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FINAL STATUS SURVEY FOR YELLOW WATER WEAPONS COMPOUND NAS CECIL FIELD FL

3/18/1999

BECHTEL ENVIRONMENTAL INC

FINAL STATUS SURVEY

FOR THE

YELLOW WATER WEAPONS COMPOUND

NAVAL AIR STATION CECIL FIELD

DELIVERY ORDER No. 0043

Prepared by

Bechtel Environmental, Inc.
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CONTENTS

Page

LIST OF FIGURES iv
LIST OF TABLES iv
ABBREVIATIONS AND ACRONYMS v
UNITS OF MEASURE v
1.0 INTRODUCTION 1
1.1 SITE DESCRIPTION 2
1.2 BUILDING DESCRIPTIONS 5
1.2.1 Building 601 5
1.2.2 Building 617 5
1.2.3 Building 626 8
1.2.4 Old Special Weapons Storage Magazines 8
1.2.5 New Special Weapons Storage Magazines 8
1.3 OPERATING HISTORY 12
1.4 OBJECTIVES 12
2.0 DOCUMENT REVIEW 13
3.0 PROCEDURES 16
3.1 CHOICE OF SAMPLE LOCATIONS 16
3.2 RADIOLOGICAL SURVEYS 17
3.3 SOIL SAMPLING 19
3.4 SWIPE SAMPLING FOR LABORATORY ANALYSIS 19
3.5 VERIFICATION AND VALIDATION 20
4.0 INTERPRETATION OF SURVEY RESULTS 21
4.1 BUILDING INTERIORS 21
4.2 EXHAUST HOUSINGS 21
4.3 OUTDOOR AREAS 22
4.4 MISCELLANEOUS SURVEYS 23
5.0 SUMMARY 23
6.0 REFERENCES 24

APPENDIXES

A Sample Locations and Results for Buildings and Outdoor Areas
B Conducting Radiological Surveys for Alpha/Beta Emitters and Tritium
C Swipe Sample Data Tables
D Direct Survey Data Tables
E Outdoor Gamma Scan

FIGURES

Figure	Title	Page
1	NAS Cecil Field	3
2	Yellow Water Weapons Compound	4
3	Building 601	6
4	Building 617	7
5	Building 626	9
6	Old Special Weapons Storage Magazine	10
7	New Special Weapons Storage Magazine	11

TABLES

Table	Title	Page
1	Survey Units at YWWC	14
2	Final Status Survey Scan Coverages for Buildings	15
3	Scanning Coverage Summary	16
4	Survey Instruments	18
5	DCGLs for COCs Present as Surface Contamination	19
6	DCGLs for COCs in Soil and Water	20

ABBREVIATIONS AND ACRONYMS

^{241}Am	americium – 241
^{3}H	hydrogen – 3 (or tritium)
^{239}Pu	plutonium – 239
^{234}U	uranium – 234
^{235}U	uranium – 235
^{238}U	uranium – 238
COC	contaminant of concern
DCGL	Derived Concentration Guideline Limit
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
FSS	Final Status Survey
GPS	Global Positioning System
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
NAS	Naval Air Station
YWWC	Yellow Water Weapons Compound

UNITS OF MEASURE

cc	cubic centimeter
cm^2	square centimeters
dpm/100 cm^2	disintegrations per minute per 100 square centimeters
ft	foot/feet
ft^2	square feet
in.	inch
m	meter
m^2	square meter
pCi/g	picocurie per gram

EXECUTIVE SUMMARY

A Final Status Survey was conducted at the Yellow Water Weapons Compound (YWWC) Naval Air Station (NAS) Cecil Field, Florida during the fall and winter of 1998/99. A Work Plan developed by ABB Environmental Services, Inc., using the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), was used as a guide to ensure that a well-structured investigation was conducted to determine with statistical confidence whether the radiological release criterion was met at the site. The potential contaminants of concern (COCs) at the site provided in the Work Plan predominantly include tritium (^{3}H), isotopes of uranium and plutonium, and americium (^{241}Am). (Other radioactive progeny also would have been present if the COCs had been detected.) These radionuclides comprise the vast majority of radioactive material used to manufacture special nuclear weapons. Both direct (direct instrument readings) and indirect (swipe, soil, and water samples) measurements were performed at locations chosen using methodologies within MARSSIM. None of the Derived Concentration Guideline Limits (DCGLs) for any of the Survey Units within YWWC were exceeded. Elevated measurements of radioactive material measured within Survey Unit 1 (exhaust housings of the old special weapons storage magazines) were determined by radioisotopic analysis to be from naturally occurring radioactivity rather than COCs being investigated within this work plan. These elevated readings, however, were still much less than the site DCGLs.

A gamma scanning survey using a Global Positioning System (GPS) was subcontracted and conducted of open areas around the industrial buildings and storage magazines within the YWWC to both locate and direct subsequent soil sampling activities. The scanning survey indicated several locations where elevated measurements around Buildings 617 and 626 and the new special weapons storage magazines were made. Even more locations were detected on and/or adjacent to the old special weapons storage magazines and drainage areas. Composite soil samples were taken in each area where elevated gamma survey measurements were made. Laboratory analyses of the soil samples indicated no soil sample result exceeded any of the site DCGLs. Laboratory analysis of two soil samples taken around two of the old special weapons storage magazines (Buildings 655 and 656) indicated defined peaks for ^{239}Pu, but the results were much less than the DCGL. The elevated measurements made during the gamma scanning survey were most probably due to variations in naturally occurring radioactive materials present at the site; none of the locations indicated COCs near the respective DCGLs.

FINAL STATUS SURVEY
USING MARSSIM SURVEY METHODOLOGIES
AT THE
YELLOW WATER WEAPONS COMPOUND
NAVAL AIR STATION CECIL FIELD, FLORIDA

1.0 INTRODUCTION

Naval Air Station (NAS) Cecil Field is located approximately 15 miles southwest of downtown Jacksonville, Florida. It was opened in 1941, covers approximately 31,000 acres, and consists of four distinct areas: the Main Station Area, the Yellow Water Weapons Compound (YWWC), OLF Whitehouse, and the Land Target Complex. Cecil Field was established to provide facilities, services, and material support for the operations and maintenance of naval weapons and aircraft to activities and units of operation forces. Some activities conducted at NAS Cecil Field include the operation of fuel storage facilities, aircraft maintenance, maintenance and operation of an engine repair facility, and special weapons support. It is the potential support (storage and maintenance) of special nuclear weapons at YWWC that requires a Final Status Survey (FSS) to be conducted to verify radiological conditions before the site can be released for public use. The principal contaminants of concern include tritium (^{3}H), uranium (^{234}U, $^{235/6}U$, and ^{238}U), plutonium (^{229}Pu, ^{240}Pu, and ^{241}Pu), and their progeny, which comprise the vast majority of radioactive material found in special nuclear weapons.

The *Final Status Survey Work Plan for the Cecil Field Yellow Water Weapons Compound* (Reference 1) prepared by ABB Environmental Services was greatly utilized, where appropriate, to guide site planning and sampling activities. (This Work Plan is subsequently referred to as the Plan throughout the remainder of this document.) The Plan utilized the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) methodology for designing a survey and releasing a site (Reference 2). The Plan segregated the YWWC into survey units. Survey units consist of structures or land areas of specified size and shape for which separate decisions are made as to whether or not the area exceeds the release criterion. Due to similarities in concrete, soil, and asphalt around buildings inside the YWWC and one recommended survey unit not being present (there was no carpet in Building 626), a total of 17 survey units were investigated at YWWC. In instances where the Plan recommended surveys or analyses that were not applicable to site conditions or that would have made the task unnecessarily expensive, professional judgement was used to make changes in the Plan. Many swipe samples were not sent offsite for isotopic analyses because gross alpha/beta analyses conducted at the site exhibited only background levels of radioactivity and so a much smaller number of samples (than recommended by MARSSIM) were sent for analyses. The Plan provided a general scope of the survey, contaminants of concern, DCGLs, classification of the areas, preliminary identification of the Survey Units, minimum number of data points in each Survey Unit, percentages of area within each Survey Units to be surveyed, a discussion of the Data Quality Objectives, and how to evaluate the results of the survey.

Due to a national security exclusion, historical records, data, and health physics surveys were not obtainable for review to confirm or deny the existence of radioactive materials prior to the beginning of site activities. It could not be confirmed or denied that nuclear weapons had been stored at YWWC. Discussions with site personnel did indicate that if nuclear weapons had been onsite, they would have been stored in magazines such as Buildings 650-670 and 760-799 and handled, if necessary, in Building 626. Although it is unlikely that any radioactive waste was generated during maintenance activities, if waste had been generated, it would have been packaged and transported to Building 617. Also, if there had been an accident where a weapon had been damaged and released radioactive material, the Explosive Ordinance Disposal (EOD) group located in Building 601 would have responded to

decontaminate any release and take possession of the weapon. Each of these buildings and surrounding land areas were designated within the Plan to be included within the scope of the FSS.

After initiating site walkdowns leading up to the FSS, it was noted that Buildings 601, 650-670, and 786-799 had already been released to other tenants. (This fact made it extremely difficult to randomly select grids prior to entering Building 601 to survey. The Red Cross and Northrop-Grumman materials stored within the above storage magazines were removed before gridding and random grid selection.) In an attempt to determine how to proceed and gain access to these buildings, contacts were made with the Cecil Field Base Realignment and Closure office. During these discussions, it was indicated that between 1983 and 1993 there had not been any nuclear weapons within either Buildings 601 or 617. It was also indicated that Building 626 had been utilized as a staging building for receiving and shipping weapons into the New Special Weapons Storage Area. Anytime weapons were moved to or from Buildings 760-799, they were first inspected in Building 626. Further, no nuclear weapons were known to have been stored in the Old Special Weapons Storage Magazines (Buildings 650-670). At no time during the period between 1983 and 1993 were any nuclear weapons breached, and it was strongly felt that any information of this type would have been widely known.

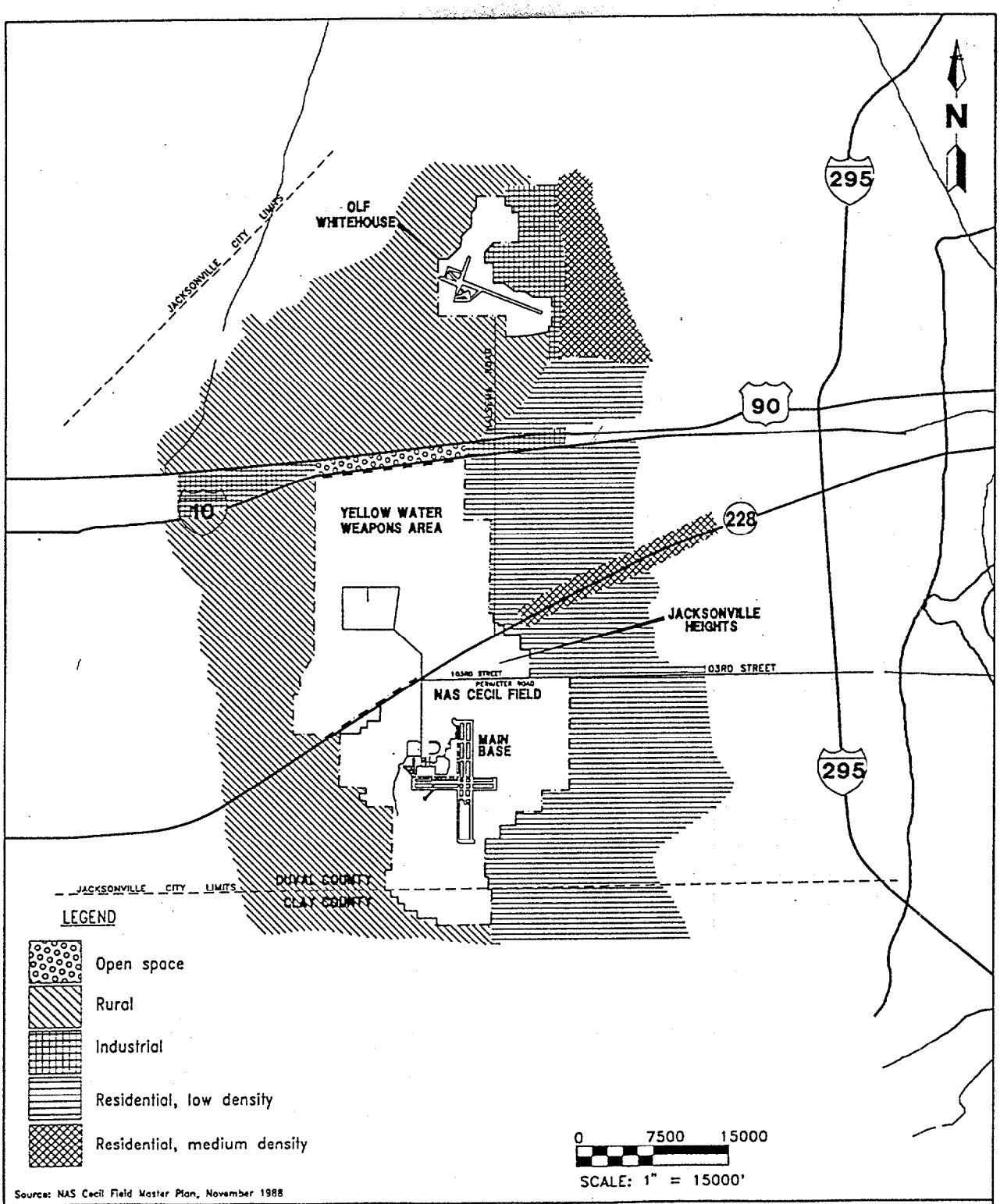
Although the above information was not used to exclude any buildings or land areas from the FSS, it was useful in providing assurance that locations of hot spot activity that potentially may have been missed when conducting a purely statistical survey during the FSS were not present within these buildings. This information was utilized, as recommended by MARSSIM, to more effectively focus resources to areas with the highest potential for contamination

1.1 SITE DESCRIPTION

As previously described, Cecil Field is located approximately 15 miles southwest of Jacksonville, Florida in Duval County and was established to provide facilities, services, and material support, for the operations and maintenance of naval weapons and aircraft to activities and units of operating forces. Figure 1 presents several features of Cecil Field. A condensed history of NAS Cecil Field is given below:

- NAS Cecil Field was constructed in 1941 and flight operations began.
- In 1948, NAS Cecil Field was selected as the home port for two carrier air groups.
- In 1950, NAS Cecil Field was expanded again, as it was selected for establishment as one of four master jet bases.
- Old Special Weapons Storage Magazines at YWWC constructed in 1959 are commissioned in 1960, and in 1961 are incorporated into the Weapons Department.
- New Special Weapons Storage Magazines, also at YWWC, were constructed in 1978, commissioned shortly thereafter, and incorporated into the Weapons Department.
- In 1984 and 1985, new hangers, simulators, and maintenance facilities were constructed due to the conversion of Cecil Field from A-7 to F/A-18 aircraft.

YWWC was used to store special weapons, which could have included nuclear devices or weaponry. Radioactive material (or contaminants) of concern which may be present as residual contamination at the site would include tritium, isotopes of uranium (^{234}U, $^{235/6}U$, and ^{238}U) and plutonium (^{229}Pu, ^{240}Pu, and ^{241}Pu). Progeny, or daughter, isotopes could also have been present. Because the Special Weapons



Source: NAS Cecil Field Master Plan, November 1988

FIGURE 1
AREA LAND USE

BRAC CLEANUP PLAN

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

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Bill Dion
358-8091, 366-1827

786-799
R.C.

