.30264E-01	1.03598E-01
		533.69*	0.19	5.06346E-01	1.16087E-01
		580.15*	0.35	6.23201E-01	1.07713E-01
		785.91*	0.85	6.69346E-01	9.33440E-02
		839.03*	0.63	5.84318E-01	6.11240E-02
RA-223	0.534	81.07	15.00		
		83.78*	24.80	9.79749E-03	1.12664E-03
		94.90*	11.30	6.79141E-03	1.22664E-03
		122.31	1.19		
		144.20*	3.26	7.66801E-03	9.69874E-03
		154.19*	5.59	1.09169E-02	5.34834E-03
		158.62	0.69		
		179.67	0.15		
		269.41*	13.60	7.06798E-03	2.51925E-03
		288.17	0.15		
		323.89	3.90		
		328.50*	0.20	1.17542E-01	1.01153E-01
		338.32*	2.78	7.89158E-02	2.00617E-02
		342.90	0.20		
		371.84	0.49		
		444.94	1.27		
RA-224	0.899	240.99*	3.97	1.39328E+00	3.69294E-01
RA-226	0.905	81.07	0.19		
		83.78*	0.32	7.59305E-01	9.00891E-02
		94.90*	0.14	5.29262E-01	9.71590E-02
		186.10*	3.50	1.23108E+00	3.10137E-01
AC-228	0.693	13.00* @	39.00	2.10738E+00	1.94174E+00
		57.76 @	0.49		
		89.95*	1.94	4.40939E-01	6.23596E-02
		93.35*	3.20	4.81189E-02	7.98458E-03
		99.50	1.28		

Enclosure (1)

Nuclide Name	Id Confidence	Energy (keV)		Yield (%)	Activity (Bq/gms)	Activity Uncertainty
AC-228	0.693	105.00		1.47		
		129.07*		2.45	2.11147E-02	8.53211E-03
		145.85	a	0.16		
		153.98*		0.74	8.24672E-02	4.06201E-02
		191.35	a	0.13		
		199.41		0.32		
		204.03	a	0.12		
		209.25*		3.88	3.16254E-02	1.02108E-02
		270.24*		3.43	2.80246E-02	9.99112E-03
		278.95		0.20		
		321.65		0.23		
		327.64*		3.20	7.27292E-03	6.24825E-03
		332.37		0.37		
		338.32*		11.30	1.94147E-02	4.93824E-03
		340.97		0.38		
		409.46		1.94		
		440.45		0.13		
		463.01*		4.44	4.33428E-02	9.33327E-03
		478.30*		0.22	5.66513E-01	1.06425E-01
		503.82		0.19		
		509.60	a	0.47		
		523.13		0.11		
		546.45		0.21		
		562.50		0.87		
		570.91		0.17		
		572.29		0.15		
		583.41*		0.11	3.80648E+00	4.99241E-01
		674.63		0.10		
		701.75		0.18		
		707.41		0.16		
		726.86*		0.64	1.40001E-01	4.22840E-02
		755.32		1.01		
		772.29		1.50		
		782.14		0.50		
		794.95*		4.34	1.19153E-02	5.67543E-03
		830.49*		0.55	3.44432E-02	3.75574E-02
		835.71*		1.68	2.01722E-02	6.60105E-03
		840.38		0.94		
		904.20*		0.78	7.74245E-02	3.25473E-02
		911.21*		26.60	1.50965E-02	1.52547E-03
		947.98		0.11		
		958.61		0.29		
		964.77*		5.11	4.73746E-02	6.62094E-03
		968.97*		16.20	1.31532E-02	1.77159E-03
		988.43		0.13		
		1033.25		0.21		
		1065.17		0.14		
		1095.68		0.13		
		1110.61		0.31		
		1153.52		0.14		
		1247.08		0.50		

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
AC-228	0.693	1459.14	0.80		
		1495.91	0.89		
		1501.58	0.47		
		1557.11	0.18		
		1580.54	0.61		
		1588.21*	3.27	9.88324E-03	4.10342E-03
		1625.00	0.26		
		1630.63	1.60		
		1638.28	0.47		
		1666.52	0.18		
		1887.00	0.10		
TH-228	0.665	84.37*	1.27	1.91926E-01	2.17020E-02
		131.61*	0.14	1.12258E-01	8.43559E-02
		166.41	0.11		
		215.99	0.26		
TH-230	0.976	67.67*	0.38	9.74085E-02	4.94760E-02
TH-231	0.787	13.30* @	71.00	1.15758E+00	1.06659E+00
		25.64*	14.70	1.26902E-02	8.76363E-03
		58.57*	0.48	9.73422E-02	4.24517E-02
		72.75	0.25		
		81.23	0.89		
		82.09	0.40		
		84.21*	6.60	3.68148E-02	4.96193E-03
		89.95*	0.94	9.10022E-01	1.30111E-01
		99.28	0.12		
		102.27	0.41		
		163.10	0.16		
TH-232	0.966	59.00*	0.19	2.45917E-01	1.06818E-01
PA-234m	0.971	1001.03*	0.59	4.98353E-02	3.69538E-02
TH-234	0.960	63.29*	4.50	1.49538E-02	5.62101E-03
		92.59*	5.41	2.84622E-02	5.01494E-03
		112.81	0.26		
235	0.704	13.00* @	31.00	2.65122E+00	2.44284E+00
		72.70	0.11		
		89.95*	2.80	3.05508E-01	1.04283E-01
		93.35* @	4.50	3.42179E-02	1.16308E-02
		94.00*	0.40	1.91857E-01	3.40346E-02
		105.00	2.10		
		109.16	1.50		
		140.76	0.22		
		143.76*	10.90	2.29337E-03	2.90071E-03
		163.33	5.00		
		182.61	0.40		
		185.71*	57.50	7.49352E-02	1.89020E-02
		194.94	0.59		
		202.11	1.00		
		205.31	5.00		
		279.50	0.27		

* = Energy line found in the spectrum.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000 sigma



Datasource: 98-10-02.CNF
Live Time: 50000 sec
Real Time: 50173 sec
Acq. Start: 4-22-98 4:11:50 PM
Start: 1 : 0.47 (keV)
Stop: 4096 : 2047.90 (keV)

Enclosure (2)

****
***** I N T E R F E R E N C E C O R R E C T E D R E P O R T *****
****

	Nuclide Name		Nuclide Id Confidence	Wt mean Activity (Bq/gms)	Wt mean Activity Uncertainty
	Ann		0.998	1.509668E-03	4.820398E-04
	sum		0.998	2.480344E-02	5.763912E-03
	K-40		0.992	3.599087E-01	4.474692E-02
	CS-137		0.977	1.949645E-02	9.644576E-04
	TL-208	@	0.893	1.036951E-02	6.777662E-04
	Pb-210		0.974	7.577546E-02	5.438534E-03
	BI-212		0.816	2.925242E-02	2.695067E-03
	PB-212		0.968	2.463981E-02	3.649673E-03
	BI-214		0.941	6.203937E-02	1.739409E-03
	PB-214		0.963	6.350083E-02	5.128903E-03
	FR-223		0.674	1.237018E-02	7.090304E-03
X	RA-223		0.624		
	RA-224		0.951	6.373260E-02	4.977803E-02
	RA-226		0.909	7.182075E-02	1.043171E-02
	AC-228	@	0.861	2.950457E-02	1.162125E-03
	TH-228		0.667	6.641505E-02	8.593500E-03
	TH-230		0.972	8.497430E-02	3.022025E-02
	TH-232		0.949	3.134140E-01	4.111476E-02
	PA-234m		0.946	5.775362E-02	1.875449E-02
	TH-234		0.986	3.410475E-02	2.887828E-03
	U-235	@	0.849	5.852732E-03	1.218029E-03