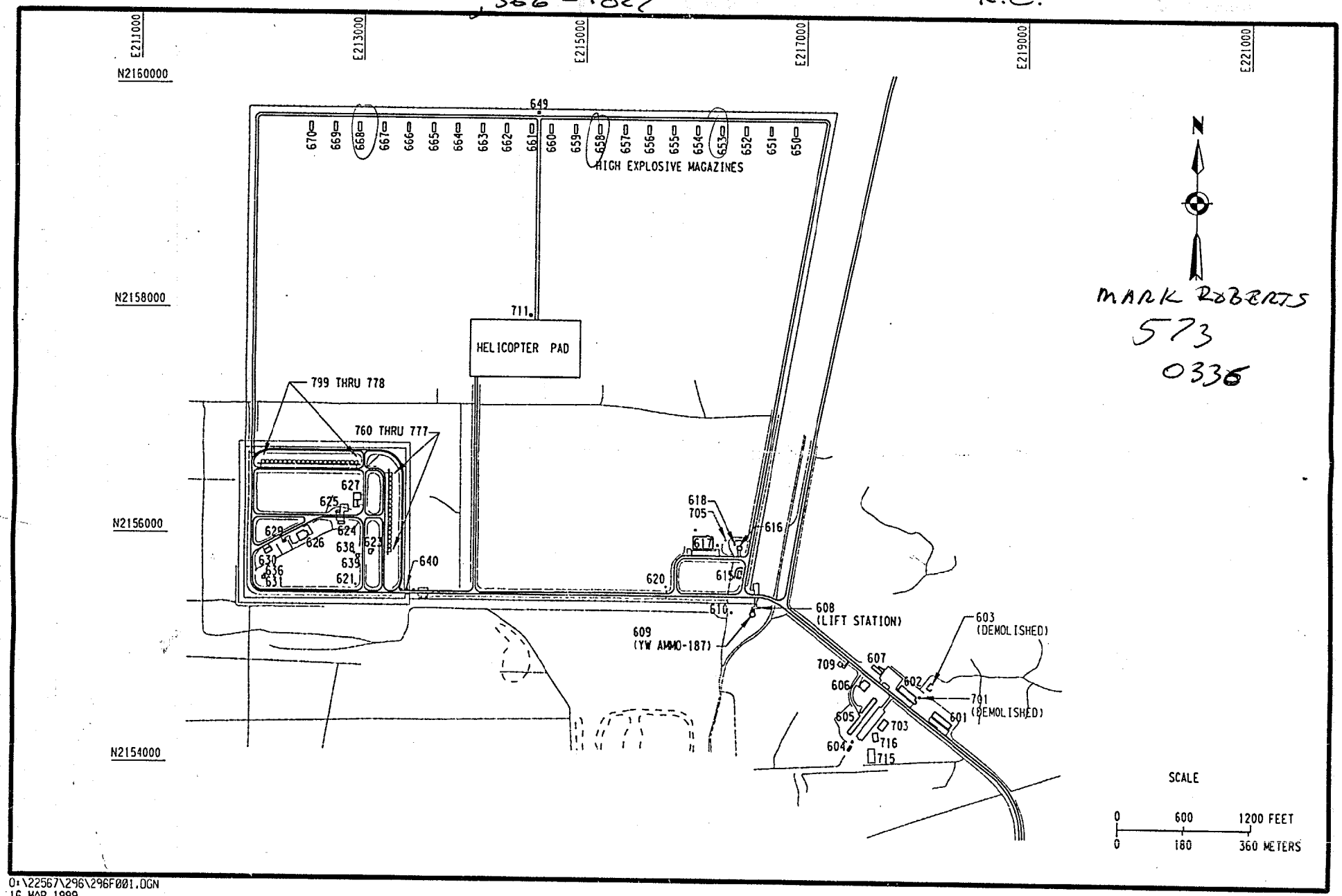

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Figure 2
Yellow Water Ammunition Storage Facility
Site Plan

Program adheres to the requirements of national security, much of the information regarding past practices, previous radiation surveys, and personnel monitoring data is classified. The YWWC site is shown on Figure 2.

1.2 BUILDING DESCRIPTIONS

The material storage magazines, as well as Buildings 601, 617, and 626, are industrial type buildings where material storage, weapons maintenance, and support activities may have been conducted. The information in the following sections was excerpted from Reference 3.

1.2.1 Building 601

Building 601 is located on Main Road outside the YWWC site boundary. The building, erected in 1959, is constructed of cinderblock and concrete. The one-story building is 190 ft long and 70 ft wide and has approximately 13,000 ft^2 of floor space. At present, Building 601 consists of two bay areas, two administrative areas, and a reception area. Figure 3 is a sketch of the building with appropriate details given to represent the current floor plan. There is no negative air ventilation system in the building to handle emission of hazardous air pollutants or radioactive material.

Building 601 was used by an EOD unit and as a barracks for Weapons Department Personnel. EOD operations would have been conducted in the middle and southeastern bay of Building 601. There have been no EOD operations that would have resulted in storage of live ordnance at this facility.

The building was renovated in 1998 to house several Department of Army operating groups. The renovation included the construction of chain-link, fenced cages for material storage in the southeastern bay. The middle and southeast bays have unfinished concrete floors. The reception and administrative areas located between the two bay areas have carpeted floors. The administrative area located on the western end of the building and the area west of the middle bay is covered with vinyl floor tile.

1.2.2 Building 617

Building 617 is located on Warehouse Road in YWWC. This building, erected in 1959, is constructed of cinderblock and concrete and contains approximately 19,800 ft^2 of available floor space. The floor plan can be seen in Figure 4.

Three separate operations were conducted in this building: maintenance of weapons transportation equipment, Bomb Dummy Unit operations, and Aviation Weapons Support Equipment Operations. Known environmental concerns at this facility include the storage and handling of waste from bead blasting and paint booths, petroleum products stored in an underground storage tank, and the presence of asbestos. Through interviews with weapons personnel, it was discovered that this structure may have served as a transfer point for radioactive waste generated at YWWC. There is no negative air ventilation system in the building to handle emissions of hazardous air pollutants or radioactive material other than that from the paint spray booth and welding and sand blasting operations. Exhaust from the grit blasting operation is ducted to a cyclone separator located outside on the north side of the building. The grit from grit blasting operations possesses elevated levels of naturally occurring radioactivity.

The high bay areas in the central and eastern portions of the building, the Weld Shop, and the Generator Room on the Southwest Corner have concrete floors. Three rooms on the western edge of the building have carpeted floors, and four small areas (rest room, hall, and two washrooms) were covered with vinyl floor tile.

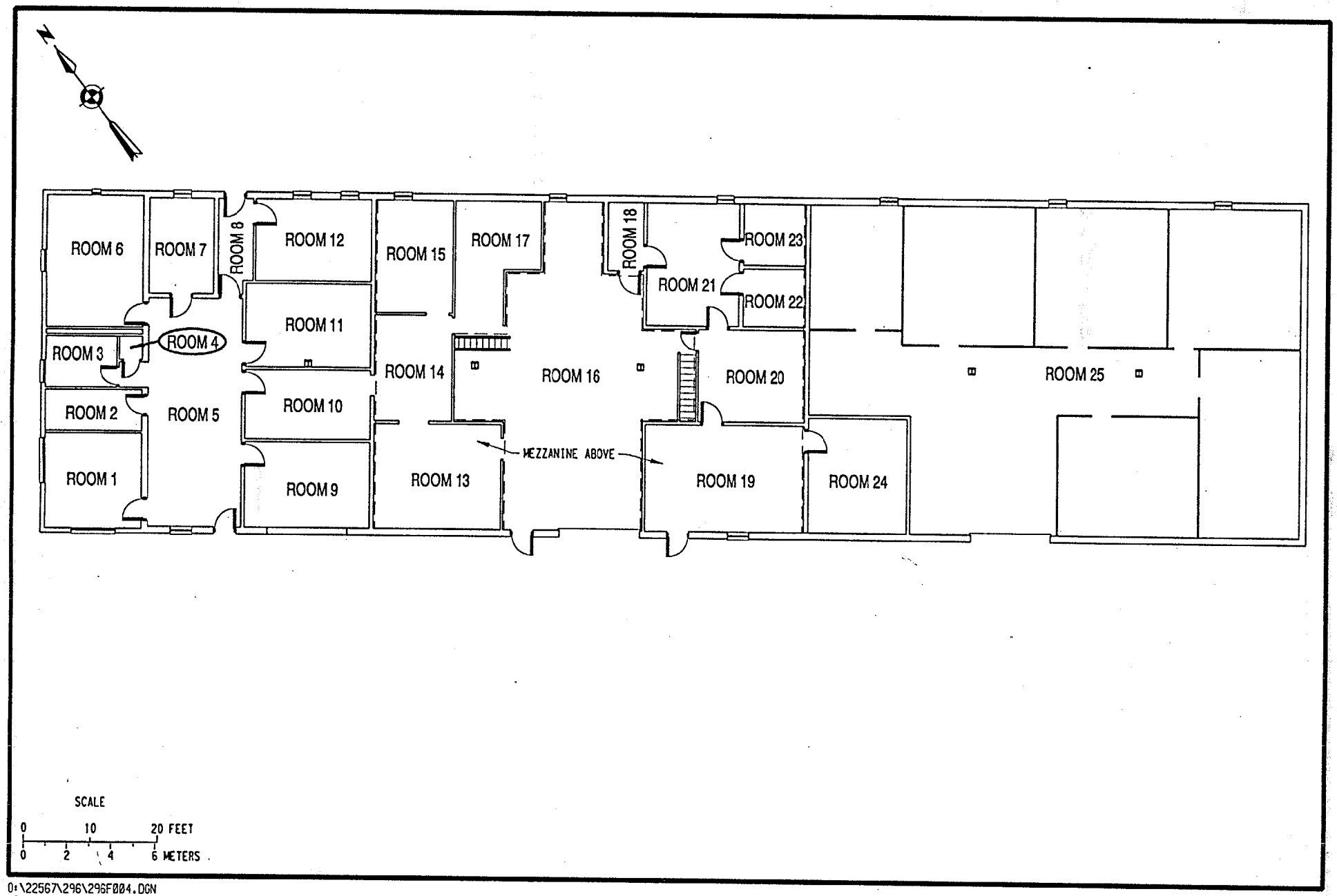

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Figure 3
Building 601
Ammunition Storage Building

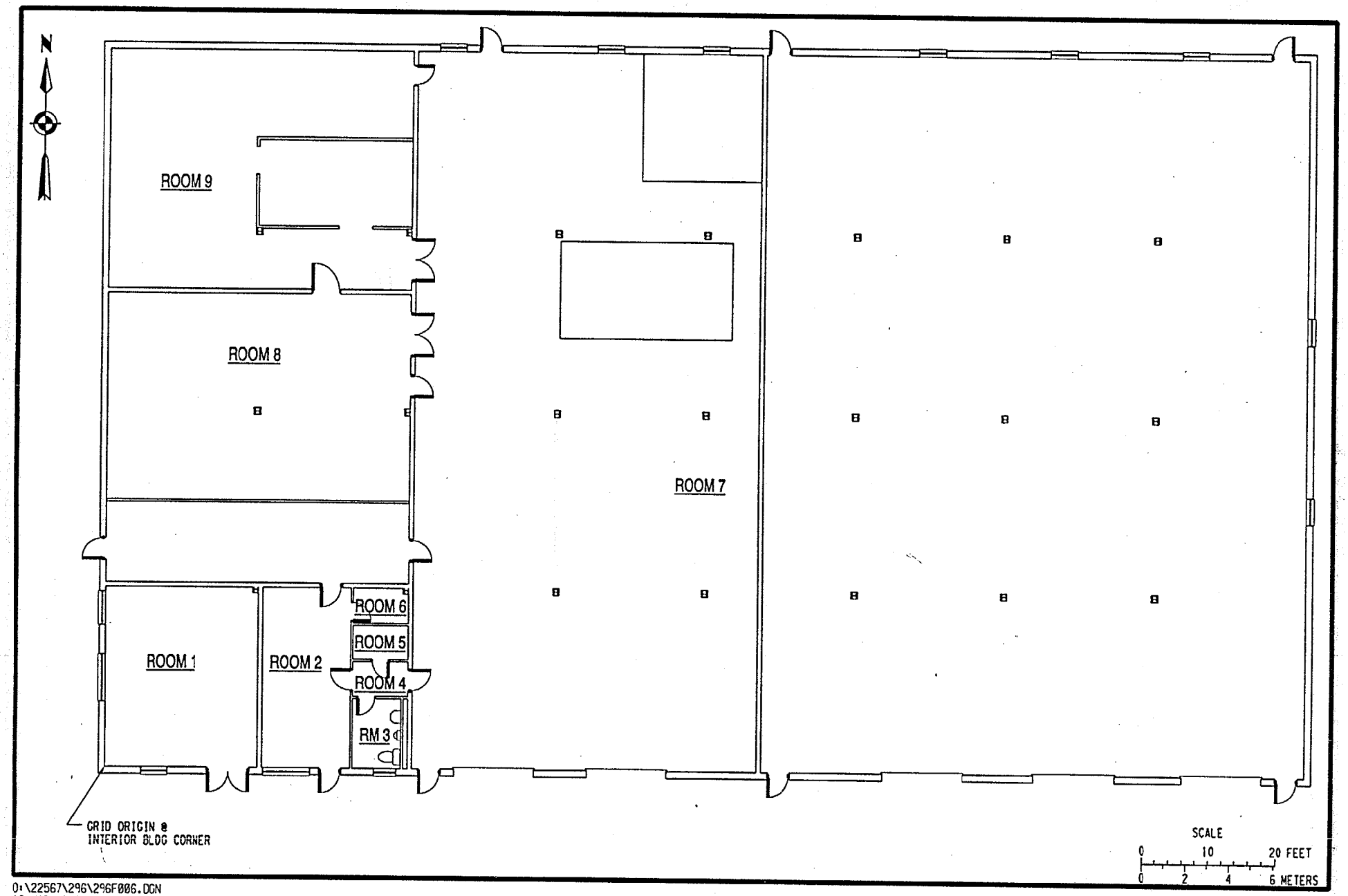

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Figure 4
Building 617 - Inert Processing Building
Room Plan and Figure Guide

1.2.3 Building 626

Building 626 is located in the southwestern corner of YWWC, in an area with the New Special Weapons Storage Magazines. The facility houses the Special Weapons Maintenance Shop. The building, constructed of concrete masonry, was erected in 1959 and contains approximately 6,000 ft^2 of floor space. The building has not been used continuously since 1993. The floor plan of Building 626 is shown in Figure 5.

The building was used for the repair and maintenance of ordinance. There is no record of spills of any hazardous materials that were used at the facility. Records indicate that no radioactive material was stored at the facility. However, interviews with YWWC personnel indicate that if nuclear weapons were onsite, maintenance and surveillance of weapons would have been conducted in this facility. Health physics records (radiation surveys, instrument calibrations, monitoring results, etc.), if available, would be classified and would not be available for inclusion in this report. Also, according to YWWC personnel, contamination from the COCs would not be generated during maintenance activities performed in the building.

The interior of the building contains a break room, two administrative or office areas, a hallway, male and female lockers, two large explosives work bays, and two storage areas. The roof of the facility was replaced in 1991. There is no negative air ventilation system in the building to handle emissions of hazardous air pollutants or radioactive material.

1.2.4 Old Special Weapons Storage Magazines

There are 21 old special weapons storage magazines numbered Buildings 650 through 670 located on North Perimeter Road along the northern edge of YWWC. A floor plan of a typical storage magazine is seen in Figure 6. Past history indicates that there was wide use for storage of munitions and weapons at these facilities. However, there is no history of release or disposal of hazardous substances along the northern boundary that borders the magazines. Surface water run-off discharges to various locations along the perimeter of the magazines. A majority of the surface water appears to eventually culminate to the west of the magazines into an unidentified creek that empties into the Caldwell Branch of the Yellow Water Creek.

No evidence was found indicating the use of radioactive materials or mixed wastes, and such substances are not thought to have been used as part of the support services provided by the base. Reports do mention the possibility that special weapons (nuclear weapons) were stored at YWWC (Reference 3).

The magazines are dome shaped concrete structures with a single entrance. The roof is earth covered. The floor in each magazine is sloped to the outside wall and has a drainage ditch that exits the front of the magazine on either side of the entrance. The magazines possess a natural draft ventilation system that allows airflow through vents on either side of the front of the magazine and through a rear vent connected to a housing at the top of the magazine. The ventilation system does not include high efficiency particulate (HEPA) filtration. There is approximately 2,200 ft^2 of floor space in each magazine.

1.2.5 New Special Weapons Storage Magazines

There are 40 new special weapons storage magazines (building numbers 760 through 799) located in the southwest corner of the YWWC. Munitions management operations in this area began in 1978 and ceased in October 1993. The floor plan of a typical storage magazine is seen in Figure 7.