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

********** U N I D E N T I F I E D P E A K S **********

Peak Locate Performed on: 4-23-98 8:03:55 AM
Peak Locate From Channel: 20
Peak Locate To Channel: 4096

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty
m104	1592.45	4.0251E-03	13.29

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 1.000 sigma

Enclosure (2)

****
***** NUCLIDE IDENTIFICATION REPORT *****
****

Sample Title: 98-10-02, NAS Memphis
Nuclide Library Used: C:\GENIEPC\CAMFILES\50000.NLB

..... IDENTIFIED NUCLIDES .....

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
Ann	0.998	511.00*	100.00	3.85318E-03	4.57055E-04
sum	0.998	16.07*	100.00	-6.77702E-02	4.23815E-02
		19.15*	100.00	2.48034E-02	5.76391E-03
		846.80*	100.00	-1.20813E-05	1.35912E-04
K-40	0.992	1460.75*	10.67	3.59909E-01	4.47469E-02
CS-137	0.977	32.00*	5.89	2.42864E-02	4.25990E-03
		36.40*	1.39	2.70570E-02	8.78708E-03
		661.66*	85.21	1.91371E-02	9.96516E-04
TL-208	0.893	72.80	2.02		
		74.97*	3.41	2.10184E-01	1.80725E-02
		84.90	1.51		
		211.40	0.18		
		233.36	0.31		
		252.61	0.69		
		277.36*	6.31	1.13895E-02	3.58640E-03
		510.77* @	22.60	1.70495E-02	2.03499E-03
		583.19*	84.50	9.76561E-03	7.91849E-04
		722.04	0.20		
		763.13*	1.81	1.38063E-02	2.89511E-03
		860.56*	12.42	1.15915E-02	1.66527E-03
		927.60	0.13		
		982.70	0.20		
		1093.90*	0.40	4.07100E-02	2.52008E-02
PB-210	0.974	46.52*	4.00	7.57755E-02	5.43853E-03
BI-212	0.816	39.86*	1.02	1.76085E-02	1.01296E-02
		288.07	0.31		
		327.96*	0.14	8.06684E-01	2.30152E-01
		452.83	0.31		
		727.18*	6.65	3.29184E-02	3.13214E-03
		785.42*	1.11	8.30415E-02	1.27989E-02
		893.39	0.37		
		952.10	0.18		
		1078.62*	0.54	6.15858E-02	2.74335E-02
		1512.75*	0.31	6.14490E-02	2.22975E-02
		1620.56*	1.51	2.76741E-02	9.65217E-03
		1806.00	0.11		
PB-212	0.968	74.81*	10.50	6.82599E-02	6.03007E-03
		77.11*	17.60	6.62681E-02	6.18838E-03
		87.30*	7.90	4.42668E-02	5.45094E-03
		115.18*	0.59	6.20254E-02	1.95682E-02
		238.63*	43.60	3.75690E-02	1.00299E-02
		300.09*	3.34	3.62189E-02	9.89882E-03

Enclosure (2)

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
BI-214	0.941	76.86*	0.45	2.57465E+00	2.23468E-01
		79.29	0.76		
		89.80*	0.34	4.93697E-01	6.17204E-02
		273.70*	0.17	1.95603E-01	8.58031E-02
		387.00*	0.29	9.45226E-02	3.51738E-02
		389.10*	0.37	7.47005E-02	2.72924E-02
		405.74*	0.18	7.92526E-02	4.22410E-02
		454.77	0.28		
		469.69	0.14		
		474.38	0.12		
		609.31*	44.80	6.35480E-02	4.27246E-03
		665.45*	1.29	5.46653E-02	9.81281E-03
		703.11*	0.37	7.40599E-02	2.47512E-02
		719.86*	0.42	5.35411E-02	2.58387E-02
		752.84	0.14		
		768.36*	4.80	6.20620E-02	4.76888E-03
		786.10*	0.30	3.07254E-01	9.42701E-02
		806.17*	1.12	6.99705E-02	1.22404E-02
		821.18*	0.18	8.55508E-02	7.01495E-02
		934.06*	3.03	6.25905E-02	7.36551E-03
		964.08*	0.38	3.48924E-01	5.94622E-02
		1051.96*	0.34	5.44935E-02	3.50958E-02
		1069.96*	0.28	5.51202E-02	4.94515E-02
		1120.29*	14.80	5.83315E-02	4.08069E-03
		1133.66	0.28		
		1155.19*	1.64	5.72054E-02	1.10373E-02
		1207.68*	0.49	1.11134E-01	3.36882E-02
		1238.11*	5.86	6.75275E-02	5.82264E-03
		1280.96*	1.44	6.18667E-02	1.21911E-02
		1303.76	0.11		
		1377.67*	3.92	7.33400E-02	7.36537E-03
		1385.31*	0.89	6.50990E-02	1.66537E-02
		1401.50*	1.55	6.03195E-02	1.24730E-02
		1407.98*	2.80	5.68407E-02	1.15252E-02
		1509.23*	2.12	6.09440E-02	1.16880E-02
		1538.50*	0.51	5.11533E-02	1.74879E-02
		1543.32*	0.33	1.02774E-01	3.33689E-02
		1583.22*	0.70	3.72465E-02	1.25268E-02
		1594.73	0.31		
		1599.31*	0.38	2.87556E-02	2.96781E-02
		1661.28*	1.14	6.32585E-02	2.15269E-02
		1683.99	0.25		
		1729.59*	2.88	8.00268E-02	2.91041E-02
		1764.49*	15.36	6.39044E-02	2.52629E-02
		1838.36*	0.40	5.05974E-02	3.24908E-02
		1847.42*	2.04	7.04400E-02	3.49414E-02
		1873.16*	0.25	5.69101E-02	3.65425E-02
		1896.30	0.17		
		2118.55	1.14		
		2204.21	4.86		
PB-214	0.963	53.23*	1.11	5.95558E-02	7.93973E-03

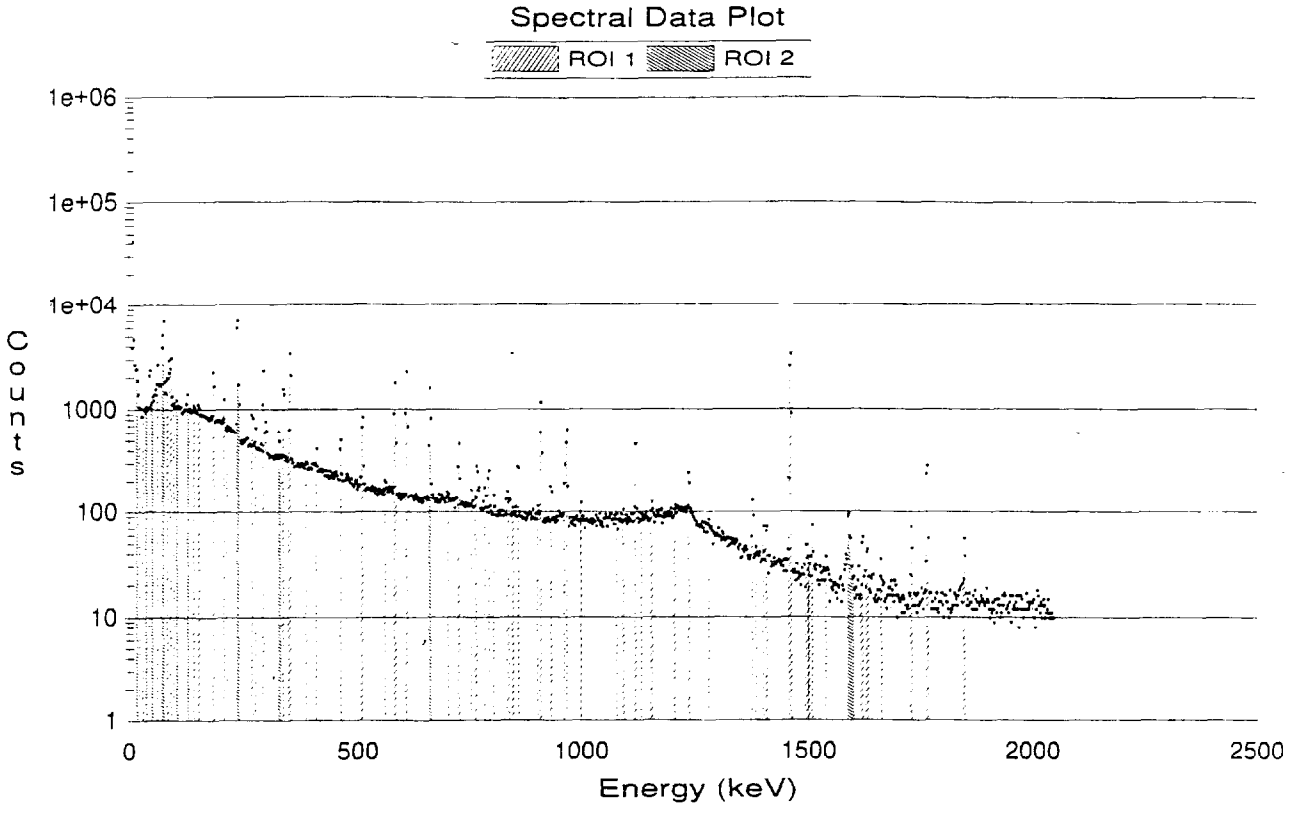
Enclosure (2)

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
PB-214	0.963	74.81*	5.90	1.21479E-01	1.14849E-02
		77.11*	9.90	1.17810E-01	1.15966E-02
		87.30*	4.41	7.92987E-02	9.66890E-03
		241.98*	7.50	9.72366E-02	2.58777E-02
		258.79*	0.55	1.09899E-01	4.40781E-02
		274.53*	0.35	9.61251E-02	4.87965E-02
		295.21*	18.50	8.98593E-02	2.27514E-02
		351.92*	35.80	8.32588E-02	1.86801E-02
		462.10*	0.23	7.19673E-01	1.59134E-01
		480.42	0.33		
		487.08*	0.44	6.89555E-02	3.51134E-02
		533.69*	0.19	6.99405E-02	4.94352E-02
		580.15	0.35		
		785.91*	0.85	1.08442E-01	2.08213E-02
		839.03*	0.63	1.15310E-01	1.81453E-02
FR-223	0.674	50.20*	34.00	1.27011E-02	7.24560E-03
		61.51	0.14		
		79.77*	9.20	5.15862E-02	2.76908E-02
		85.43	1.66		
		88.47	2.70		
		100.00	1.25		
		100.30	0.50		
		134.50	0.54		
		173.45	0.14		
		184.70*	0.31	7.61921E+01	4.37490E+01
		205.00*	0.95	5.76510E-01	4.61330E-01
		234.90	3.40		
		289.50	0.27		
		319.26	0.57		
		369.40	0.11		
		775.30	0.42		
RA-224	0.951	240.99*	3.97	1.83696E-01	4.88610E-02
RA-226	0.909	81.07*	0.19	9.29684E-02	9.51740E-03
		83.78*	0.32	3.28488E-01	3.55171E-02
		94.90	0.14		
		186.10*	3.50	2.53816E-01	6.43600E-02
AC-228	0.861	13.00 a	39.00		
		57.76 a	0.49		
		89.95*	1.94	8.65242E-02	1.27548E-02
		93.35*	3.20	8.99533E-02	1.44412E-02
		99.50*	1.28	5.32425E-02	1.33618E-02
		105.00*	1.47	3.70440E-02	1.09156E-02
		129.07*	2.45	3.57074E-02	8.52812E-03
		145.85 a	0.16		
		153.98*	0.74	9.08009E-02	3.10113E-02
		191.35 a	0.13		
		199.41	0.32		
		204.03 a	0.12		
		209.25*	3.88	4.50694E-02	1.26516E-02
		270.24*	3.43	5.16320E-02	1.46315E-02
		278.95	0.20		

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
AC-228	0.861	321.65*	0.23	1.12698E-01	6.34730E-02
		327.64*	3.20	3.50403E-02	9.60796E-03
		332.37	0.37		
		338.32*	11.30	3.73626E-02	8.83439E-03
		340.97	0.38		
		409.46*	1.94	3.64966E-02	9.24162E-03
		440.45	0.13		
		463.01*	4.44	3.72803E-02	6.72025E-03
		478.30	0.22		
		503.82	0.19		
		509.60* a	0.47	1.09161E+00	1.74200E-01
		523.13	0.11		
		546.45	0.21		
		562.50*	0.87	2.60146E-02	1.50296E-02
		570.91	0.17		
		572.29	0.15		
		583.41*	0.11	7.23855E+00	9.10354E-01
		674.63	0.10		
		701.75*	0.18	1.52697E-01	5.15692E-02
		707.41*	0.16	7.28274E-02	3.78885E-02
		726.86*	0.64	3.42043E-01	5.31758E-02
		755.32*	1.01	4.31160E-02	1.51133E-02
		772.29*	1.50	1.99698E-02	4.52744E-03
		782.14	0.50		
		794.95*	4.34	3.24619E-02	4.03190E-03
		830.49*	0.55	3.06398E-02	1.40484E-02
		835.71*	1.68	3.77149E-02	6.49891E-03
		840.38	0.94		
		904.20*	0.78	2.16095E-02	1.20745E-02
		911.21*	26.60	2.93206E-02	2.55662E-03
		947.98	0.11		
		958.61	0.29		
		964.77*	5.11	2.59474E-02	3.54938E-03
		968.97*	16.20	2.70770E-02	2.52110E-03
		988.43	0.13		
		1033.25*	0.21	5.61402E-02	5.19741E-02
		1065.17	0.14		
		1095.68	0.13		
		1110.61	0.31		
		1153.52	0.14		
		1247.08*	0.50	5.72439E-02	2.62931E-02
		1459.14	0.80		
		1495.91*	0.89	3.65791E-02	1.41819E-02
		1501.58*	0.47	3.22809E-02	2.36214E-02
		1557.11	0.18		
		1580.54	0.61		
		1588.21*	3.27	2.62308E-02	6.64828E-03
		1625.00	0.26		
		1630.63*	1.60	2.70599E-02	1.10116E-02
		1638.28*	0.47	3.87079E-02	3.38682E-02
		1666.52	0.18		