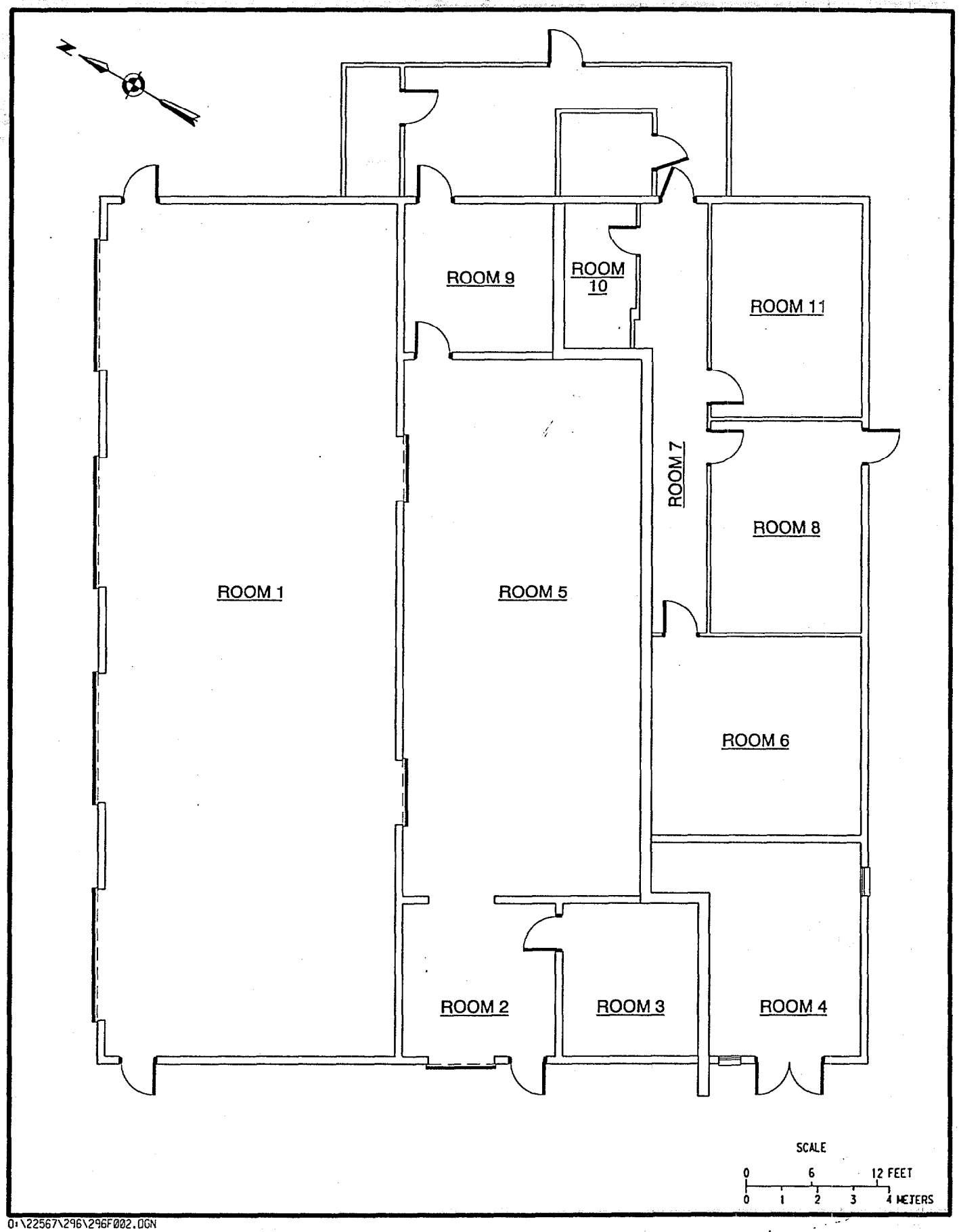

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Figure 5
Building 626 - Special Weapons Maintenance Building
Room Plan and Figure Guide

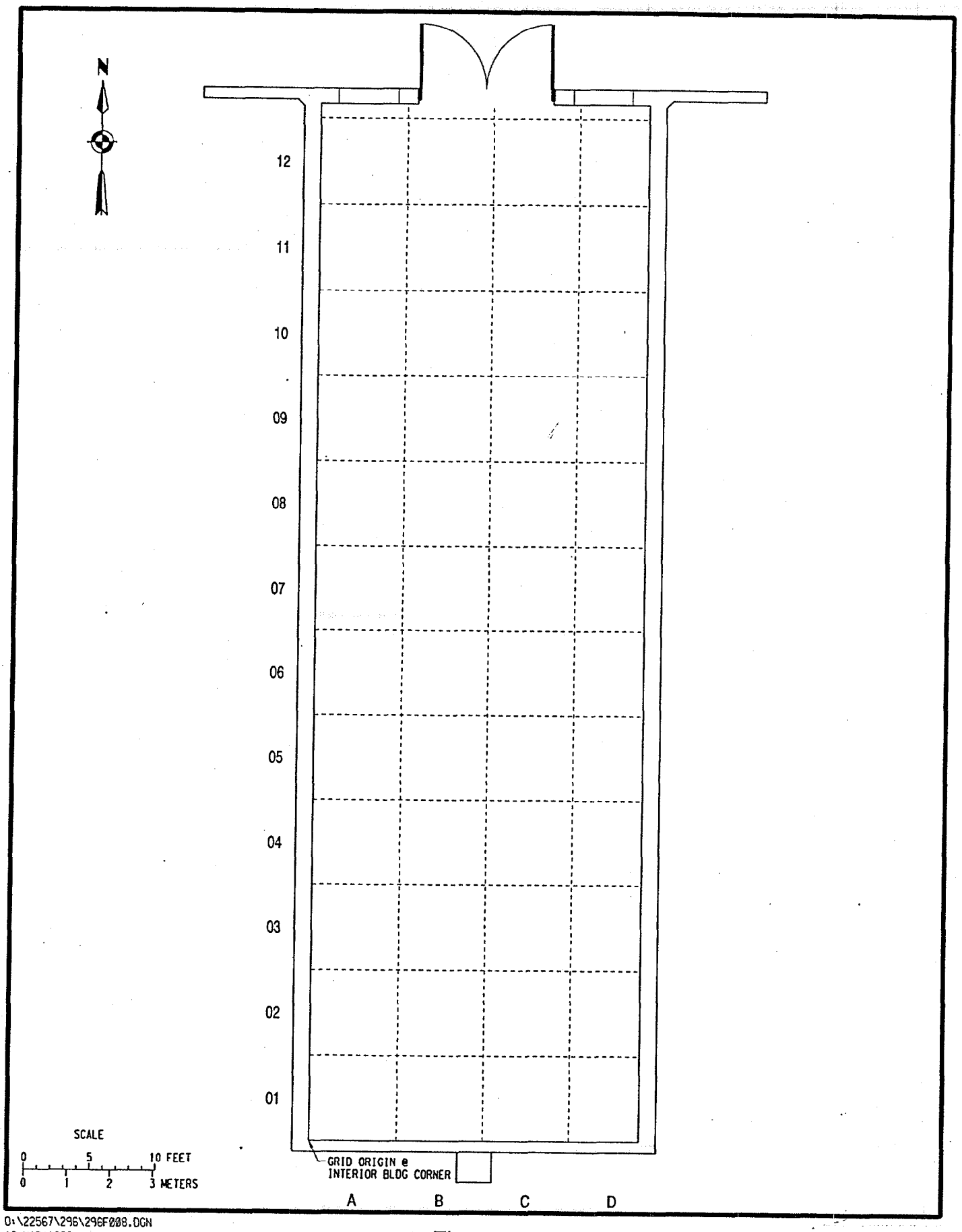

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Figure 6
Old Special Weapons Storage Magazines
2 Meter Interior Grid

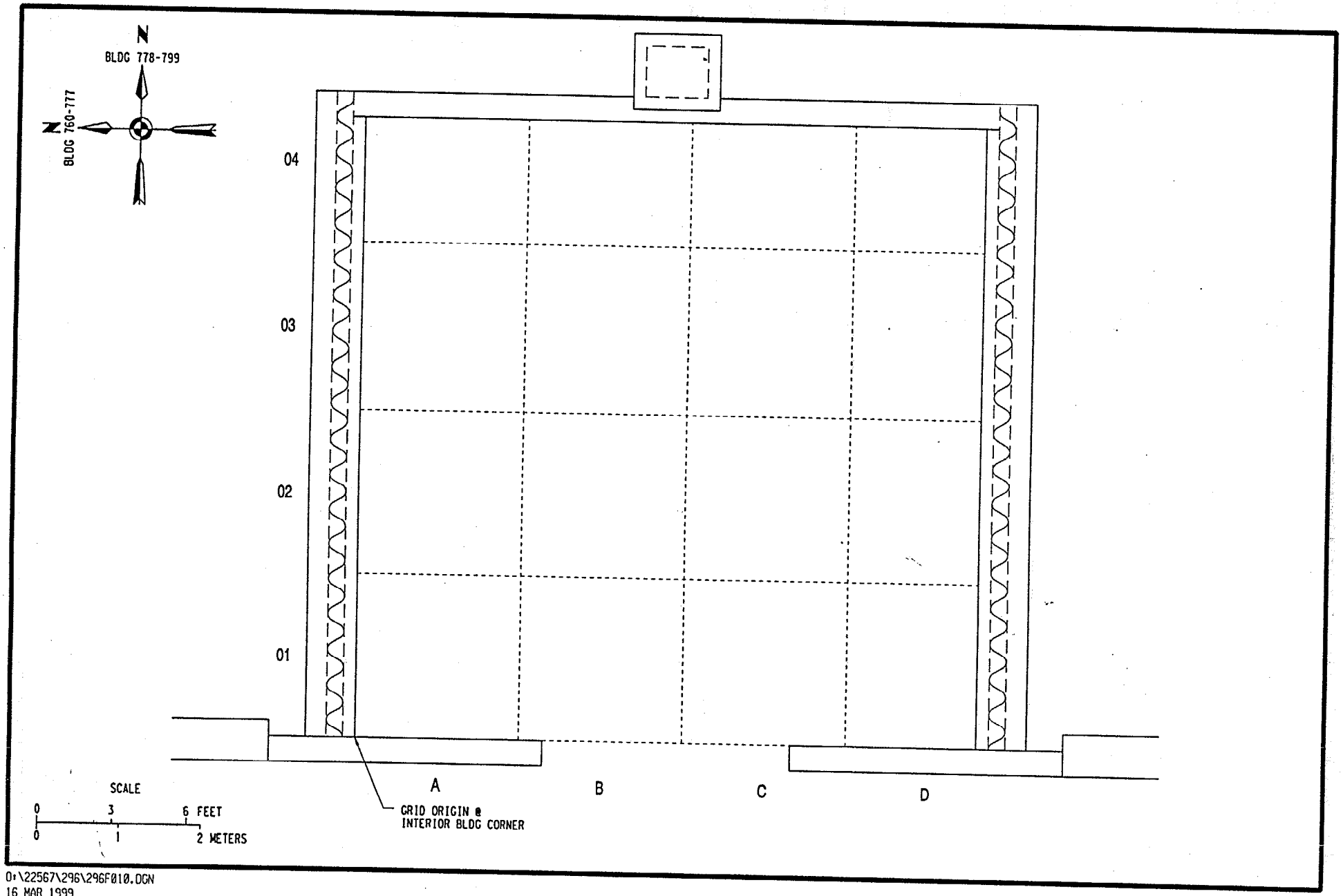

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Figure 7
Buildings 760 Thru 799 - Weapons Storage Magazines
2 Meter Interior Grid

A high probability exists that special weapons (nuclear weapons) were stored in the new magazines. The facilities that were involved with weapons activity are classified. Surface water runoff appears to eventually drain to the same unidentified creek as the old special weapons storage magazines. The main creek runs to the north of the complex and west. This main creek terminates at the Caldwell Branch of the Yellow Water Creek.

The new magazines are smaller than the old magazines. Like the old magazines, they are dome-shaped structures having a single entrance. The domed wall and ceiling is constructed of corrugated steel except for the concrete front and back walls. The concrete floor in each magazine is sloped to the front of the magazine. The roof is earth covered. The magazines have a natural draft ventilation system that allows airflow through vents on either side of the front of the magazine and through an exhaust housing at the top. Ventilation system design does not include HEPA filtration. There is approximately 625 ft^2 of available floor space for storage in each magazine.

1.3 OPERATING HISTORY

YWWC was commissioned in 1960. The industrial buildings that could have received radioactive material at that time include Buildings 601, 617, 626, and the old special weapons storage magazines (650 through 670). Assuming the new special weapons storage magazines were available, operations in Buildings 760 through 799 would have begun in 1978. Operations that may have involved radioactive materials in the old special weapons storage magazines would have ceased in 1978. All site operations that may have used radioactive material ceased in September 1993. No additional information regarding the movement, shipment, dispersal, or disposal of radioactive material at YWWC is available. The information in this and the previous section was excerpted from Reference 3.

1.4 OBJECTIVES

The objective of planning and obtaining results using the methodology in MARSSIM is to determine with statistical confidence whether a site meets the release criterion. The DCGLs used at the site are concentrations of radioactive materials present in soil or on surfaces that were approved to be used by the Partnering Team and, from a risk perspective, are acceptable to be left in place. (The Partnering Team is comprised of the U.S. Navy, EPA, State of Florida Department of Environmental Protection, NAS Cecil Field, and contractor personnel.) They are typically used as goals or targets in the field to determine whether further remediation is necessary. The MARSSIM methodology provides guidance in the ultimate attempt to release a site for uncontrolled use.

Procedures for obtaining samples and measurements, analyzing the samples, and verifying/validating sample results must be utilized to ensure that acceptable data is obtained for making the correct decision regarding the contamination levels at the site. These procedures are discussed in a following section.

Two non-parametric statistical tests are typically used in the process of releasing a site that is known to have been contaminated with radioactive material. These tests are the Sign Test (for radionuclides that are not present in background) and the Wilcoxon Rank Sum Test (for radionuclides that are present in background). At the beginning of the FSS, it was believed that both tests would need to be used to show that the buildings and land areas within YWWC met the release criterion. In this FSS, all direct and indirect measurements taken within YWWC were less than the site DCGLs; therefore, the use of statistical testing was unnecessary to the release of the site.

2.0 DOCUMENT REVIEW

Both the Plan (Reference 1) and MARSSIM (Reference 2) were used extensively to develop, plan, and conduct the FSS for the YWWC. The Plan provided much of the site-specific information that had been agreed upon by the Partnering Team (i.e., scope of area to be included in the survey, survey design, identification of COCs, DCGLs to be used, survey unit classification, Data Quality Objectives, and identification of survey units) to be used in performing the survey. MARSSIM was used as a reference to provide additional detail to the Plan.

The Plan recommended 20 survey units to be investigated, as necessary. In addition, a conservative estimate of 21 sample locations was calculated to be evenly taken within each survey unit and reference area. After walking down the site, it was noted that several of the outdoor areas (e.g., outdoor concrete, asphalt, and soil) should be consolidated into one area for ease of data recording. The survey unit of carpet within Building 626 did not exist. The survey units that were investigated are listed in Table 1.

MARSSIM (Reference 2) provides a good definition of survey unit classification in Chapter 2. The two major classifications provided are non-impacted and impacted areas. Non-impacted areas those areas "that have no reasonable potential for residual contamination. These areas have no radiological impact from site operations and are typically identified early in decommissioning." The majority of the YWWC buildings and areas were classified in the Plan as non-impacted.

Impacted areas are broken down into three additional classifications:

- Class 1 Areas: Areas that have a potential for radioactive contamination (based on site operating history) or known contamination (based on previous radiation surveys) *above the DCGL.*

- Class 2 Areas: Areas that have a potential for radioactive contamination or known contamination, but *are not expected to exceed the DCGL.*

- Class 3 Areas: Any impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of residual radioactivity at a small fraction of the DCGL, based on site operating history and previous radiation surveys.

Class 1 areas have the greatest potential for contamination and therefore receive the highest degree of survey effort for the FSS using a graded approach, followed by Class 2, and then by Class 3. Non-impacted areas do not receive any level of survey coverage because they have no potential for residual contamination. Non-impacted areas are determined on a site-specific basis.

Interior surfaces within Buildings 617 and 626, a 10-meter strip of soil directly north of Building 617, and all accessible surfaces of exhaust housings on the old special weapons storage magazines were considered as Class 2 areas. Class 3 areas included interior surfaces of Buildings 601, 650-670, and 760-799 and outdoor areas around Buildings 617, 626, and the weapons storage magazines.

As was recommended by the Plan and noted in Table 2, the scope of the FSS included specified percentages of surfaces of the interior portions of Buildings 601, 617, 626, 650-670, and 760-799. As also noted above, outdoor areas (e.g., soil, asphalt, concrete, and broken pavement) surrounding these structures were included within the survey plan. The survey percentages within the buildings were set in the Plan to ensure that when combining the areas to be surveyed in the FSS and the areas covered in the Scoping Survey (Reference 3), a total of 125 percent of the areas would be surveyed.

Table 1
Survey Units at YWWC

Survey Unit	Buildings	Surface	Investigation Class
1	650-670	Accessible surfaces of Exhaust Housings	2
2	617	Indoor concrete (east section of high bay)	2
3	617	Indoor concrete (all other concrete)	2
4	617	Carpet	2
5	617	Tile	2
6	626	Indoor concrete	2
7	626	Tile	2
8	601	Indoor concrete	3
9	601	Carpet	3
10	601	Tile	3
11	650-660	Indoor concrete	3
12	661-670	Indoor concrete	3
13	760-777	Indoor concrete	3
14	778-799	Indoor concrete	3
15	617	Soil – within 10 meters directly behind 617	2
16	617, 626, and the Magazines	Concrete, asphalt, and soil within 20 m of industrial buildings and magazines, including soil on top of Magazines. Excludes Survey Unit 16, but extends 20 m beyond that 10-m area.	3
17	650-670	Soil-drainage and runoff areas between the old magazines.	3

Table 2
Final Status Survey Scan Coverages for Buildings

Building Number	Percent to be Surveyed	Building Number	Percent to be Surveyed
650	25	771	25
651	25	772	25
652	75	773	25
653	60	774	25
654	25	775	25
655	85	776	25
656	75	777	25
657	30	778	25
658	25	779	25
659	25	780	25
660	25	781	25
661	65	782	25
662	25	783	25
663	25	784	25
664	25	785	25
665	25	786	25
666	75	787	25
667	25	788	25
668	25	789	25
669	60	790	25
670	75	791	25
760	25	792	25
761	25	793	25
762	75	794	25
763	25	795	25
764	75	796	25
765	75	797	25
766	100	798	25
767	55	799	25
768	25	601	25
769	25	617	100
770	25	626	100

From drawings provided by the Navy, interior portions of buildings were gridded, *a priori*, in 2-m by 2-m (4-m^2) grids where applicable. The scope of this gridding included all horizontal floor surfaces and vertical wall surfaces up to 2 m. In all cases, the southwestern corners of rooms within buildings were used as the point of origin for gridding purposes. All other areas (e.g., walls above 2 m, ceilings, roofs, piping, etc.) within the structures were not part of the scope of the FSS.

In addition to the indoor surveys, outdoor areas were planned to be surveyed based upon information provided within the Plan. Table 3 summarizes the information that was utilized to design the outdoor surveys.