Nuclide Name	Id Confidence	Energy (keV)		Yield (%)	Activity (Bq/gms)	Activity Uncertainty
AC-228	0.861	1887.00		0.10		
TH-228	0.667	84.37*		1.27	8.30302E-02	8.46727E-03
		131.61*		0.14	1.19839E-01	4.90246E-02
		166.41		0.11		
		215.99		0.26		
TH-230	0.972	67.67*		0.38	8.49743E-02	3.02203E-02
TH-232	0.949	59.00*		0.19	3.13414E-01	4.11148E-02
PA-234m	0.946	1001.03*		0.59	5.77536E-02	1.87545E-02
TH-234	0.986	63.29*		4.50	3.41665E-02	7.53463E-03
		92.59*		5.41	5.32071E-02	9.10518E-03
		112.81*		0.26	1.58577E-01	5.81955E-02
U-235	0.849	13.00	@	31.00		
		72.70		0.11		
		89.95*		2.80	5.99489E-02	2.06145E-02
		93.35*	@	4.50	6.39668E-02	2.15763E-02
		94.00		0.40		
		105.00*		2.10	2.59308E-02	1.13408E-02
		109.16*		1.50	2.24525E-02	7.05924E-03
		140.76		0.22		
		143.76*		10.90	3.50147E-03	1.68169E-03
		163.33		5.00		
		182.61		0.40		
		185.71*		57.50	1.54497E-02	3.92249E-03
		194.94		0.59		
		202.11		1.00		
		205.31*		5.00	4.11980E-03	2.33793E-03
		279.50		0.27		

* = Energy line found in the spectrum.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000 sigma



Datasource:	98-10-03.CNF		
Live Time:	50000 sec		
Real Time:	50139 sec		
Acq. Start:	4-20-98 3:05:40 PM		
Start:	1	:	0.47 (keV)
Stop:	4096	:	2047.90 (keV)

Enclosure (3)

****
***** INTERFERENCE CORRECTED REPORT *****
****

	Nuclide Name		Nuclide Id Confidence	Wt mean Activity (Bq/gms)	Wt mean Activity Uncertainty
X	Ann		0.946		
	sum		0.989	7.541892E-05	1.637281E-04
	Tl-esc		0.967	8.166042E-04	2.023181E-04
	K-40		0.999	4.291936E-01	5.334828E-02
	CS-137		0.991	1.066239E-02	5.843762E-04
	TL-208	@	0.897	1.143380E-02	7.394825E-04
	Pb-210		0.991	4.851708E-02	3.752575E-03
	BI-212		0.796	3.167926E-02	3.211268E-03
	PB-212		0.975	2.256815E-02	2.962775E-03
	BI-214		0.911	2.746301E-02	1.076895E-03
	PB-214		0.946	2.624001E-02	4.114592E-03
	FR-223		0.431	1.148273E-02	7.002771E-03
X	RA-223		0.316		
	RA-224		0.990	5.535759E-02	2.894202E-02
	RA-226		0.818	2.795474E-02	3.835545E-02
	AC-228	@	0.869	3.198347E-02	1.264327E-03
	TH-228		0.860	2.964080E-02	1.782430E-02
	TH-231	@	0.646	3.589637E-03	2.536841E-03
	PA-234m		0.999	6.856015E-02	2.547453E-02
	TH-234		0.953	3.134877E-02	3.120368E-03
	U-235	@	0.770	4.783542E-03	1.401641E-03

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

********** UNIDENTIFIED PEAKS **********

Peak Locate Performed on: 4-21-98 8:00:12 AM
Peak Locate From Channel: 20
Peak Locate To Channel: 4096

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 1.000 sigma

Enclosure (3)

****
***** NUCLIDE IDENTIFICATION REPORT *****
****

Sample Title: 98-10-03
Nuclide Library Used: C:\GENIEPC\CAMFILES\50000.NLB

..... IDENTIFIED NUCLIDES .....

Nuclide Name	Id Confidence	Energy (keV)		Yield (%)	Activity (Bq/gms)	Activity Uncertainty
sum	0.989	16.07*		100.00	6.86884E-02	3.82799E-02
		19.15*		100.00	3.66748E-02	7.50457E-03
		846.80*		100.00	5.67337E-05	1.63769E-04
Tl-esc	0.967	1593.00*		100.00	8.16604E-04	2.02318E-04
K-40	0.999	1460.75*		10.67	4.29194E-01	5.33483E-02
CS-137	0.991	32.00*		5.89	6.51167E-03	4.07581E-03
		36.40*		1.39	2.08583E-02	6.77992E-03
		661.66*		85.21	1.06722E-02	5.92729E-04
TL-208	0.897	72.80		2.02		
		74.97*		3.41	1.61152E-01	1.40411E-02
		84.90		1.51		
		211.40		0.18		
		233.36		0.31		
		252.61		0.69		
		277.36*		6.31	1.36584E-02	4.46608E-03
		510.77*	a	22.60	1.17074E-02	1.76143E-03
		583.19*		84.50	1.10099E-02	9.05884E-04
		722.04		0.20		
		763.13*		1.81	1.37016E-02	4.70070E-03
		860.56*		12.42	1.17270E-02	1.42181E-03
		927.60		0.13		
		982.70		0.20		
		1093.90*		0.40	3.22401E-02	4.66063E-02
210	0.991	46.52*		4.00	4.85171E-02	3.75257E-03
BI-212	0.796	39.86*		1.02	3.08393E-02	9.14207E-03
		288.07		0.31		
		327.96*		0.14	8.46967E-01	2.28484E-01
		452.83		0.31		
		727.18*		6.65	3.60960E-02	3.91996E-03
		785.42*		1.11	4.86206E-02	1.06193E-02
		893.39		0.37		
		952.10		0.18		
		1078.62*		0.54	3.17417E-02	2.35529E-02
		1512.75		0.31		
		1620.56*		1.51	3.35352E-02	1.21631E-02
		1806.00		0.11		
PB-212	0.975	74.81*		10.50	5.23359E-02	4.68173E-03
		77.11*		17.60	4.93919E-02	4.65000E-03
		87.30*		7.90	2.40415E-02	3.12741E-03
		115.18		0.59		
		238.63*		43.60	4.68238E-02	1.24893E-02
		300.09*		3.34	4.36008E-02	1.15412E-02

Enclosure (3)

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
BI-214	0.911	76.86*	0.45	1.91898E+00	1.68129E-01
		79.29	0.76		
		89.80*	0.34	2.07964E-01	3.26708E-02
		273.70	0.17		
		387.00*	0.29	9.70687E-02	5.53142E-02
		389.10	0.37		
		405.74	0.18		
		454.77	0.28		
		469.69	0.14		
		474.38	0.12		
		609.31*	44.80	2.78144E-02	1.93733E-03
		665.45*	1.29	1.82603E-02	4.81789E-03
		703.11*	0.37	6.32761E-02	4.35809E-02
		719.86	0.42		
		752.84	0.14		
		768.36*	4.80	2.67098E-02	3.32491E-03
		786.10*	0.30	1.79896E-01	6.18183E-02
		806.17*	1.12	2.40011E-02	1.14993E-02
		821.18	0.18		
		934.06*	3.03	2.85431E-02	6.23529E-03
		964.08*	0.38	3.44037E-01	6.01606E-02
		1051.96	0.34		
		1069.96	0.28		
		1120.29*	14.80	2.78182E-02	2.40755E-03
		1133.66*	0.28	6.67763E-02	4.28049E-02
		1155.19*	1.64	3.44061E-02	9.45008E-03
		1207.68*	0.49	8.88847E-02	3.79558E-02
		1238.11*	5.86	2.98759E-02	4.14530E-03
		1280.96*	1.44	2.67883E-02	9.37375E-03
		1303.76	0.11		
		1377.67*	3.92	3.22179E-02	4.30658E-03
		1385.31*	0.89	2.18665E-02	1.51717E-02
		1401.50*	1.55	2.60558E-02	8.57497E-03
		1407.98*	2.80	1.95574E-02	6.60029E-03
		1509.23*	2.12	2.35720E-02	6.69623E-03
		1538.50*	0.51	4.58080E-02	2.27234E-02
		1543.32	0.33		
		1583.22	0.70		
		1594.73	0.31		
		1599.31*	0.38	4.09180E-02	1.55247E-02
		1661.28*	1.14	2.63557E-02	1.21676E-02
		1683.99*	0.25	4.26118E-02	2.33269E-02
		1729.59*	2.88	3.36546E-02	1.27897E-02
		1764.49*	15.36	2.89138E-02	1.14744E-02
		1838.36	0.40		
		1847.42*	2.04	3.12264E-02	1.67246E-02
		1873.16	0.25		
		1896.30	0.17		
		2118.55	1.14		
		2204.21	4.86		
PB-214	0.946	53.23*	1.11	2.52238E-02	6.72946E-03

Enclosure (3)

Nuclide Name	Id Confidence	Energy (keV)		Yield (%)	Activity (Bq/gms)	Activity Uncertainty
PB-214	0.946	74.81*		5.90	9.31401E-02	8.90280E-03
		77.11*		9.90	8.78078E-02	8.70679E-03
		87.30*		4.41	4.30676E-02	5.55315E-03
		241.98*		7.50	5.55427E-02	1.47757E-02
		258.79		0.55		
		274.53		0.35		
		295.21*		18.50	3.96999E-02	1.01120E-02
		351.92*		35.80	3.71246E-02	8.35503E-03
		462.10*		0.23	7.76970E-01	1.68773E-01
		480.42		0.33		
		487.08		0.44		
		533.69		0.19		
		580.15		0.35		
		785.91*		0.85	6.34928E-02	1.56576E-02
		839.03*		0.63	6.52219E-02	1.80632E-02
FR-223	0.431	50.20*		34.00	1.14471E-02	6.98807E-03
		61.51		0.14		
		79.77		9.20		
		85.43		1.66		
		88.47		2.70		
		100.00*		1.25	1.05351E+00	6.06363E-01
		100.30		0.50		
		134.50		0.54		
		173.45		0.14		
		184.70*		0.31	3.70658E+01	2.13295E+01
		205.00		0.95		
		234.90		3.40		
		289.50		0.27		
		319.26		0.57		
		369.40		0.11		
		775.30		0.42		
RA-224	0.990	240.99*		3.97	1.04929E-01	2.78987E-02
RA-226	0.818	81.07		0.19		
		83.78*		0.32	1.98428E-01	3.60356E-02
		94.90		0.14		
		186.10*		3.50	1.23558E-01	3.17587E-02
AC-228	0.869	13.00	a	39.00		
		57.76	a	0.49		
		89.95*		1.94	3.64472E-02	6.39452E-03
		93.35*		3.20	8.53724E-02	1.37838E-02
		99.50*		1.28	3.87206E-02	1.01305E-02
		105.00*		1.47	3.12482E-02	8.01159E-03
		129.07*		2.45	4.40683E-02	1.01043E-02
		145.85	a	0.16		
		153.98*		0.74	7.66490E-02	2.84487E-02
		191.35	a	0.13		
		199.41		0.32		
		204.03	a	0.12		
		209.25*		3.88	4.45004E-02	1.23836E-02
		270.24*		3.43	5.33492E-02	1.47575E-02
		278.95		0.20		

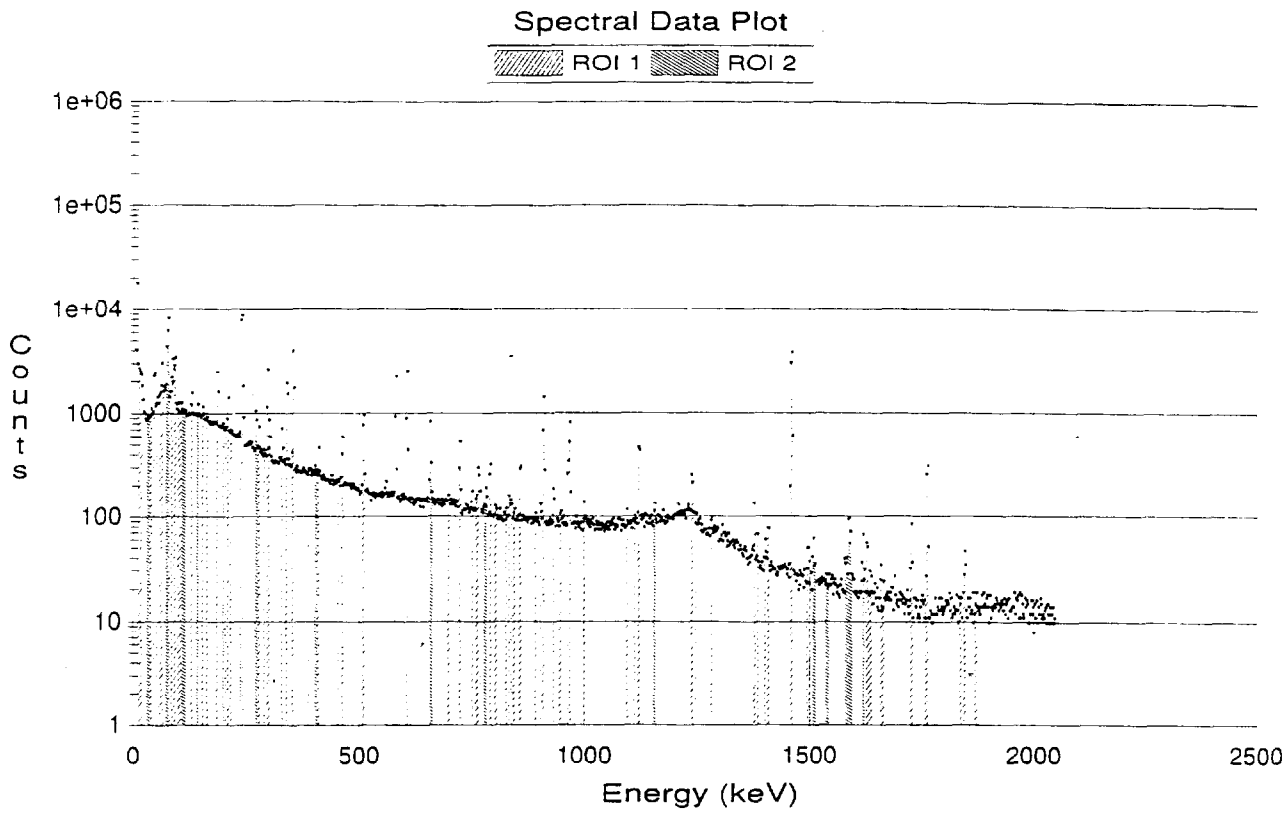
Enclosure (3)