Table 3
Scanning Coverage Summary

Description	Survey Unit Classification	Percent Coverage
Interior surfaces of industrial buildings	Class 2	100
Interior surfaces of Building 601 and interior and exterior surfaces of magazines below 2 m (excluding metal)	Class 3	25 – 100
Interior metal surfaces of Building 601 and magazines below 2 m	Class 3	25
Paved surfaces	Class 2	50
Paved surfaces	Class 3	25
Exhaust Housings of old magazines	Class 2	100
Unpaved outdoor surfaces (soil)	Class 2	50
Unpaved outdoor surfaces (soil)	Class 3	25

Outdoor areas were gridded in 10-m squares (100 m^2). The southwestern corner(s) of the building(s) were used as the origin for gridding. Due to the short distances between each of the new special weapons storage magazines, the outdoor areas of the two sets of magazines were gridded as two groups. A point was chosen off the southwestern corner of Building 799 for the magazines that run east to west (Buildings 778-799) and a point off the northwestern corner of Building 777 for the magazines that run north to south (Buildings 760-777).

3.0 PROCEDURES

3.1 CHOICE OF SAMPLE LOCATIONS

The criteria found in Section 5.5 of MARSSIM was used to choose sample locations within the industrial and material storage buildings within YWWC. For each of the Survey Units that included the interiors of buildings (i.e., Survey Units 2 through 14), at least 21samples were taken. (The tiled area within Building 617 included four small rooms, and professional judgment was used to locate eight sample locations.) In Survey Units where non-rectangular rooms made it difficult to use MARSSIM to randomly choose locations, professional judgement was again used to choose sample locations. In addition to all the randomly selected locations within the material storage buildings, two to five more samples were taken to obtain additional information and better characterize the potential for contamination being detected. Each of the sample locations for buildings and areas can be found on the drawings attached in Appendix A.

As is discussed within MARSSIM, the effective length and width of each Survey Unit was determined. The total area within each Survey Unit was estimated, and this was used to determine the length of each grid side. (Several of the indoor Survey Units included noncontiguous areas which made it difficult to accurately determine sample locations. In these Survey Units, the number of samples to be taken within each room was prorated by the area in each room to the total area available within the Survey Unit. In all cases except in Building 626, 21 or more sample locations were chosen.) The following equation was used to calculate distance between sample locations of each survey unit:

$$L = \sqrt{\frac{A}{N}}$$

where L = distance between sample locations, m
A = area in survey unit or room, m^2
N = number of sample locations within survey unit or room

Initial sample locations within each Survey Unit were obtained using the random number function on a HP-42S calculator. Two random numbers were computed—one multiplied by the horizontal dimension of the Survey Unit and the other multiplied by the vertical dimension. Once this initial location was noted on a drawing, the other sample points were found by adding and/or subtracting the length, calculated above, by the initial data location in both the *X* and *Y* directions. (The walls up to 2 m in height were "folded out" on drawings to show a two-dimensional view of the surfaces to be surveyed.)

Soil sample locations outside of buildings were each determined from the results of the gamma scanning survey. A gamma scan of the grounds around each of the industrial buildings within YWWC and the special weapons storage magazines was contracted to International Technology Corporation. The results of the gamma scan indicated several (24) locations where elevated measurements had been made. At each location where an elevated gamma scan result was measured, a composite soil sample of the area was obtained to quantify the amount of radioactive material present. Soil sampling is discussed in Section 3.3.

Some liberty was taken in the design of the survey to include a factor of approximately two times more direct instrument measurements and swipes to provide additional confidence in the final outcome of the survey. The equipment to conduct the measurements was present at the site, and additional sampling/ analyses did not effect the overall schedule or cost of completing the survey.

3.2 RADIOLOGICAL SURVEYS

As was recommended within the Plan, a limited survey was conducted prior to designing the Final Status Survey. The data obtained from the survey was utilized to provide reference (or background) radiological data to be used to compare to results within each of the Survey Units. (The number of sample locations to be taken in each Survey Unit recommended within the Plan was used in the FSS.) The measurements and samples taken during the limited survey were as follows:

- Asphalt – Direct instrument measurements of the East and West Perimeter Roads and the northwestern and southeastern corners of the Helipad
- Outdoor concrete – Direct instrument measurements of the concrete ramp on south side of Building 602

- Soil – Samples taken adjacent to West Perimeter Road and in soil areas adjacent to the northwestern and southeastern corners of the Helipad
- Indoor concrete – Direct instrument measurements of the concrete inside Building 602
- Tile – Direct instrument measurements of the floor tile inside Building 602.

At this same time, groundwater samples were taken within YWWC—two samples around Building 617 (northwestern and southeastern corners), one directly east of Building 626, one off the southwestern corner of Building 624, one north of Building 625, and one approximately 400 ft directly west of the security gate area leading into the new special weapons storage area. (Four well locations were observed later during surveys of the old special weapons storage buildings. These are located at the east and west ends of the buildings, but none were sampled during the FSS.)
A procedure was developed and utilized to conduct the direct and swipe radiological surveys. (The procedure is attached in Appendix B.) The surveys included both direct instrument surveys to determine the total amount of alpha and beta emitting contaminants present and swipe samples that were utilized to quantify the amounts of removable radioactivity that was present within the Survey Units within YWWC. Measurements and swipes were taken at each randomly selected location and several additional locations based upon discoloration of the base surface. The instruments used to conduct the surveys are shown in Table 4.

Table 4
Survey Instruments

Instrument	Use
Ludlum Model 2224/43-89	Phoswich detector able to simultaneously directly measure alpha and beta radiations (area = 126 cm^2)
Ludlum Model 2360/43-89	Phoswich detector able to simultaneously directly measure alpha and beta radiations (area = 126 cm^2)
Ludlum Model 2221/44-110	Open window, gas proportional detector able to directly measure low energy beta radiation, as well as all other radiations emitted from surfaces (area = 100 cm^2)
Ludlum Model 2221/239-1F	Large area (area = 584 cm^2), mylar-covered window to directly measure radiations emitted from surfaces. Used exclusively for scanning purposes.
Ludlum Model 2929/43-10	Scintillation detector used to simultaneously detect alpha and beta radiations from swipe (indirect) measurements

The total tritium contamination results measured using the windowless, gas proportional counter were very erratic and depended more on surface features (e.g., roughness) rather than the radioactivity present in the makeup of the material, and they could not effectively indicate whether tritium or some other radioactive material was present. None of the direct measurements exceeded the DCGL for total tritium. However, this data could not be effectively utilized to locate areas where elevated tritium may be present.

Table 5 indicates the DCGLs for surface contamination. The table values were used to compare to the direct survey measurements and swipe sample results.

Table 5
DCGLs for COCs Present as Surface Contamination

Row	Nuclides[a]	Total DCGL	Removable DCGL
1	Uranium Isotopes and Significant Decay Products	5,000 dpm/100 cm^2	1,000 dpm/100 cm^2
2	Plutonium Isotopes and Significant Decay Products	100 dpm/100 cm^2	20 dpm/100 cm^2
3	Tritium	5,000 dpm/100 cm^2	1,000 dpm/100 cm^2

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

A driveover gamma scan was contracted and performed of the outdoor areas (including soil, concrete, and asphalt) adjacent to the industrial buildings (Buildings 617 and 626) and special weapons storage buildings. The survey results were utilized to qualitatively indicate whether surveyed areas possessed elevated levels of radioactive materials. The scan results were used to locate future soil sampling activities.

Although the recommended minimum detectable concentration for the gamma scanning survey was not met, the ability to qualitatively assess elevated levels of radioactive materials present in the environment was more than adequate. As will be shown in the Discussion section, soil samples taken from areas where scan results indicated elevated levels of radioactive material all were lower than the DCGLs.

3.3 SOIL SAMPLING

Subsurface soil samples were collected on two separate occasions during the FSS. The first sampling event occurred on December 23, 1998 and the second sampling event occurred on January 18, 1999. The first sampling event consisted of samples from twenty predetermined sample locations—four samples at Building 617, six samples at various locations around Buildings 760-799, and ten samples at various locations around Buildings 650-670. The second sampling event consisted of samples from four predetermined sample locations—one each for Buildings 626, 655, 656, and 670.

For each location, a composite soil sample was collected in accordance with Bechtel's Comprehensive Quality Assurance Program Plan that is on file with Florida Department of Environmental Protection (#940316). Each sample was collected in a 250-cc glass sample bottle. Once containerized in appropriate sample containers, the samples were packaged in a cooler for shipment for analyses. Table 6 indicates the DCGLs for COCs present in soil at YWWC. This table was described in Reference 1.

3.4 SWIPE SAMPLING FOR LABORATORY ANALYSIS

Each of the swipe samples taken to determine the amount of gross alpha or beta radioactivity was analyzed and evaluated onsite before being sent for laboratory analysis. Since little or no radioactivity was measured on the swipes, it was justified that a much smaller number of swipes was needed for analysis at the laboratory. (No swipe sample approached the most conservative DCGL for YWWC.) Only 58 swipes were sent for analyses, chosen because they had the greatest amount of radioactivity present. These swipes were sent to the analytical laboratory to quantify the amount of ^{234}U, $^{235/6}U$, ^{238}U, and ^{239}Pu present.

Swipe samples to determine the amount of tritium present on surfaces were also taken. Seventy-five swipes were taken in various high traffic locations (e.g., building exits or locations where radioactive materials may have been processed or stored). Dry swipe samples were taken and inserted directly into

scintillation vials containing low tritium background water. Each of the removable tritium results received from laboratory analysis was very low when compared to the DCGL.

3.5 VERIFICATION AND VALIDATION

Compliance screening of analytical data included a quality control review and review of sample results. The procedures used are loosely based on U.S. Environmental Protection Agency (EPA) guidance for inorganic data validation. Each step used in the data review is described below:

- Compliance screening is the act of reviewing a data package to verify that the data have been properly controlled and accurately transcribed, are suitably complete, and appear to be reasonable and consistent based on prior knowledge of the site under investigation.
- The quality control review is used to verify that QC data are present at the required frequency and within the regulatory or contractual protocol.
- The reviewer uses the information in the data package to check the acceptability of the following parameters: precision, accuracy, representativeness, comparability, and completeness. The sample results review is used to examine the results for the regular samples, make assessments of the sample results based on the QC sample review, and summarize the results made during the review of the data package.

The evaluation of analytical results indicated that the data was acceptable for use in evaluating where radiological contaminants were present and at what concentrations they appeared within YWWC.

Table 6
DCGLs[a] for COCs in Soil and Water

Radionuclide	DCGL for Soil (pCi/g)	DCGL for Drinking Water pCi/l)
^{3}H	210	20,000
^{239}Pu	50	10
^{240}Pu	50	10
^{241}Pu	1,500[b]	500
^{241}Am	47	10
^{234}U	12	110
^{235}U	12[b]	100
^{231}Th	NA	NA
^{236}U	12	110
^{238}U	12[b]	77
^{234}Th	NA	NA
^{234m}Pa	NA	NA
^{234}Pa	NA	NA

[a]DCGLs from Reference 1.
[b]The limit accounts for significant decay product(s) contribution(s).

4.0 INTERPRETATION OF SURVEY RESULTS

Consistent beta backgrounds were not obtained before beginning surveys within each building. A conservative use of the minimum beta measurement detected within each of the industrial buildings was used as the background measurement. Likewise, the lowest beta measurements within the Old or New Special Weapons Storage Buildings were used as background in those facilities, respectively.

4.1 BUILDING INTERIORS

No scan results, direct measurements, or analyses of swipe samples (except the bathroom tile in each industrial building) indicate that surface contamination exceed the most restrictive DCGL (i.e., surface contamination limit for plutonium of 20 dpm alpha/100 cm^2 removable and 100 dpm alpha/100 cm^2, total) inside any of the buildings on the floors and walls up to 2 m that were surveyed within YWWC. [Each of the bathroom areas of the industrial buildings (e.g., Buildings 601, 617, and 626) possessed ceramic tile with measurements that were elevated. The entire surface of these rooms consistently indicated elevated measurements; the radioactivity attributed to naturally occurring radioactivity known to exist in ceramic tile.] This includes all interior survey results from within Buildings 601, 617, 626, 650-670, and 760-799. These results indicate that the release criteria for the various radionuclides (^3H, isotopes of uranium, isotopes of plutonium, and ^{241}Am) in survey units 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14 have been met. See Appendix A to view the locations and results of these surveys. Note on the figures that the shading indicates grids that were surveyed. (Building 601 had been leased out and office/bay areas contained much material that could not easily be moved without disrupting activities that were taking place in the Building. <u>All</u> accessible floor and wall surfaces were monitored with the floor monitor and handheld instruments, respectively, in Building 601.)

4.2 EXHAUST HOUSINGS

Each of the randomly selected sample locations on the exhaust housings of the old material storage bunkers (Buildings 650-670) were less than the most conservative removable and total surface contamination DCGL. Upon inspecting each of the housings further, small localized areas (generally <100 cm^2) of elevated radioactivity were detected on each housing that exceeded the most conservative total surface contamination DCGL. (The survey unit included all accessible surfaces of the housings. The only accessible housing surfaces were on the outside of the structure, exposed to the environment. A hinged doorway present on the north face of each housing was either locked or tack-welded to prevent entry.) After detecting the radioactivity on the initial housing that was monitored and observing the construction of material emitting radiation, the locations of elevated radioactivity on subsequent housings often could visually be identified and verified by monitoring. Locations where the exterior concrete surfaces had not been spalled off were most often higher than areas where weathering had occurred and subsurface aggregate could be observed. (See the comparison made in Appendix D, titled "Measurement Differences between Housing Sample Locations with Smooth, Discolored Surfaces and those with Rough, Weathered Surfaces.") Elevated radioactivity was most often located in the following locations on the housings:

- South face directly under the lightning rod, either on the beveled or directly under the beveled surface on the vertical surface
- East face on the beveled surface above the damper control mechanism
- North face on the beveled surface.

The removable radioactivity from all systematic and biased swipe samples of the housings was less than the most conservative DCGL (e.g., 20 dpm alpha/100 cm^2, removable) for loose contamination. At two locations where elevated radioactivity was measured (housings of Buildings 655 and 657), scrapings of material were taken directly from the surface and sent to the laboratory to be analyzed to identify and quantify what COCs were present. The results of each sample indicated the presence of isotopes of uranium that were more than an order of magnitude greater than analytical results of any other sample measured from within YWWC, but was much less than the respective DCGLs for the contaminants of concern. The analytical results also indicated that isotopes of uranium were present in natural abundances rather than as enriched or depleted uranium that may have indicated contamination from storage of special weapons. No other elevated contaminants of concern were present. (As will be noted in the next section, differing aggregate materials contain varying levels of naturally occurring radioactive material. In this case, though, the elevated activity was contained in the mortar rather than in the aggregate.) The results of the exhaust housings indicate that no measurement exceeded the site DCGLs and thus should be considered to meet the release criterion. The results of these surveys are located in Appendixes C and D under results for the old special weapons storage bunkers.

4.3 OUTDOOR AREAS

A driveover gamma scan was contracted to International Technology Corporation and conducted of outdoor areas around Buildings 617 and 626 within YWWC and the special weapons storage facilities. The survey predominantly included soil, but asphalt, concrete, and broken pavement were also monitored. A global positioning system (GPS) was utilized to place a latitude/longitude, date/time, and measurement result stamp at a frequency of one per second. A large-area plastic scintillator, composed of a 1.5-in. thick by 3-in. wide by 33-in. detector, designed to detect >300 keV beta particles and >40 keV gamma photons was used on an all-terrain vehicle approximately 12 in. above the monitored surface. The width of the detector's field of view was approximately 5 ft, and the survey speed was nominally less than 3 miles per hour. Raw data was reviewed in the field on a daily basis and areas of elevated measurements were pin flagged. The data within each 10-m by 10-m grid were averaged and plotted. The figures are provided in Appendix E.

The results of the scanning survey were used to identify general areas where elevated radioactivity may have been located. Pin flags were placed in locations where measurement results indicated that radioactivity may be present and biased soil samples were later taken to determine whether radioactive material was present. The sample locations and results are provided in Appendix A. Sample results for all soil and asphalt samples indicated concentrations of radioactive material, which did not exceed the DCGL. These results indicate that the release criteria for the various radionuclides (^{3}H, isotopes of uranium, isotopes of plutonium, and ^{241}Am) in Survey Units 15 and 16 have been met.

Thirteen-soil samples were taken in areas adjacent to the old material storage bunkers based upon elevated results from the gamma scan. Most of these samples exhibited no elevated radioactivity, however, two of these soil samples (CF22721 and CF22722) indicated defined peaks for ^{239}Pu. Elevated plutonium levels were not measured at any other locations at YWWC. The samples were taken from areas east of Buildings 656 and 655, respectively. The DCGL set for ^{239}Pu in the Plan was 50 pCi/g, and the results were at least a factor of 340 less than this value (see Appendix A for results).

One asphalt sample taken immediately off the northeastern corner of Building 626 (CF22719) possessed elevated levels of radioactivity, but it is believed to be from the aggregate making up the asphalt. The ratio of the activities of ^{234}U:^{238}U indicates relatively equivalent activity and the uranium would be considered to be naturally enriched. Depleted or enriched uranium, expected to be in special weapons, would have had much different ratios and would have been easy to distinguish if either were truly present. Three grids, including an asphalt parking lot adjacent to the northeast corner of Building 626,

had elevated readings, and the one closest to the building (having the highest survey results) was sampled. The activity concentrations [1.57 pCi/g (^{234}U) and 1.58 pCi/g (^{238}U)] are also less than the uranium DCGLs of 12 pCi/g.

The driveover survey indicated varying levels of background radioactivity present within YWWC. The vehicle carrying the detector would travel from Building 626 by the most convenient road surface to access the various areas to be surveyed. The asphalt located at the security checkpoint entering into the New Material Storage Area was a factor of 2 higher than other asphalt at the site. Also, asphalt to the east of Building 626 had uniformly elevated readings when compared to the asphalt roadway immediately adjacent to the north of the Building.

Survey Unit 17 consisted of the drainage ravines between the old material storage magazines. Approximately 50 percent of the ravines were surveyed to determine whether any elevated gamma-emitting radioactive material were present. Elevated gamma scan results were indicated in or around five ravines. Composite soil samples were taken and analyzed from areas with elevated gamma measurements. No elevated results were indicated and all were significantly less than the soil DCGLs. These results indicate that the release criteria for the various radionuclides (^{3}H, isotopes of uranium, isotopes of plutonium, and ^{241}Am) in this Survey Unit have been met.

4.4 MISCELLANEOUS SURVEYS

Additional scanning surveys (recommended within the Plan) of exterior/interior metal doors, exterior drainage ports from both the old and new storage bunkers, and drainage gutters within the old material storage magazines were conducted. No elevated radioactivity was detected on exterior/interior metal doors, exterior drainage ports from the bunkers, or drainage gutters within the old material storage magazines. Surveys were conducted up to 2 m on the doors. The effluent drainage ports were surveyed directly, and the concrete surface was surveyed out to a distance of approximately 1 m, where liquids would drain. The drainage gutters within the old material storage magazines have a concave, circular shape and could not effectively be surveyed due to the fixed, flat shape of the detector; in any event, there were no elevated results at the drainage ports or concrete drainways.

5.0 SUMMARY

No radioactivity exceeding the DCGLs for the COCs that were being investigated was found to exist at the YWWC. Other than bathroom tile in all three buildings, the scanning surveys conducted in the interior of all the buildings did not indicate any elevated levels of radioactivity. Physical samples of the tile were not analyzed, but it is well known that these tiles possess elevated levels of naturally occurring radioactive materials. The scans of the tile indicated consistent measurements throughout each restroom, and no hot spots were located. The old special weapons storage buildings' exhaust housings consistently possessed locations of radioactivity exceeding background levels at fairly specific locations; however, the radiation was caused by the decay of uranium isotopes rather than from other radioisotopes. The activity ratio of ^{234}U to ^{238}U indicates that a natural enrichment of uranium is present. If the ratio had been much different, it would have indicated that enriched or depleted uranium was present and may have been due to the storage of special weapons in the magazines. In any event, neither the surface nor volumetric DCGLs were exceeded from any sample result.

Asphalt located at the security check point entering into the New Special Weapons Material Storage Area possessed the greatest amount of radioactivity, while asphalt in the parking lot located on the east side of Building 626 also indicated elevated readings, but to lower levels. The asphalt adjacent to Building 626 was analyzed and found to contain some elevated radioactivity.

6.0 REFERENCES

1. ABB Environmental Services, Inc., *Final Status Survey Work Plan for the Cecil Field Yellow Water Weapons Compound, Jacksonville, Florida*, Revision 1, April 1998.

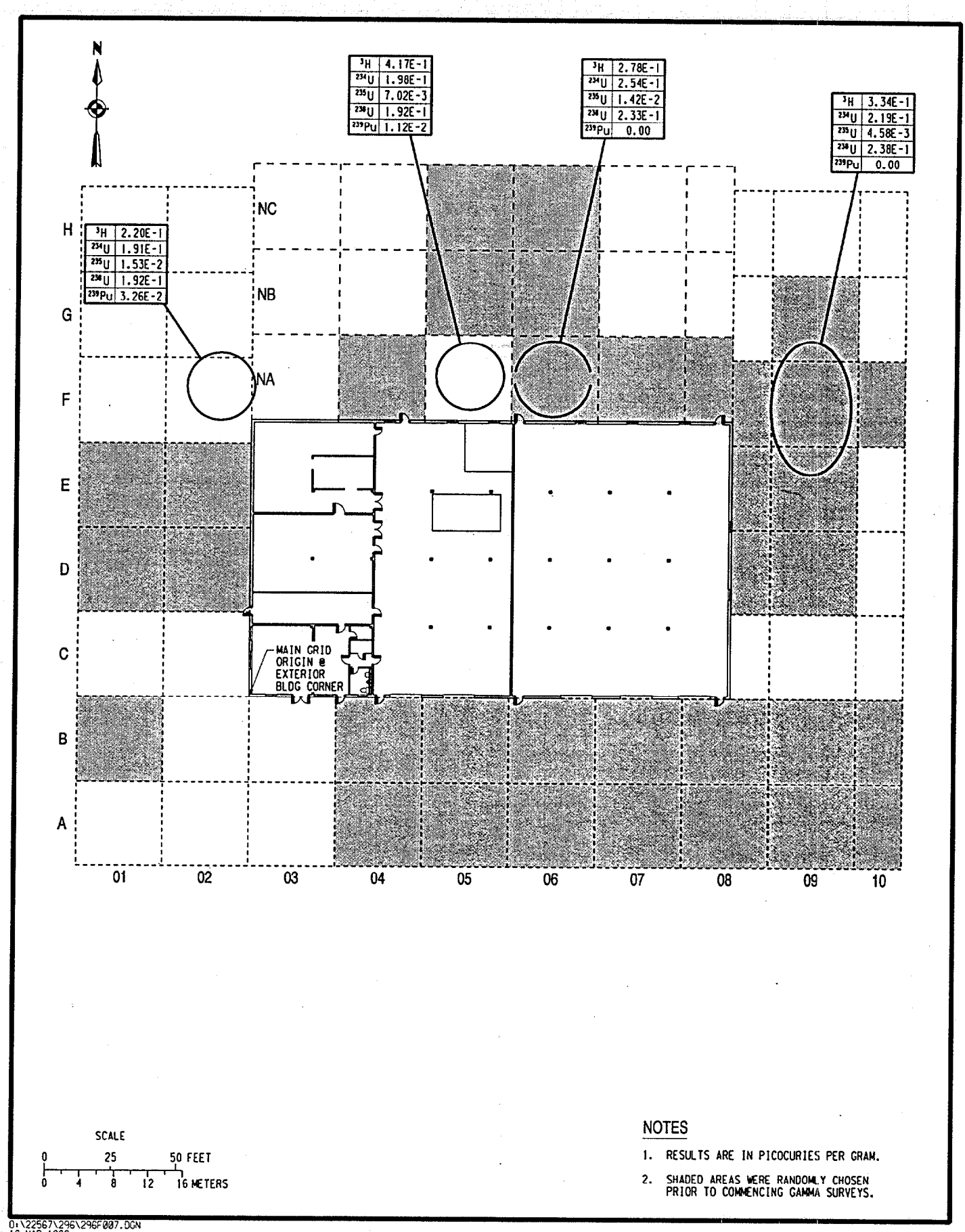
2. Nuclear Regulatory Commission (NRC), NUREG-1575, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*, NRC, Washington, D.C., December 1997

3. General Physics, *Radiological Investigation Report – Yellow Water Weapons Compound, Naval Air Station Cecil Field, Jacksonville, Florida*, GP-R-71194068, February 1995

Appendix A

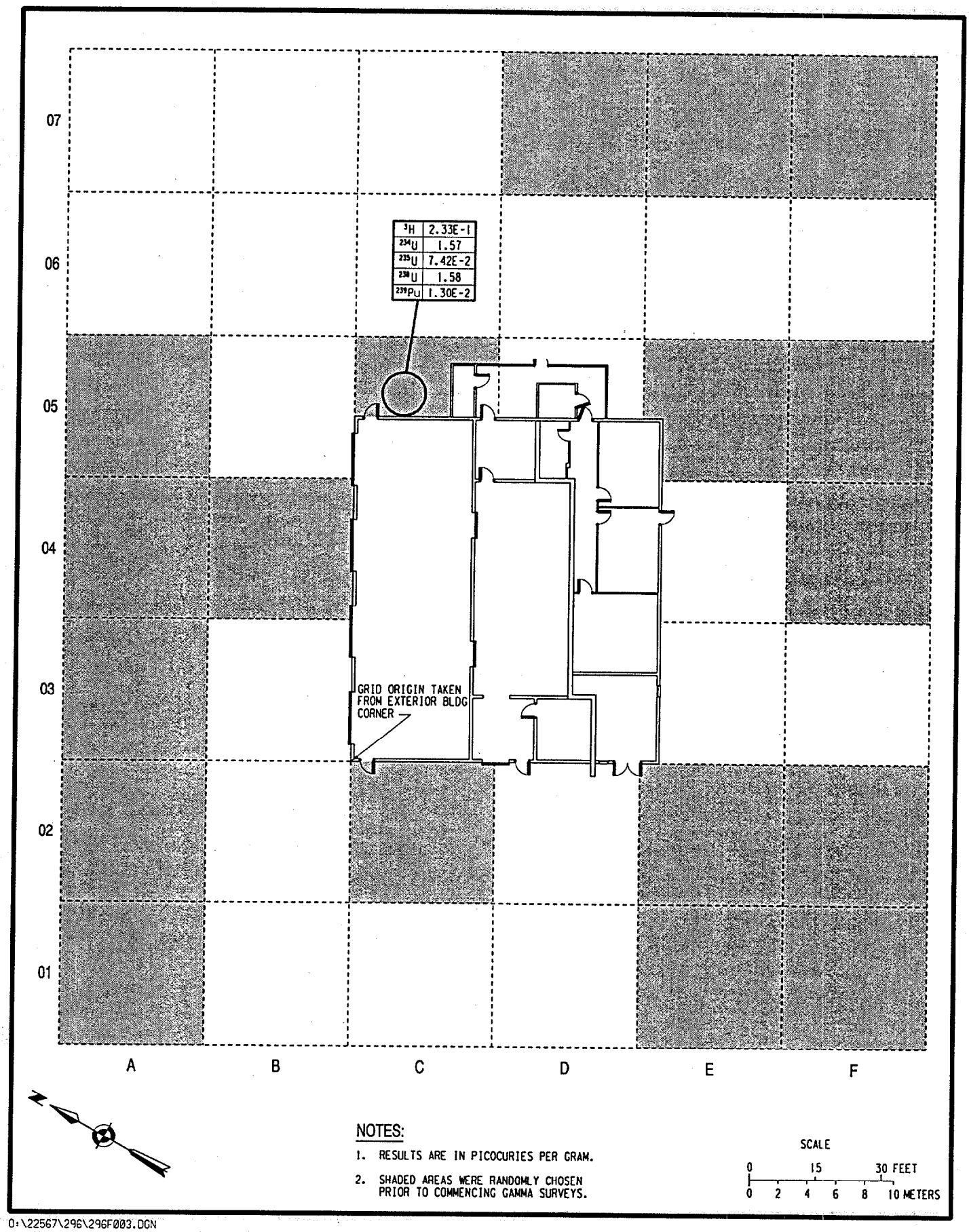
Sample Locations and Results for Buildings and Outdoor Areas

Figure Number	Title
8	Building 601 Survey Results
8a	Building 601 Survey Results
9	Building 617 Survey Results
10	Building 626 Survey Results
11	Old Special Weapons Storage Magazine Survey Results (Buildings 650-670)
12	New Special Weapons Storage Magazine Survey Results (Buildings 760-779)
12a	New Special Weapons Storage Magazine Survey Results (Buildings 778-799)
13	Soil Sample Locations and Results Around Building 617
14	Soil Sample Location and Results Around Building 626
15	Soil Sample Locations and Results Around Buildings 760-777
16	Soil Sample Locations and Results Around Buildings 778-799
17	Soil Sample Locations and Results Around Buildings 650-670



D:\22567\296\296F007.DGN
16 MAR 1999

Figure 13
Building 617 - Outdoor Gridding
Randomly Selected Grids
Soil Sample Locations/Results



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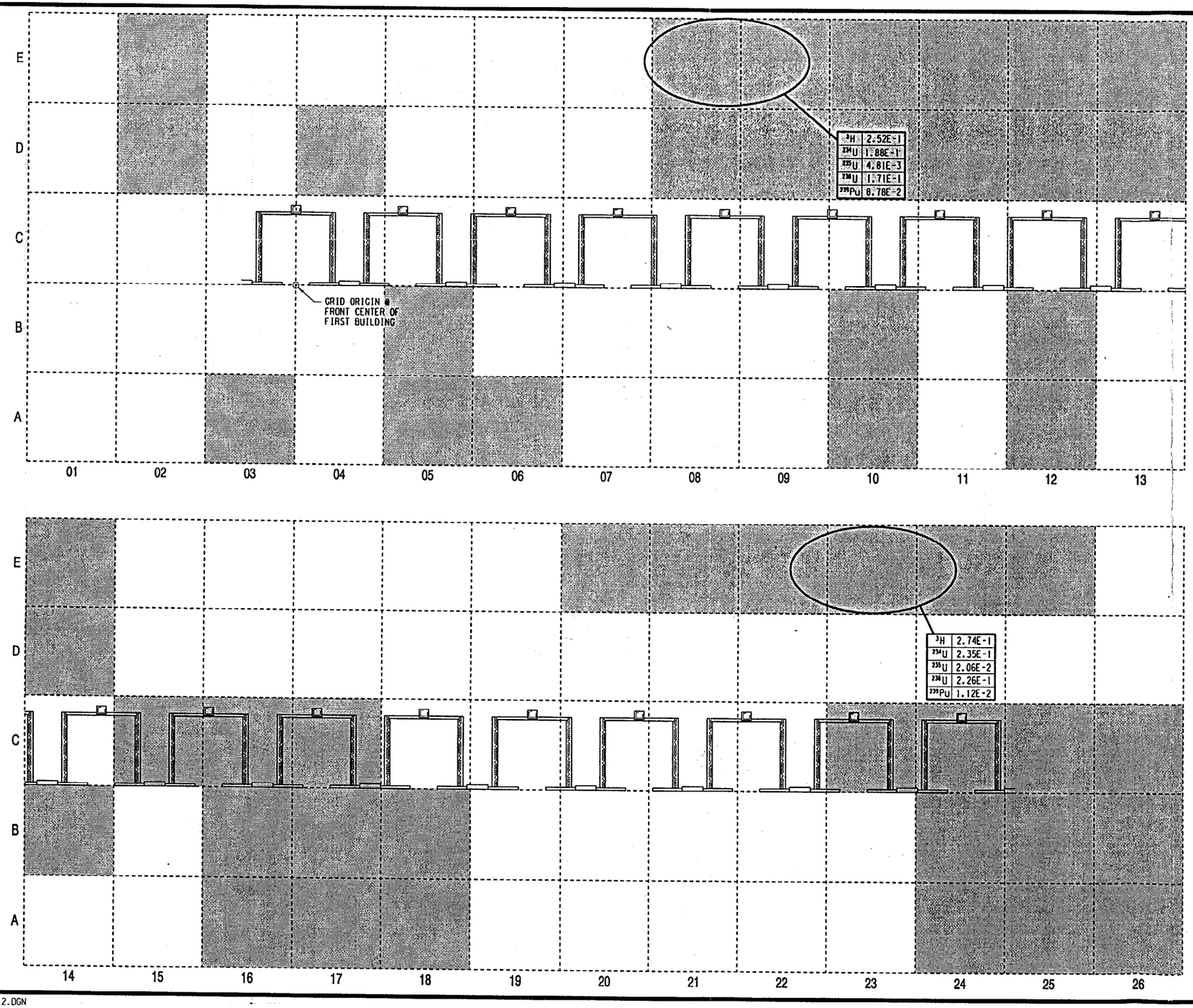
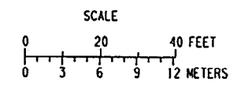
16 MAR 1999

Figure 14
Building 626 - Outdoor Gridding
Randomly Selected Survey Grid
Soil Sample Locations/Results



NOTES

1. RESULTS ARE IN PICOCURIES PER GRAM.
2. SHADED AREAS WERE RANDOMLY CHOSEN PRIOR TO COMMENCING GAMMA SURVEYS.



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16 MAR 1999

Figure 15
Buildings 760 Thru 777 - Outdoor Gridding
Randomly Selected Survey Grid
Soil Sample Locations/Results