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
AC-228	0.869	321.65	0.23		
		327.64*	3.20	3.67901E-02	9.49151E-03
		332.37*	0.37	5.80586E-02	2.34970E-02
		338.32*	11.30	4.17015E-02	9.81686E-03
		340.97	0.38		
		409.46*	1.94	4.44668E-02	1.11989E-02
		440.45*	0.13	2.30727E-01	8.05854E-02
		463.01*	4.44	4.02485E-02	7.06185E-03
		478.30	0.22		
		503.82	0.19		
		509.60* a	0.47	5.62953E-01	1.03463E-01
		523.13	0.11		
		546.45	0.21		
		562.50*	0.87	3.89377E-02	1.40759E-02
		570.91	0.17		
		572.29	0.15		
		583.41*	0.11	8.16082E+00	1.03265E+00
		674.63	0.10		
		701.75	0.18		
		707.41	0.16		
		726.86*	0.64	3.75060E-01	6.15256E-02
		755.32*	1.01	5.30648E-02	1.44120E-02
		772.29*	1.50	3.56946E-02	7.62870E-03
		782.14	0.50		
		794.95*	4.34	3.34346E-02	3.90946E-03
		830.49*	0.55	4.90055E-02	1.72842E-02
		835.71*	1.68	1.76867E-02	7.63401E-03
		840.38*	0.94	4.37125E-02	1.20701E-02
		904.20*	0.78	3.30078E-02	1.55159E-02
		911.21*	26.60	3.35908E-02	2.88111E-03
		947.98	0.11		
		958.61	0.29		
		964.77*	5.11	2.55839E-02	3.64054E-03
		968.97*	16.20	3.20222E-02	2.91437E-03
		988.43	0.13		
		1033.25	0.21		
		1065.17	0.14		
		1095.68	0.13		
		1110.61	0.31		
		1153.52	0.14		
		1247.08	0.50		
		1459.14	0.80		
		1495.91*	0.89	3.49859E-02	1.33759E-02
		1501.58*	0.47	3.21350E-02	3.01219E-02
		1557.11	0.18		
		1580.54	0.61		
		1588.21*	3.27	3.62807E-02	8.83927E-03
		1625.00	0.26		
		1630.63*	1.60	1.69383E-02	9.77139E-03
		1638.28	0.47		
		1666.52	0.18		

Nuclide Name	Id Confidence	Energy (keV)		Yield (%)	Activity (Bq/gms)	Activity Uncertainty
AC-228	0.869	1887.00		0.10		
TH-228	0.860	84.37*		1.27	5.01556E-02	8.92846E-03
		131.61*		0.14	1.56943E-01	5.52883E-02
		166.41		0.11		
		215.99*		0.26	1.53310E-01	7.01533E-02
TH-231	0.646	13.30	@	71.00		
		25.64*		14.70	7.13683E-03	2.72064E-03
		58.57		0.48		
		72.75		0.25		
		81.23		0.89		
		82.09		0.40		
		84.21*		6.60	9.62076E-03	1.85232E-03
		89.95*		0.94	7.52209E-02	1.32914E-02
		99.28*		0.12	4.13020E-01	1.10431E-01
		102.27		0.41		
		163.10		0.16		
PA-234m	0.999	1001.03*		0.59	6.85601E-02	2.54745E-02
TH-234	0.953	63.29*		4.50	3.24008E-02	7.37280E-03
		92.59*		5.41	5.04975E-02	8.68481E-03
		112.81		0.26		
U-235	0.770	13.00	@	31.00		
		72.70		0.11		
		89.95*		2.80	2.52527E-02	9.00979E-03
		93.35*	@	4.50	6.07092E-02	2.05040E-02
		94.00		0.40		
		105.00*		2.10	2.18737E-02	9.02357E-03
		109.16*		1.50	9.01095E-03	4.15064E-03
		140.76		0.22		
		143.76*		10.90	5.14375E-03	1.73260E-03
		163.33		5.00		
		182.61		0.40		
		185.71*		57.50	7.52091E-03	1.93551E-03
		194.94		0.59		
		202.11		1.00		
		205.31		5.00		
		279.50		0.27		

* = Energy line found in the spectrum.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000 sigma

Enclosure (3)



Datasource:	98-10-04.CNF
Live Time:	50000 sec
Real Time:	50156 sec
Acq. Start:	4-21-98 4:14:38 PM
Start:	1 : 0.47 (keV)
Stop:	4096 : 2047.90 (keV)

Enclosure (4)

****
***** INTERFERENCE CORRECTED REPORT *****
****

	Nuclide Name		Nuclide Id Confidence	Wt mean Activity (Bq/gms)	Wt mean Activity Uncertainty
	Ann		0.934	1.159589E-04	4.802244E-04
	sum		0.998	1.943721E-02	5.223851E-03
	Tl-esc		0.869	6.857371E-04	1.717720E-04
	K-40		0.995	4.509750E-01	5.600346E-02
	CS-137		0.989	4.139110E-03	2.688083E-04
	TL-208	@	0.932	1.258838E-02	7.862887E-04
	Pb-210		0.979	4.381421E-02	3.659148E-03
	BI-212		0.899	3.789705E-02	2.554521E-03
	PB-212		0.965	2.981097E-02	3.102178E-03
	BI-214		0.917	2.636242E-02	9.989766E-04
	PB-214		0.956	2.925400E-02	3.874623E-03
	Rn-219	@	0.967	3.290360E-03	1.398773E-03
	RA-223		0.634	8.435591E-04	8.455146E-04
	RA-224		0.966	3.727579E-02	2.584554E-02
	RA-226		0.904	2.437561E-02	3.551572E-02
	AC-228	@	0.922	3.797646E-02	1.355021E-03
	TH-228		0.743	4.133243E-03	4.004896E-02
	TH-230		0.915	5.640833E-02	2.424366E-02
	TH-231	@	0.345	1.232847E-02	9.795524E-03
	TH-232		0.981	1.119355E-02	6.763839E-02
	PA-234m		0.996	8.641364E-02	2.434763E-02
	TH-234		0.988	3.650873E-02	3.024212E-03
X	U-234		0.999		
	U-235	@	0.964	5.737391E-03	1.067780E-03

? = nuclide is part of an undetermined solution
X = nuclide rejected by the interference analysis
@ = nuclide contains energy lines not used in Weighted Mean Activity

Errors quoted at 1.000 sigma

Enclosure (4)

****
***** NUCLIDE IDENTIFICATION REPORT *****
****

Sample Title: 98-10-04
Nuclide Library Used: C:\GENIEPC\CAMFILES\50000.NLB

..... IDENTIFIED NUCLIDES .....

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
Ann	0.934	511.00*	100.00	3.13942E-03	4.46075E-04
sum	0.998	16.07*	100.00	-5.55506E-02	4.00431E-02
		19.15*	100.00	1.94372E-02	5.22385E-03
		846.80*	100.00	-1.43416E-04	1.95418E-04
Tl-esc	0.869	1593.00*	100.00	6.85737E-04	1.71772E-04
K-40	0.995	1460.75*	10.67	4.50975E-01	5.60035E-02
CS-137	0.989	32.00*	5.89	6.55146E-03	2.25091E-03
		36.40*	1.39	9.32782E-03	4.75037E-03
		661.66*	85.21	4.08718E-03	2.71187E-04
TL-208	0.932	72.80*	2.02	1.58236E-02	2.87935E-03
		74.97*	3.41	1.68492E-01	1.45745E-02
		84.90	1.51		
		211.40	0.18		
		233.36	0.31		
		252.61	0.69		
		277.36*	6.31	1.60061E-02	4.63244E-03
		510.77* a	22.60	1.38912E-02	1.98238E-03
		583.19*	84.50	1.19540E-02	9.60771E-04
		722.04	0.20		
		763.13*	1.81	1.89992E-02	5.31205E-03
		860.56*	12.42	1.27729E-02	1.73553E-03
		927.60	0.13		
		982.70	0.20		
		1093.90*	0.40	8.65625E-02	3.81613E-02
Pb-210	0.979	46.52*	4.00	4.38142E-02	3.65915E-03
BI-212	0.899	39.86*	1.02	2.67761E-02	1.22618E-02
		288.07*	0.31	5.24789E-02	2.70898E-02
		327.96*	0.14	9.90556E-01	2.75370E-01
		452.83*	0.31	9.63162E-02	4.63076E-02
		727.18*	6.65	4.10971E-02	3.02365E-03
		785.42*	1.11	7.90593E-02	1.11115E-02
		893.39*	0.37	5.61737E-02	2.63584E-02
		952.10	0.18		
		1078.62	0.54		
		1512.75*	0.31	9.48146E-02	2.67579E-02
		1620.56*	1.51	2.73702E-02	8.74522E-03
		1806.00	0.11		
PB-212	0.965	74.81*	10.50	5.47199E-02	4.86139E-03
		77.11*	17.60	5.15928E-02	4.83565E-03
		87.30*	7.90	3.50217E-02	4.38021E-03
		115.18	0.59		
		238.63*	43.60	4.80881E-02	1.28271E-02

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
PB-212	0.965	300.09*	3.34	4.55054E-02	1.19833E-02
BI-214	0.917	76.86*	0.45	2.00449E+00	1.74720E-01
		79.29	0.76		
		89.80*	0.34	4.21151E-01	5.36135E-02
		273.70*	0.17	9.87238E-02	4.68228E-02
		387.00*	0.29	1.01052E-01	5.88594E-02
		389.10	0.37		
		405.74*	0.18	1.35064E-01	6.23893E-02
		454.77	0.28		
		469.69	0.14		
		474.38	0.12		
		609.31*	44.80	2.65867E-02	1.83453E-03
		665.45*	1.29	1.66928E-02	4.41666E-03
		703.11*	0.37	5.06079E-02	4.94595E-02
		719.86	0.42		
		752.84	0.14		
		768.36*	4.80	3.32247E-02	3.23571E-03
		786.10*	0.30	2.92519E-01	8.78211E-02
		806.17*	1.12	2.36322E-02	1.47822E-02
		821.18	0.18		
		934.06*	3.03	2.84400E-02	4.90751E-03
		964.08*	0.38	4.36605E-01	6.74627E-02
		1051.96	0.34		
		1069.96	0.28		
		1120.29*	14.80	2.37576E-02	2.12944E-03
		1133.66	0.28		
		1155.19*	1.64	2.05836E-02	5.72934E-03
		1207.68	0.49		
		1238.11*	5.86	3.19998E-02	4.95325E-03
		1280.96*	1.44	2.22766E-02	1.07093E-02
		1303.76	0.11		
		1377.67*	3.92	3.16028E-02	4.30269E-03
		1385.31*	0.89	3.70506E-02	1.22315E-02
		1401.50*	1.55	1.85740E-02	7.01622E-03
		1407.98*	2.80	2.10850E-02	6.69749E-03
		1509.23*	2.12	2.80935E-02	6.31750E-03
		1538.50*	0.51	2.10854E-02	1.29928E-02
		1543.32*	0.33	2.83043E-02	1.80726E-02
		1583.22*	0.70	2.68777E-02	9.66691E-03
		1594.73*	0.31	5.86747E-02	2.02957E-02
		1599.31	0.38		
		1661.28*	1.14	1.93938E-02	9.50810E-03
		1683.99	0.25		
		1729.59*	2.88	3.54006E-02	1.32989E-02
		1764.49*	15.36	2.64895E-02	1.05212E-02
		1838.36*	0.40	2.16389E-02	2.47555E-02
		1847.42*	2.04	3.18606E-02	1.65051E-02
		1873.16*	0.25	6.35124E-02	4.71035E-02
		1896.30	0.17		
		2118.55	1.14		
		2204.21	4.86		

Enclosure (4)

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
PB-214	0.956	53.23*	1.11	2.81039E-02	6.41959E-03
		74.81*	5.90	9.73828E-02	9.25239E-03
		77.11*	9.90	9.17205E-02	9.05838E-03
		87.30*	4.41	6.27373E-02	7.77201E-03
		241.98*	7.50	4.89853E-02	1.31370E-02
		258.79*	0.55	2.96954E-02	2.03222E-02
		274.53*	0.35	4.85157E-02	2.61362E-02
		295.21*	18.50	3.79451E-02	9.64061E-03
		351.92*	35.80	3.68205E-02	8.27852E-03
		462.10*	0.23	8.86493E-01	1.90172E-01
		480.42	0.33		
		487.08	0.44		
		533.69	0.19		
		580.15	0.35		
		785.91*	0.85	1.03242E-01	1.87161E-02
		839.03*	0.63	3.51484E-02	1.86528E-02
Rn-219	0.967	271.23* a	10.60	1.66690E-03	9.09605E-04
		401.81*	6.50	3.29036E-03	1.39235E-03
RA-223	0.634	81.07*	15.00	1.82953E-03	4.50294E-04
		83.78*	24.80	4.53148E-03	5.68185E-04
		94.90	11.30		
		122.31	1.19		
		144.20*	3.26	1.63955E-02	4.63400E-03
		154.19*	5.59	1.20702E-02	3.46894E-03
		158.62	0.69		
		179.67	0.15		
		269.41*	13.60	1.58729E-02	4.29982E-03
		288.17*	0.15	1.05639E-01	5.29605E-02
		323.89	3.90		
		328.50*	0.20	6.95391E-01	1.88616E-01
		338.32*	2.78	1.91736E-01	4.50332E-02
		342.90	0.20		
		371.84	0.49		
		444.94	1.27		
RA-224	0.966	240.99*	3.97	9.25416E-02	2.48049E-02
RA-226	0.904	81.07*	0.19	1.42932E-01	3.54756E-02
		83.78*	0.32	3.51190E-01	4.52141E-02
		94.90	0.14		
		186.10*	3.50	1.27900E-01	3.27511E-02
AC-228	0.922	13.00* a	39.00	1.52064E+01	1.08373E+01
		57.76* a	0.49	5.43937E-02	2.46311E-02
		89.95*	1.94	7.38100E-02	1.10239E-02
		93.35*	3.20	1.06264E-01	1.68255E-02
		99.50*	1.28	5.84371E-02	1.20128E-02
		105.00*	1.47	5.11626E-02	1.24690E-02
		129.07*	2.45	4.22854E-02	1.04781E-02
		145.85 a	0.16		
		153.98*	0.74	9.11789E-02	2.66141E-02
		191.35 a	0.13		
		199.41*	0.32	6.60892E-02	3.18904E-02
		204.03* a	0.12	3.35897E-01	1.31314E-01