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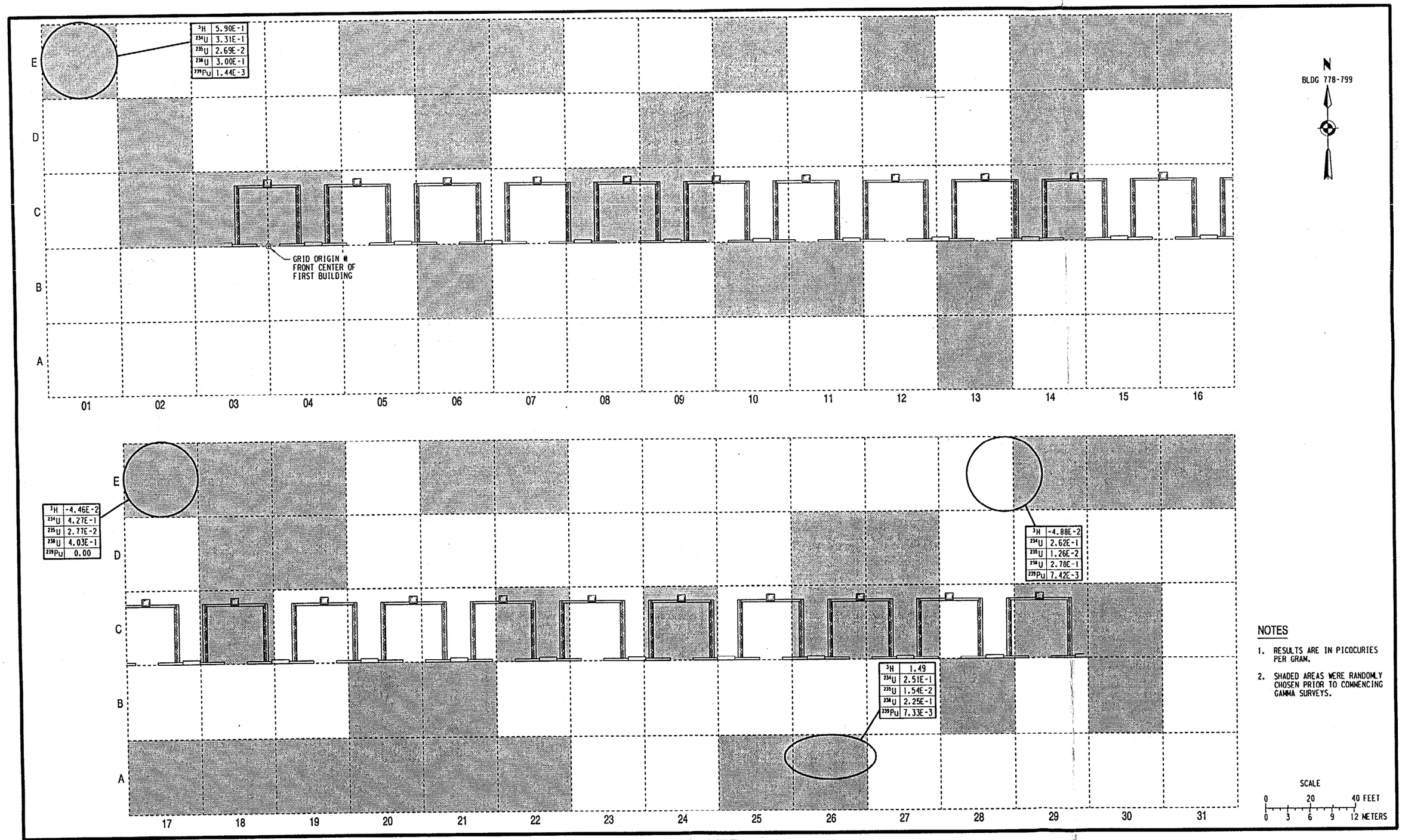

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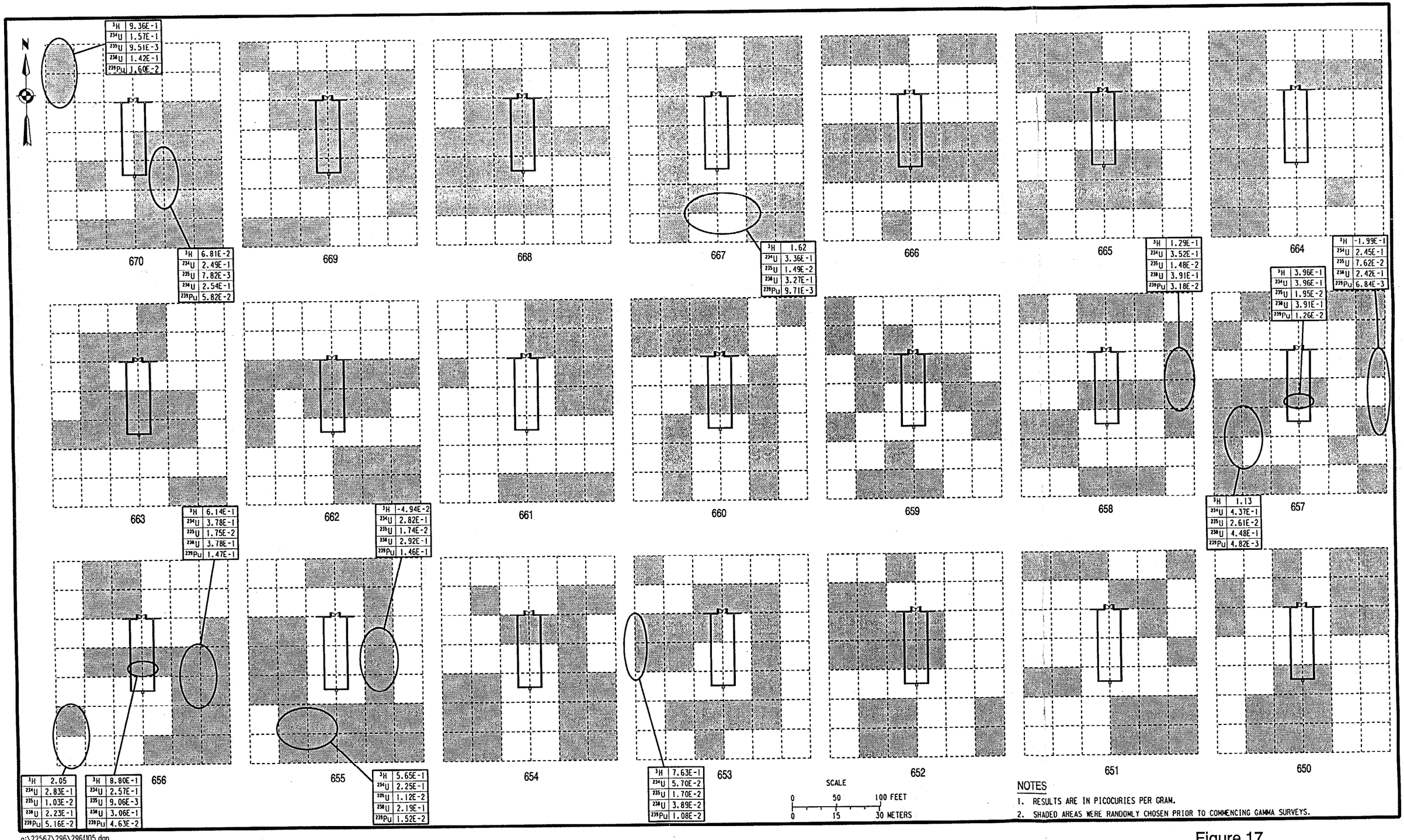
16 MAR 1999

Figure 16
Buildings 778 Thru 799 - Outdoor Gridding
Randomly Selected Survey Grid
Soil Sample Locations/Results



NOTES

1. RESULTS ARE IN PICOCURIES PER GRAM.
2. SHADED AREAS WERE RANDOMLY CHOSEN PRIOR TO COMMENCING GAMMA SURVEYS.

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16 MAR 1999

Figure 17
Buildings 650 Through 670 - Outdoor Gridding
Randomly Selected Survey Grids
Soil Sample Locations/Results

Appendix B

Conducting Radiological Surveys for Alpha/Beta Emitters and Tritium

CONDUCTING RADIOLOGICAL SURVEYS FOR ALPHA/BETA EMITTERS AND TRITIUM

1.0 PURPOSE

This procedure provides the methodology for performing direct and removable contamination surveys for alpha/beta emitters and tritium.

2.0 SCOPE

This procedure applies to all field radiological surveys for alpha/beta emitters and tritium at the Yellow Water Weapons Compound.

3.0 DEFINITIONS

Contamination – Radioactive material in a location where it should not be.

Direct Contamination Measurement – A radiation measurement made in near-contact distance with the monitored surface to assess the total quantity of radioactive contamination (e.g., disintegrations per minute) over a specified area. Field measurements will be documented in units of counts per minute per probe area, and final results documented in units of disintegrations per minute per 100 cm^2.

Radiation – Energy emitted by an unstable atom in the form of particulate or electromagnetic emissions.

Radioactive Material – Physical material (i.e., solid, liquid, or gaseous) that spontaneously decays, emitting radiation.

Removable Contamination Measurement – A measurement made of the radioactive contamination transferred to a soft, dry filter paper when swiped with moderate hand pressure over a specified area. The area covered is approximately 100 cm^2. Consideration will be given to using templates for conducting these surveys to ensure a consistent area is swiped.

Total Contamination Measurement – A contamination measurement made using portable instruments. Used to quantify the radioactive contamination at a location

4.0 PROCEDURE

4.1 ALPHA/BETA EMITTERS

4.1.1 Direct Contamination Measurements

Ludlum Model 2224 (or 2360) ratemeter/scalers attached to Ludlum Model 43-89 alpha/beta, phoswich scintillation detectors (or equivalent) will be used to conduct direct contamination measurements for alpha/beta emitters. This detector set-up has the ability to provide simultaneous measurements of gross alpha and beta emitting radioactive materials. The measurements will be made in close contact with the surface and will be taken at locations required by the work plan.

The Model 2224 has a toggle switch which allows gross alpha, gross beta, and gross alpha + beta results to be documented. Measurement results will be documented on field paperwork and after verification and conversion to dpm/100 cm^2, later transferred to an electronic database. The instrument will have a current calibration label and be calibrated with ^{230}Th (alpha) and $^{90}Sr/^{90}Y$ (beta) due to their similar emission radiations to uranium. If possible, the detection level shall be set at a value less than 10 percent of the site Derived Concentration Guideline Limit (DCGL) (equal to 500 alpha dpm/100 cm^2). The direct

measurement is intended to represent a total contamination measurement for uranium isotopes. The detection level equation is given in Attachment 1.

A large area gas flow proportional probe (Ludlum Model 239-1F) attached to a Ludlum Model 2221 rate meter/scaler will be used to scan floors for alpha and beta/gamma emitting radionuclides. The detector and rate meter/scaler is supported on a four-wheeled chassis for easy movement. The Model 239-1F uses P-10 fill gas (10 percent methane, 90 percent argon) for detector purposes. The detector requires approximately 15 minutes to fill and purge. After being fully purged, the detector is very sensitive to radiations that are able to enter the detector volume. With its large size, the detector covers a lot of area. The large detector, though, causes measurement geometries to change on uneven surfaces and can only be used as a qualitative instrument to detect and locate sources of radiation. Elevated radiation measurements will be marked and quantitative measurements made using the Ludlum Model 2224/43-89.

A control chart will be developed for each scaler (e.g., Ludlum Model 2929/43-10-01, Ludlum 2224/43-89, Ludlum 2221/44-110, Ludlum 2221/239-1F) used to conduct surveys on this project. The control chart will be developed as in Attachments 4 and 5. (See the description of control charts given in Section 4.3.) If ratemeters are used to conduct field surveys, the instruments will be source checked before the first use in the field with a suitable alpha or beta emitting check source. An acceptance range of +/- 20 percent of this initial check will be used to determine whether the instrument is operating properly. Field surveys will not be conducted if daily source checks indicate measurements that are outside of the acceptance range. Daily acceptance tests (when instruments are used) will be documented on Attachment 2, "Radiological Instrument Response and Signout Record."

4.1.2 Removable Contamination Measurements

Removable contamination measurements for alpha/beta emitting radioactive material will be conducted by using a soft, dry filter paper swiped with moderate hand pressure over an area approximately equal to 100 cm^2. A template will be utilized to closely approximate the area of 100 cm^2. The radioactive material present on the swipe will be quantified using a Ludlum Model 2929 scaler attached to a Ludlum Model 43-10-01 scintillation detector (or equivalent). See Section 4.3 for operation of this scaler. This smear will also be sent offsite for later analyses at an analytical laboratory to identify and quantify alpha emitters if site gross alpha measurements are elevated or exceed a level equivalent to 20 dpm/100 cm^2.

4.2 TRITIUM

4.2.1 Direct Contamination Measurements

Ludlum Model 2221 ratemeter/scalers attached to Ludlum Model 44-110 windowless, gas proportional detectors (or equivalent) will be used to conduct direct contamination measurements for low energy beta emitters. It is assumed that all measurements made with this instrument will be from the decay of tritium. If field measurements indicate radiation at levels that exceed 10 percent of the FRG, then additional measurements using the gross alpha/beta scintillator (Section 4.1.1) will be made in an attempt to discriminate between low energy beta activity and activity that is caused by alpha and/or higher energy beta emissions. The measurements will be made in close contact with the surface and will be taken at locations required by the work plan.

The Model 44-110 probe uses P-10 fill gas (10 percent methane, 90 percent argon) for detection purposes. If there is no fill gas in the detector volume, no detection is possible. (The detector volume must be purged with fill gas before making a measurement.) As fill gas enters the detection volume, the sensitivity increases until a point approximately 15 to 30 seconds after the detector has been placed on a surface, where detection is optimal. The detector has a toggle switch at its base that allows for stopping the flow of gas to the detector face. This toggle switch will be used to minimize the loss of fill gas when the instrument is not in use. Measurement results will be documented on field paperwork and after verification and conversion to

dpm/100 cm^2, later transferred to an electronic database. The instrument will have a current calibration label. Since the calibration of this instrument is highly geometry dependent, a conservative efficiency of 30 percent will be used, as recommended in Reference 1. The detection level shall be set at a value less than 10 percent of the site DCGL (equal to 500 beta/gamma dpm/100 cm^2). The direct measurement is intended to represent a total contamination measurement for tritium. The detection level equation is given in Attachment 1.

Background measurements will be taken. As with alpha/beta emitters, a control chart will be developed as in Section 4.3, using a beta emitting check source. Field surveys will not be conducted if daily source checks indicate measurements that are outside of the acceptance range. Daily acceptance tests (when instruments are used) will be documented on Attachment 2, "Radiological Instrument Response and Signout Record."

Reference 1 indicates several considerations that must be taken into account when using the instrument. These include: how much volume of gas will be used by the instrument during surveys; dust particles could interfere with the response causing maintenance issues; surfaces to be surveyed must be relatively flat, smooth and clean; other radiological contaminants can interfere with the detector response; and the detector has problems functioning accurately in areas with high static charge, high humidity, and moisture coverage. The reference also includes techniques that can be utilized to correct for the above considerations.

4.2.2 Removable Contamination Measurements

Removable contamination measurements for tritium will be conducted by using a soft, dry, filter paper swiped with moderate hand pressure over an area approximately equal to 100 cm^2. The swipe will be transferred directly into a liquid scintillation vial in the field. Scintillation vials containing swipe samples will be shipped to and quantified at an analytical laboratory.

4.3 LUDLUM 2929 OPERATION

A Ludlum Model 2929 scaler attached to a Ludlum Model 43-10-01 scintillation detector (or equivalent) will be used to quantify the gross amounts of alpha and beta emitters from field swipe samples. This instrument has the ability to provide simultaneous measurements of gross alpha and beta emitting radioactive materials from swipe samples. The swipe samples required by the work plan will be taken in the field and brought back to the counting room for assessment. The results (in counts per minute per 100 cm^2) will be documented on Form 2, "Alpha/Beta Contamination Results." These values will later be converted to dpm per 100 cm^2 for comparison to the FRG values.

Control charts will be developed and maintained for this instrument as given below to aid in trending the response of scalers assessing loose contamination. The control charts will be initiated before using the instrument to assess the amount of radioactive material on swipe paper. Since only the alpha emission is necessary to be compared to the FRG, the alpha channel will be utilized to develop and use the control chart. The check source will be placed in the counting chamber (in a reproducible manner) and the check source slid under the detector's active area. Ten counts will be made of the source. (The counting time will be long enough to get an instrument response of several thousand counts per minute.) The sample mean and standard deviation will be calculated from the 10 sample counts. Attachment 4 shows an example of the calculations if hand calculations must be performed.

Attachment 5 is an example of a control chart. Using Attachment 5 as an example, several trends or occurrences would indicate that the fixed scaler may not be operating properly. First, it appears that a downward trend has developed from the latter part of January through early February. If a general trend develops over eight to ten daily checks (either upwards or downwards), the project Health Physicist shall be contacted to assess the control chart. Second, in the middle of March, four consecutive source checks were outside of two standard deviations from the mean. Fixed scalers shall be pulled from service anytime that

three consecutive source checks are outside of two standard deviations from the mean. Third, at the end of April, two consecutive source checks were outside of three standard deviations from the mean. Fixed scalers shall be pulled from service anytime that two consecutive source checks are outside of three standard deviations from the mean.

Scalers shall be source-checked (one sample count) daily before use. The same source and geometry used to develop the control chart for the scaler shall be used for the source check. The result of the daily source check shall be plotted on the control chart.

Occurrence	Action
General Trend	Contact Project Health Physicist
Three consecutive source checks outside of two standard deviations from the mean.	Pull scaler from service and send for recalibration
Two consecutive source checks outside of three standard deviations from the mean.	Pull scaler from service and send for recalibration

5.0 RESPONSIBILITIES

The field survey manager is responsible for developing this procedure, answering all technical questions associated with the procedure, and ensuring that each individual utilizing this procedure is adequately trained.

Survey personnel are responsible for understanding the procedural requirements within this document and, if questions arise, asking the field survey manager for clarification before proceeding. They are also required to double-check the values documented on the field paperwork.

6.0 ATTACHMENTS

Attachment 1: Detection Level Calculation

Attachment 2: Form 1, Radiological Instrument Response and Signout Record

Attachment 3: Form 2, Alpha/Beta Contamination Results

Attachment 4: Example Development of a Control Chart

Attachment 5: Example Control Chart

7.0 REFERENCES

1. Steinmeyer, Paul R., "Experience Performing Decommissioning Surveys for Fixed Tritium Contamination Using a Large-Area Windowless Gas Flow Proportional Detector," 1997.