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
AC-228	0.922	209.25*	3.88	5.74001E-02	1.57295E-02
		270.24*	3.43	6.29364E-02	1.70555E-02
		278.95	0.20		
		321.65	0.23		
		327.64*	3.20	4.30273E-02	1.14703E-02
		332.37	0.37		
		338.32*	11.30	4.71705E-02	1.10861E-02
		340.97	0.38		
		409.46*	1.94	4.85291E-02	1.14340E-02
		440.45	0.13		
		463.01*	4.44	4.59219E-02	7.90338E-03
		478.30	0.22		
		503.82	0.19		
		509.60* a	0.47	6.67962E-01	1.18564E-01
		523.13	0.11		
		546.45	0.21		
		562.50*	0.87	2.88522E-02	1.43283E-02
		570.91	0.17		
		572.29	0.15		
		583.41*	0.11	8.86063E+00	1.11029E+00
		674.63	0.10		
		701.75*	0.18	1.04343E-01	1.02102E-01
		707.41	0.16		
		726.86*	0.64	4.27024E-01	6.11842E-02
		755.32*	1.01	4.45059E-02	1.36608E-02
		772.29*	1.50	5.04474E-02	8.04034E-03
		782.14*	0.50	7.41031E-02	1.53980E-02
		794.95*	4.34	3.68867E-02	3.94905E-03
		830.49*	0.55	2.00547E-02	2.13357E-02
		835.71*	1.68	1.78150E-02	7.89245E-03
		840.38*	0.94	2.35569E-02	1.24912E-02
		904.20*	0.78	3.75814E-02	1.30564E-02
		911.21*	26.60	3.78249E-02	3.22216E-03
		947.98*	0.11	3.54656E-01	1.38020E-01
		958.61	0.29		
		964.77*	5.11	3.24677E-02	3.77877E-03
		968.97*	16.20	3.73808E-02	3.32089E-03
		988.43	0.13		
		1033.25	0.21		
		1065.17	0.14		
		1095.68	0.13		
		1110.61*	0.31	5.26661E-02	3.98776E-02
		1153.52*	0.14	1.34822E-01	5.03090E-02
		1247.08*	0.50	5.16981E-02	2.11447E-02
		1459.14	0.80		
		1495.91*	0.89	2.97813E-02	1.13254E-02
		1501.58*	0.47	6.41153E-02	2.50649E-02
		1557.11	0.18		
		1580.54*	0.61	2.66063E-02	1.01082E-02
		1588.21*	3.27	3.47137E-02	8.44354E-03
		1625.00*	0.26	4.73125E-02	1.97810E-02

Nuclide Name	Id Confidence	Energy (keV)	Yield (%)	Activity (Bq/gms)	Activity Uncertainty
AC-228	0.922	1630.63*	1.60	3.65578E-02	1.29760E-02
		1638.28*	0.47	7.22953E-02	2.97938E-02
		1666.52*	0.18	5.89877E-02	5.47993E-02
		1887.00	0.10		
TH-228	0.743	84.37*	1.27	8.87684E-02	1.09744E-02
		131.61	0.14		
		166.41	0.11		
		215.99*	0.26	6.46822E-02	5.53809E-02
TH-230	0.915	67.67*	0.38	5.64083E-02	2.42437E-02
TH-231	0.345	13.30* @	71.00	8.35280E+00	5.95286E+00
		25.64	14.70		
		58.57*	0.48	5.55269E-02	2.53394E-02
		72.75*	0.25	1.27346E-01	2.49088E-02
		81.23*	0.89	3.08347E-02	7.92475E-03
		82.09	0.40		
		84.21*	6.60	1.70274E-02	2.44769E-03
		89.95*	0.94	1.52331E-01	2.29754E-02
		99.28*	0.12	6.23329E-01	1.32662E-01
		102.27	0.41		
		163.10*	0.16	4.81174E-02	1.08301E-01
TH-232	0.981	59.00*	0.19	1.40278E-01	6.37820E-02
PA-234m	0.996	1001.03*	0.59	8.64136E-02	2.43476E-02
TH-234	0.988	63.29*	4.50	3.61055E-02	7.92478E-03
		92.59*	5.41	6.28549E-02	1.06263E-02
		112.81*	0.26	2.14706E-01	7.68418E-02
U-235	0.964	13.00* @	31.00	1.91306E+01	1.36340E+01
		72.70*	0.11	2.90580E-01	5.19076E-02
		89.95*	2.80	5.11398E-02	1.76281E-02
		93.35* @	4.50	7.55656E-02	2.54098E-02
		94.00	0.40		
		105.00*	2.10	3.58139E-02	1.44966E-02
		109.16*	1.50	3.14496E-02	9.62021E-03
		140.76*	0.22	2.17715E-02	3.27397E-02
		143.76*	10.90	4.90361E-03	1.38581E-03
		163.33*	5.00	1.49164E-03	3.35553E-03
		182.61	0.40		
		185.71*	57.50	7.78519E-03	1.99600E-03
		194.94	0.59		
		202.11*	1.00	5.24597E-03	5.52954E-03
		205.31*	5.00	8.06153E-03	3.02691E-03
		279.50	0.27		

* = Energy line found in the spectrum.
@ = Energy line not used for Weighted Mean Activity
Energy Tolerance : 1.000 keV
Nuclide confidence index threshold = 0.30
Errors quoted at 1.000 sigma

********** U N I D E N T I F I E D P E A K S **********

Peak Locate Performed on: 4-22-98 7:56:02 AM
Peak Locate From Channel: 20
Peak Locate To Channel: 4096

Peak No.	Energy (keV)	Peak Size in Counts per Second	Peak CPS % Uncertainty

All peaks were identified.

M = First peak in a multiplet region
m = Other peak in a multiplet region
F = Fitted singlet

Errors quoted at 1.000 sigma

Enclosure (4)