2. Walker, Edward, "Proper Selection and Application of Portable Survey Instruments for Unrestricted Release Surveys," *Radiation Protection Management*, p. 46-52, 1997.

ATTACHMENT 1

DETECTION LIMIT CALCULATION

For Time Integrated Measurements:

$$MDC = \frac{3.0 + 4.65\sqrt{R_b \times \tau}}{t * E * (A_d / 100)}$$

where:
- R_b = Background count rate, CPM
- t = Sample count time, min.
- E = Efficiency, C/d
- A_d = Window area of detector, cm^2

For Ratemeter (Scanning) Measurements:

$$MDC = \frac{4.65\sqrt{R_b / 2\tau}}{E * (A_d / 100)}$$

where:
- Rb = Background count rate, CPM
- E = Efficiency, C/d
- A_d = Window area at detector, cm^2
- τ = Ratemeter time constant, 0.015 min.

ATTACHMENT 2

Form 1, Radiological Instrument Response and Signout Record

Date	Time	Instrument	Cal Due Date	Source ID	Source check Initial Check	Acceptance Range (CPM)	Acc (Y/N)	Issued To	Check By	Remarks

ATTACHMENT 3

Form 2, Alpha/Beta Contamination Results

Date: _____ **Surveyor:** _____ _____

Analysis Type: ____ Direct ____ Swipe **Instrument: Model:** Ludlum **Serial:**	**Matrix:** ___ Asphalt ___ Indoor Concrete ___ Outdoor Concrete ___ Tile ___ Carpet
Background: α _____ CPM β _____ CPM	**Efficiency:** α _____ c/d β _____ c/d

Location	Gross α (CPM)	Gross β (CPM)	Comments
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.			
26.			
27.			
28.			
29.			
30.			

Reviewed by: _____ Date: _____

ATTACHMENT 4

Example Development of a Control Chart

Ten 1-minute counts taken with check source
Counter background (C_B) = 31 counts per minute (CPM)

COUNT #	Gross Count Rate (C_{s+B}), CPM	Net Count Rate ($C_{s+B} - C_B$)$_g$ CPM	(Net Count Rate-Mean)^2 (CPM)^2
1	3,794	3,763	25,536.04
2	4,135	4,104	32,833.44
3	4,108	4,077	23,777.64
4	3,682	3,651	73,875.24
5	3,880	3,849	5,446.44
6	4,021	3,990	4,515.84
7	3,854	3,823	9,960.04
8	4,217	4,186	69,274.24
9	3,814	3,783	19,544.04
10	4,033	4,002	6,272.64

n = 10 Σ Net Count Rate = 39,228 Σ (Net Count Rate-Mean)^2 = 271,035.60

Calculate the mean net sample count rate ($\bar{n}$ n):

$$n = \frac{\sum \text{Net Count Rate}}{n} = \frac{39{,}228 \text{ CPM}}{10} = 3{,}922.8 \text{ CPM}$$

Calculate the Sample Standard Deviation(s):

$$s = \left[\frac{\Sigma(\text{Net Count Rate} - \text{Mean})^2}{n-1}\right]^{1/2}$$

$$= \left[\frac{271{,}035.60\,(\text{CPM})^2}{9}\right]^{1/2} = \left[30{,}115.07\,(\text{CPM})^2\right]^{1/2}$$

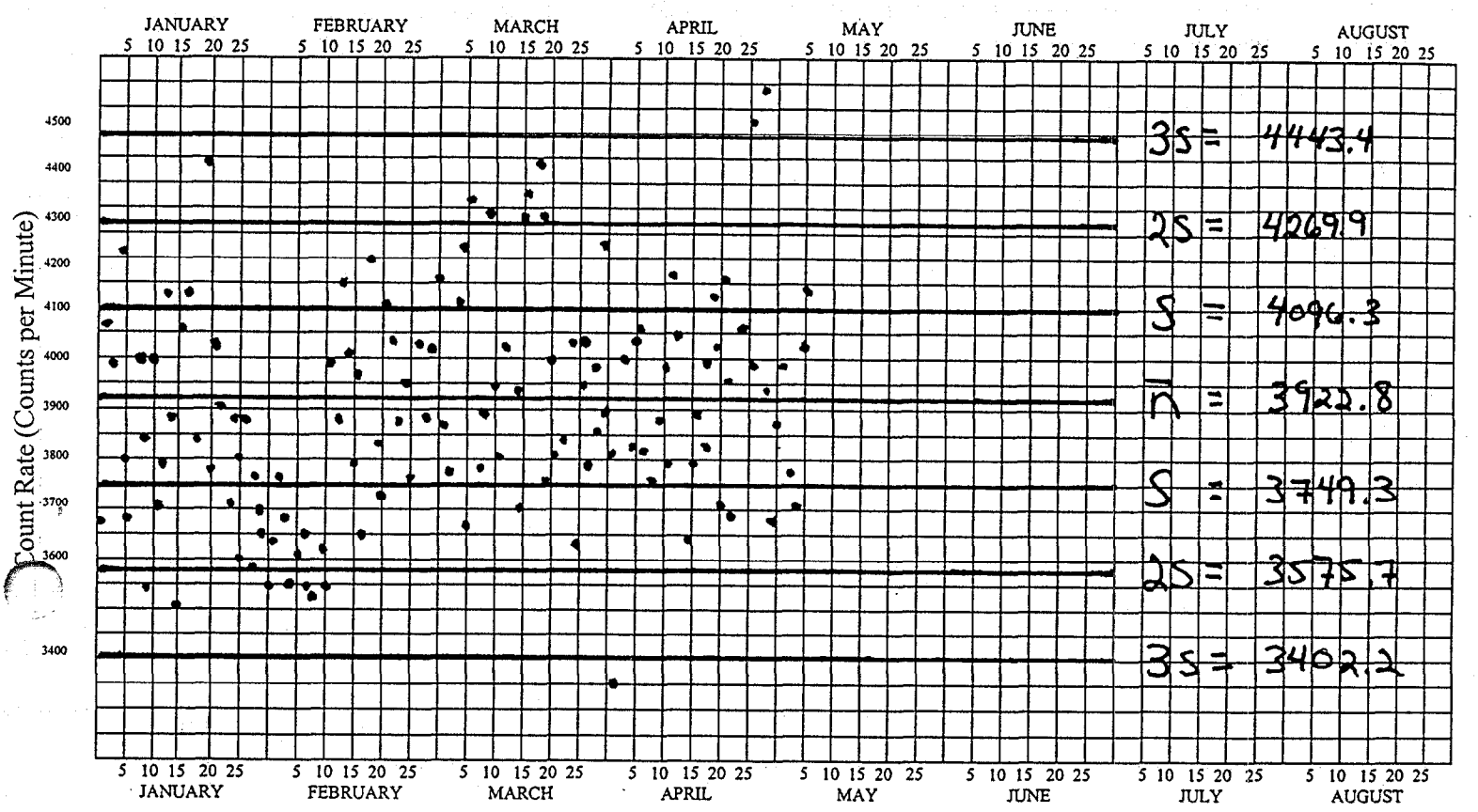
$$= 113.54 \text{ CPM}$$

Determination of the Confidence Intervals:

$(\bar{n} - s) < \bar{n} < (\bar{n} + s)$ $3{,}749.3 < \bar{n} < 4{,}096.3$
$(\bar{n} - 2s) < \bar{n} < (\bar{n} + 2s)$ $3{,}575.7 < \bar{n} < 4{,}269.9$
$(\bar{n} - 3s) < \bar{n} < (\bar{n} + 3s)$ $3{,}402{,}2 < \bar{n} < 4{,}443.4$

ATTACHMENT 5

Example Control Chart



pa0063b

Appendix C

Swipe Sample Data Tables

Building 601
Building 617
Building 626
Old Storage Bunkers (Interior)
Old Storage Bunkers (Housings)
New Storage Bunkers

BUILDING 601

16-Mar-99

SWIPE SAMPLE RESULTS

LOCATION	DATE COUNTED	GROSS ALPHA RESULT	GROSS BETA RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm2)	NET BETA RESULT (dpm/100cm2)
Room 11 - #37	12/18/1998	0	156	4	0.2	45.5	0.3738	0.4423	(0.54)	(14.70)
Room 11 - #38	12/18/1998	0	156	4	0.2	45.5	0.3738	0.4423	(0.54)	(14.70)
Room 10 - #39	12/18/1998	1	169	4	0.2	45.5	0.3738	0.4423	0.13	(7.35)
Room 10 - #40	12/18/1998	0	197	4	0.2	45.5	0.3738	0.4423	(0.54)	8.48
Room 9 - #41	12/18/1998	0	163	4	0.2	45.5	0.3738	0.4423	(0.54)	(10.74)
Room 9 - #42	12/18/1998	0	172	4	0.2	45.5	0.3738	0.4423	(0.54)	(5.65)
Room 14 - #43	12/18/1998	0	174	4	0.2	45.5	0.3738	0.4423	(0.54)	(4.52)
Room 14 - #44	12/18/1998	0	196	4	0.2	45.5	0.3738	0.4423	(0.54)	7.91
Room 15 - #45	12/18/1998	2	194	4	0.2	45.5	0.3738	0.4423	0.80	6.78
Room 15 - #46	12/18/1998	1	166	4	0.2	45.5	0.3738	0.4423	0.13	(9.04)
Room 17 - #47	12/18/1998	0	183	4	0.2	45.5	0.3738	0.4423	(0.54)	0.57
Room 17 - #48	12/18/1998	0	169	4	0.2	45.5	0.3738	0.4423	(0.54)	(7.35)
Room 16 - #49	12/18/1998	1	201	4	0.2	45.5	0.3738	0.4423	0.13	10.74
Room 16 - #50	12/18/1998	0	206	4	0.2	45.5	0.3738	0.4423	(0.54)	13.57
Room 16 - #51	12/18/1998	1	177	4	0.2	45.5	0.3738	0.4423	0.13	(2.83)
Room 16 - #52	12/18/1998	0	194	4	0.2	45.5	0.3738	0.4423	(0.54)	6.78
Room 16 - #53	12/18/1998	1	177	4	0.2	45.5	0.3738	0.4423	0.13	(2.83)
Room 16 - #54	12/18/1998	0	147	4	0.2	45.5	0.3738	0.4423	(0.54)	(19.78)
Room 16 - #55	12/18/1998	0	169	4	0.2	45.5	0.3738	0.4423	(0.54)	(7.35)
Room 16 - #56	12/18/1998	1	180	4	0.2	45.5	0.3738	0.4423	0.13	(1.13)
Room 13 - #57	12/18/1998	0	173	4	0.2	45.5	0.3738	0.4423	(0.54)	(5.09)
Room 13 - #58	12/18/1998	0	199	4	0.2	45.5	0.3738	0.4423	(0.54)	9.61
Room 25 - #28	12/18/1998	0	185	4	0.2	45.5	0.3738	0.4423	(0.54)	1.70
Room 25 - #29	12/18/1998	0	195	4	0.2	45.5	0.3738	0.4423	(0.54)	7.35
Room 25 - #30	12/18/1998	2	197	4	0.2	45.5	0.3738	0.4423	0.80	8.48
Room 25 - #31	12/18/1998	0	211	4	0.2	45.5	0.3738	0.4423	(0.54)	16.39
Room 25 - #32	12/18/1998	0	147	4	0.2	45.5	0.3738	0.4423	(0.54)	(19.78)
Room 25 - #33	12/18/1998	1	170	4	0.2	45.5	0.3738	0.4423	0.13	(6.78)
Room 25 - #34	12/18/1998	0	159	4	0.2	45.5	0.3738	0.4423	(0.54)	(13.00)
Room 25 - #35	12/18/1998	2	194	4	0.2	45.5	0.3738	0.4423	0.80	6.78
Room 25 - #36	12/18/1998	1	182	4	0.2	45.5	0.3738	0.4423	0.13	0.00
Room 25 - #37	12/18/1998	0	175	4	0.2	45.5	0.3738	0.4423	(0.54)	(3.96)
Room 25 - #38	12/18/1998	0	202	4	0.2	45.5	0.3738	0.4423	(0.54)	11.30
Room 25 - #39	12/18/1998	0	188	4	0.2	45.5	0.3738	0.4423	(0.54)	3.39
Room 25 - #40	12/18/1998	0	145	4	0.2	45.5	0.3738	0.4423	(0.54)	(20.91)
Room 25 - #41	12/18/1998	0	192	4	0.2	45.5	0.3738	0.4423	(0.54)	5.65
Room 25 - #42	12/18/1998	1	182	4	0.2	45.5	0.3738	0.4423	0.13	0.00
Room 5 - #22	12/18/1998	0	183	4	0.2	45.5	0.3738	0.4423	(0.54)	0.57
Room 5 - #23	12/18/1998	0	178	4	0.2	45.5	0.3738	0.4423	(0.54)	(2.26)
Room 5 - #24	12/18/1998	0	170	4	0.2	45.5	0.3738	0.4423	(0.54)	(6.78)

LOCATION	DATE COUNTED	GROSS ALPHA RESULT	GROSS BETA RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm2)	NET BETA RESULT (dpm/100cm2)
Room 2 - #25	12/18/1998	3	203	4	0.2	45.5	0.3738	0.4423	1.47	11.87
Room 2 - #26	12/18/1998	0	193	4	0.2	45.5	0.3738	0.4423	(0.54)	6.22
Room 4 - #27	12/18/1998	0	164	4	0.2	45.5	0.3738	0.4423	(0.54)	(10.17)
Room 3 - #28	12/18/1998	0	186	4	0.2	45.5	0.3738	0.4423	(0.54)	2.26
Room 3 - #29	12/18/1998	0	188	4	0.2	45.5	0.3738	0.4423	(0.54)	3.39
Room 6 - #30	12/18/1998	0	161	4	0.2	45.5	0.3738	0.4423	(0.54)	(11.87)
Room 6 - #31	12/18/1998	0	194	4	0.2	45.5	0.3738	0.4423	(0.54)	6.78
Room 7 - #32	12/18/1998	0	185	4	0.2	45.5	0.3738	0.4423	(0.54)	1.70
Room 7 - #33	12/18/1998	0	174	4	0.2	45.5	0.3738	0.4423	(0.54)	(4.52)
Room 8 - #34	12/18/1998	0	177	4	0.2	45.5	0.3738	0.4423	(0.54)	(2.83)
Room 12 - #35	12/18/1998	0	168	4	0.2	45.5	0.3738	0.4423	(0.54)	(7.91)
Room 12 - #36	12/18/1998	1	177	4	0.2	45.5	0.3738	0.4423	0.13	(2.83)
Room 19 - #59	12/19/1998	0	179	4	0.1	45.9	0.3738	0.4423	(0.27)	(2.60)
Room 19 - #60	12/19/1998	0	187	4	0.1	45.9	0.3738	0.4423	(0.27)	1.92
Room 19 - #61	12/19/1998	0	192	4	0.1	45.9	0.3738	0.4423	(0.27)	4.75
Room 19 - #62	12/19/1998	2	173	4	0.1	45.9	0.3738	0.4423	1.07	(5.99)
Room 19 - #63	12/19/1998	0	187	4	0.1	45.9	0.3738	0.4423	(0.27)	1.92
Room 20 - #64	12/19/1998	0	152	4	0.1	45.9	0.3738	0.4423	(0.27)	(17.86)
Room 20 - #65	12/19/1998	0	185	4	0.1	45.9	0.3738	0.4423	(0.27)	0.79
Room 20 - #66	12/19/1998	0	192	4	0.1	45.9	0.3738	0.4423	(0.27)	4.75
Room 20 - #67	12/19/1998	0	189	4	0.1	45.9	0.3738	0.4423	(0.27)	3.05
Room 21 - #68	12/19/1998	2	176	4	0.1	45.9	0.3738	0.4423	1.07	(4.30)
Room 21 - #69	12/19/1998	0	158	4	0.1	45.9	0.3738	0.4423	(0.27)	(14.47)
Room 21 - #70	12/19/1998	1	175	4	0.1	45.9	0.3738	0.4423	0.40	(4.86)
Room 21 - #71	12/19/1998	0	175	4	0.1	45.9	0.3738	0.4423	(0.27)	(4.86)
Room 22 - #72	12/19/1998	1	192	4	0.1	45.9	0.3738	0.4423	0.40	4.75
Room 22 - #73	12/19/1998	0	194	4	0.1	45.9	0.3738	0.4423	(0.27)	5.88
Room 22 - #74	12/19/1998	1	180	4	0.1	45.9	0.3738	0.4423	0.40	(2.03)
Room 24 - #78	12/19/1998	1	180	4	0.1	45.9	0.3738	0.4423	0.40	(2.03)
Room 24 - #79	12/19/1998	0	153	4	0.1	45.9	0.3738	0.4423	(0.27)	(17.30)
Room 24 - #80	12/19/1998	0	173	4	0.1	45.9	0.3738	0.4423	(0.27)	(5.99)
Room 24 - #81	12/19/1998	0	177	4	0.1	45.9	0.3738	0.4423	(0.27)	(3.73)
								Average	(0.29)	(1.32)

BUILDING 617

16-Mar-99

SWIPE SAMPLE RESULTS

LOCATION	DATE COUNTED	GROSS ALPHA RESULT	GROSS BETA RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)
Room 7 - #77	12/19/1998	1	325	4	0.4	82.4	0.3738	0.4423	(0.40)	(2.60)
Room 7 - #78	12/19/1998	1	320	4	0.4	82.4	0.3738	0.4423	(0.40)	(5.43)
Room 7 - #79	12/19/1998	0	330	4	0.4	82.4	0.3738	0.4423	(1.07)	0.23
Room 7 - #80	12/19/1998	0	306	4	0.4	82.4	0.3738	0.4423	(1.07)	(13.34)
Room 7 - #81	12/19/1998	1	339	4	0.4	82.4	0.3738	0.4423	(0.40)	5.31
Room 7 - #82	12/19/1998	2	310	4	0.4	82.4	0.3738	0.4423	0.27	(11.08)
Room 7 - #83	12/19/1998	0	307	4	0.4	82.4	0.3738	0.4423	(1.07)	(12.77)
Room 7 - #84	12/19/1998	0	341	4	0.4	82.4	0.3738	0.4423	(1.07)	6.44
Room 7 - #85	12/19/1998	0	338	4	0.4	82.4	0.3738	0.4423	(1.07)	4.75
Room 7 - #86	12/19/1998	0	316	4	0.4	82.4	0.3738	0.4423	(1.07)	(7.69)
Room 7 - #87	12/19/1998	1	338	4	0.4	82.4	0.3738	0.4423	(0.40)	4.75
Room 7 - #88	12/19/1998	1	297	4	0.4	82.4	0.3738	0.4423	(0.40)	(18.43)
Room 7 - #89	12/19/1998	0	317	4	0.4	82.4	0.3738	0.4423	(1.07)	(7.12)
Room 7 - #90	12/19/1998	0	310	4	0.4	82.4	0.3738	0.4423	(1.07)	(11.08)
Room 7 - #91	12/19/1998	1	293	4	0.4	82.4	0.3738	0.4423	(0.40)	(20.69)
Room 7 - #92	12/19/1998	0	301	4	0.4	82.4	0.3738	0.4423	(1.07)	(16.17)
Room 7 - #93	12/19/1998	0	304	4	0.4	82.4	0.3738	0.4423	(1.07)	(14.47)
Room 7 - #94	12/19/1998	3	318	4	0.4	82.4	0.3738	0.4423	0.94	(6.56)
Room 7 - #95	12/19/1998	0	321	4	0.4	82.4	0.3738	0.4423	(1.07)	(4.86)
Room 7 - #96	12/19/1998	0	298	4	0.4	82.4	0.3738	0.4423	(1.07)	(17.86)
Room 7 - #97	12/19/1998	0	285	4	0.4	82.4	0.3738	0.4423	(1.07)	(25.21)
Room 7 - #98	12/19/1998	2	302	4	0.4	82.4	0.3738	0.4423	0.27	(15.60)
Room 7 - #99	12/19/1998	0	328	4	0.4	82.4	0.3738	0.4423	(1.07)	(0.90)
Room 7 - #100	12/19/1998	3	332	4	0.4	82.4	0.3738	0.4423	0.94	1.36
Room 7 - #43	12/19/1998	1	308	4	0.4	82.4	0.3738	0.4423	(0.40)	(12.21)
Room 7 - #44	12/19/1998	0	335	4	0.4	82.4	0.3738	0.4423	(1.07)	3.05
Room 7 - #45	12/19/1998	1	311	4	0.4	82.4	0.3738	0.4423	(0.40)	(10.51)
Room 7 - #46	12/19/1998	0	320	4	0.4	82.4	0.3738	0.4423	(1.07)	(5.43)
Room 7 - #47	12/19/1998	0	309	4	0.4	82.4	0.3738	0.4423	(1.07)	(11.64)
Room 7 - #48	12/19/1998	1	283	4	0.4	82.4	0.3738	0.4423	(0.40)	(26.34)
Room 7 - #49	12/19/1998	2	297	4	0.4	82.4	0.3738	0.4423	0.27	(18.43)
Room 7 - #50	12/19/1998	0	310	4	0.4	82.4	0.3738	0.4423	(1.07)	(11.08)
Room 7 - #51	12/19/1998	0	299	4	0.4	82.4	0.3738	0.4423	(1.07)	(17.30)
Room 7 - #52	12/19/1998	0	302	4	0.4	82.4	0.3738	0.4423	(1.07)	(15.60)
Room 7 - #53	12/19/1998	0	298	4	0.4	82.4	0.3738	0.4423	(1.07)	(17.86)
Room 8 - #54	12/19/1998	0	329	4	0.4	82.4	0.3738	0.4423	(1.07)	(0.34)
Room 8 - #55	12/19/1998	1	325	4	0.4	82.4	0.3738	0.4423	(0.40)	(2.60)
Room 8 - #56	12/19/1998	0	317	4	0.4	82.4	0.3738	0.4423	(1.07)	(7.12)
Room 8 - #57	12/19/1998	0	292	4	0.4	82.4	0.3738	0.4423	(1.07)	(21.25)
Room 8 - #58	12/19/1998	3	313	4	0.4	82.4	0.3738	0.4423	0.94	(9.38)
Room 1 - #59	12/19/1998	1	298	4	0.4	82.4	0.3738	0.4423	(0.40)	(17.86)

LOCATION	DATE COUNTED	GROSS ALPHA RESULT	GROSS BETA RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)
Room 1 - #60	12/19/1998	0	302	4	0.4	82.4	0.3738	0.4423	(1.07)	(15.60)
Room 1 - #61	12/19/1998	1	289	4	0.4	82.4	0.3738	0.4423	(0.40)	(22.95)
Room 9 - #62	12/19/1998	3	353	4	0.4	82.4	0.3738	0.4423	0.94	13.23
Room 9 - #63	12/19/1998	1	327	4	0.4	82.4	0.3738	0.4423	(0.40)	(1.47)
Room 9 - #64	12/19/1998	1	307	4	0.4	82.4	0.3738	0.4423	(0.40)	(12.77)
Room 9 - #65	12/19/1998	2	319	4	0.4	82.4	0.3738	0.4423	0.27	(5.99)
Room 9 - #66	12/19/1998	0	299	4	0.4	82.4	0.3738	0.4423	(1.07)	(17.30)
Room 9 - #67	12/19/1998	0	327	4	0.4	82.4	0.3738	0.4423	(1.07)	(1.47)
Room 9 - #68	12/19/1998	0	313	4	0.4	82.4	0.3738	0.4423	(1.07)	(9.38)
Room 9 - #69	12/19/1998	0	347	4	0.4	82.4	0.3738	0.4423	(1.07)	9.83
Room 9 - #70	12/19/1998	0	282	4	0.4	82.4	0.3738	0.4423	(1.07)	(26.90)
Room 9 - #71	12/19/1998	1	319	4	0.4	82.4	0.3738	0.4423	(0.40)	(5.99)
Room 9 - #72	12/19/1998	1	283	4	0.4	82.4	0.3738	0.4423	(0.40)	(26.34)
Room Hall - #73	12/19/1998	2	316	4	0.4	82.4	0.3738	0.4423	0.27	(7.69)
Room Hall - #98	12/19/1998	0	302	4	0.4	82.4	0.3738	0.4423	(1.07)	(15.60)
Room Hall - #99	12/19/1998	1	336	4	0.4	82.4	0.3738	0.4423	(0.40)	3.62
Room Hall - #100	12/19/1998	1	342	4	0.4	82.4	0.3738	0.4423	(0.40)	7.01
Room Hall - #76	12/19/1998	0	299	4	0.4	82.4	0.3738	0.4423	(1.07)	(17.30)
Room Hall - #77	12/19/1998	NM	NM	4	0.4	82.4	0.3738	0.4423	NM	NM
Room 2 - #82	12/19/1998	0	308	4	0.4	82.4	0.3738	0.4423	(1.07)	(12.21)
Room 2 - #83	12/19/1998	0	306	4	0.4	82.4	0.3738	0.4423	(1.07)	(13.34)
Room 2 - #84	12/19/1998	0	313	4	0.4	82.4	0.3738	0.4423	(1.07)	(9.38)
Room 2 - #85	12/19/1998	0	344	4	0.4	82.4	0.3738	0.4423	(1.07)	8.14
Room 2 - #86	12/19/1998	2	309	4	0.4	82.4	0.3738	0.4423	0.27	(11.64)
Room 3 - #87	12/19/1998	2	288	4	0.4	82.4	0.3738	0.4423	0.27	(23.51)
Room 3 - #88	12/19/1998	0	332	4	0.4	82.4	0.3738	0.4423	(1.07)	1.36
Room 4 - #89	12/19/1998	0	302	4	0.4	82.4	0.3738	0.4423	(1.07)	(15.60)
Room 4 - #90	12/19/1998	0	329	4	0.4	82.4	0.3738	0.4423	(1.07)	(0.34)
Room 5 - #91	12/19/1998	2	289	4	0.4	82.4	0.3738	0.4423	0.27	(22.95)
Room 5 - #92	12/19/1998	1	313	4	0.4	82.4	0.3738	0.4423	(0.40)	(9.38)
Room 6 - #93	12/19/1998	1	276	4	0.4	82.4	0.3738	0.4423	(0.40)	(30.30)
Room 6 - #94	12/19/1998	0	308	4	0.4	82.4	0.3738	0.4423	(1.07)	(12.21)
								Average	(0.62)	(9.66)

NM = Not measured

BUILDING 626

16-Mar-99

SWIPE SAMPLE RESULTS

LOCATION	DATE COUNTED	GROSS ALPHA RESULT	GROSS BETA RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)
Room 1 - #79	12/17/1998	0	171	4	0.2	46	0.3738	0.4423	(0.54)	(7.35)
Room 1 - #80	12/17/1998	1	187	4	0.2	46	0.3738	0.4423	0.13	1.70
Room 1 - #81	12/17/1998	2	177	4	0.2	46	0.3738	0.4423	0.80	(3.96)
Room 1 - #82	12/17/1998	1	187	4	0.2	46	0.3738	0.4423	0.13	1.70
Room 1 - #83	12/17/1998	0	183	4	0.2	46	0.3738	0.4423	(0.54)	(0.57)
Room 1 - #84	12/17/1998	0	146	4	0.2	46	0.3738	0.4423	(0.54)	(21.48)
Room 1 - #85	12/17/1998	0	162	4	0.2	46	0.3738	0.4423	(0.54)	(12.43)
Room 1 - #86	12/17/1998	0	166	4	0.2	46	0.3738	0.4423	(0.54)	(10.17)
Room 2 - #87	12/17/1998	0	195	4	0.2	46	0.3738	0.4423	(0.54)	6.22
Room 2 - #88	12/17/1998	0	150	4	0.2	46	0.3738	0.4423	(0.54)	(19.22)
Room 3 - #89	12/17/1998	0	177	4	0.2	46	0.3738	0.4423	(0.54)	(3.96)
Room 3 - #90	12/17/1998	2	184	4	0.2	46	0.3738	0.4423	0.80	0.00
Room 4 - #91	12/17/1998	1	176	4	0.2	46	0.3738	0.4423	0.13	(4.52)
Room 4 - #92	12/17/1998	0	168	4	0.2	46	0.3738	0.4423	(0.54)	(9.04)
Room 5 - #93	12/17/1998	1	178	4	0.2	46	0.3738	0.4423	0.13	(3.39)
Room 5 - #94	12/17/1998	1	162	4	0.2	46	0.3738	0.4423	0.13	(12.43)
Room 5 - #95	12/17/1998	0	176	4	0.2	46	0.3738	0.4423	(0.54)	(4.52)
Room 5 - #96	12/17/1998	1	168	4	0.2	46	0.3738	0.4423	0.13	(9.04)
Room 9 - #97	12/17/1998	0	163	4	0.2	46	0.3738	0.4423	(0.54)	(11.87)
Room 9 - #98	12/17/1998	0	172	4	0.2	46	0.3738	0.4423	(0.54)	(6.78)
Room 10 - #99	12/17/1998	1	189	4	0.2	46	0.3738	0.4423	0.13	2.83
Room 6 - #100	12/18/1998	0	170	4	0.2	45.5	0.3738	0.4423	(0.54)	(6.78)
Room 6 - #1	12/18/1998	1	174	4	0.2	45.5	0.3738	0.4423	0.13	(4.52)
Room 6 - #2	12/18/1998	2	175	4	0.2	45.5	0.3738	0.4423	0.80	(3.96)
Room 6 - #3	12/18/1998	1	162	4	0.2	45.5	0.3738	0.4423	0.13	(11.30)
Room 6 - #4	12/18/1998	2	171	4	0.2	45.5	0.3738	0.4423	0.80	(6.22)
Room 6 - #5	12/18/1998	2	172	4	0.2	45.5	0.3738	0.4423	0.80	(5.65)
Room 7 - #6	12/18/1998	0	195	4	0.2	45.5	0.3738	0.4423	(0.54)	7.35
Room 7 - #7	12/18/1998	1	190	4	0.2	45.5	0.3738	0.4423	0.13	4.52
Room 7 - #8	12/18/1998	0	164	4	0.2	45.5	0.3738	0.4423	(0.54)	(10.17)
Room 7 - #9	12/18/1998	1	164	4	0.2	45.5	0.3738	0.4423	0.13	(10.17)
Room 7 - #10	12/18/1998	1	186	4	0.2	45.5	0.3738	0.4423	0.13	2.26
Room 7 - #11	12/18/1998	0	203	4	0.2	45.5	0.3738	0.4423	(0.54)	11.87
Room 8 - #12	12/18/1998	0	179	4	0.2	45.5	0.3738	0.4423	(0.54)	(1.70)
Room 8 - #13	12/18/1998	0	195	4	0.2	45.5	0.3738	0.4423	(0.54)	7.35
Room 8 - #14	12/18/1998	1	197	4	0.2	45.5	0.3738	0.4423	0.13	8.48
Room 8 - #15	12/18/1998	0	203	4	0.2	45.5	0.3738	0.4423	(0.54)	11.87
Room 8 - #16	12/18/1998	1	186	4	0.2	45.5	0.3738	0.4423	0.13	2.26
Room 11 - #17	12/18/1998	1	169	4	0.2	45.5	0.3738	0.4423	0.13	(7.35)
Room 11 - #18	12/18/1998	0	186	4	0.2	45.5	0.3738	0.4423	(0.54)	2.26
Room 11 - #19	12/18/1998	0	201	4	0.2	45.5	0.3738	0.4423	(0.54)	10.74
Room 11 - #20	12/18/1998	0	180	4	0.2	45.5	0.3738	0.4423	(0.54)	(1.13)
Room 11 - #21	12/18/1998	0	176	4	0.2	45.5	0.3738	0.4423	(0.54)	(3.39)
								Average	(0.15)	(3.06)

OLD STORAGE BUNKERS (Interior)

19-Mar-99

SWIPE SAMPLE RESULTS

BUILDING	DATE COUNTED	GROSS ALPHA RESULT	GROSS BETA RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)
650 - #95	12/18/1998	2	183	4	0.2	45.5	0.3738	0.4423	0.80	0.57
650 - #96	12/18/1998	0	181	4	0.2	45.5	0.3738	0.4423	(0.54)	(0.57)
650 - #97	12/18/1998	0	172	4	0.2	45.5	0.3738	0.4423	(0.54)	(5.65)
651 - #92	12/18/1998	1	185	4	0.2	45.5	0.3738	0.4423	0.13	1.70
651 - #93	12/18/1998	1	162	4	0.2	45.5	0.3738	0.4423	0.13	(11.30)
651 - #94	12/18/1998	1	202	4	0.2	45.5	0.3738	0.4423	0.13	11.30
652 - #89	12/17/1998	2	182	4	0.2	46	0.3738	0.4423	0.80	(1.13)
652 - #90	12/17/1998	0	171	4	0.2	46	0.3738	0.4423	(0.54)	(7.35)
652 - #91	12/17/1998	0	197	4	0.2	46	0.3738	0.4423	(0.54)	7.35
653 - #86	12/17/1998	0	161	4	0.2	46	0.3738	0.4423	(0.54)	(13.00)
653 - #87	12/17/1998	3	189	4	0.2	46	0.3738	0.4423	1.47	2.83
653 - #88	12/17/1998	0	177	4	0.2	46	0.3738	0.4423	(0.54)	(3.96)
654 - #83	12/16/1998	3	233	4	0	48	0.3738	0.4423	2.01	23.17
654 - #84	12/16/1998	1	239	4	0	48	0.3738	0.4423	0.67	26.57
654 - #85	12/16/1998	1	206	4	0	48	0.3738	0.4423	0.67	7.91
655 - #80	12/16/1998	3	215	4	0	48	0.3738	0.4423	2.01	13.00
655 - #81	12/16/1998	0	214	4	0	48	0.3738	0.4423	0.00	12.43
655 - #82	12/16/1998	3	227	4	0	48	0.3738	0.4423	2.01	19.78
656 - #77	12/15/1998	0	188	5	0.2	44.7	0.3738	0.4423	(0.54)	(16.05)
656 - #78	12/15/1998	1	241	5	0.2	44.7	0.3738	0.4423	0.00	7.91
656 - #79	12/15/1998	2	224	5	0.2	44.7	0.3738	0.4423	0.54	0.23
657 - #74	12/15/1998	1	239	5	0.2	44.7	0.3738	0.4423	0.00	7.01
657 - #75	12/15/1998	0	223	5	0.2	44.7	0.3738	0.4423	(0.54)	(0.23)
657 - #76	12/15/1998	0	227	5	0.2	44.7	0.3738	0.4423	(0.54)	1.58
658 - #71	12/15/1998	0	219	5	0.2	44.7	0.3738	0.4423	(0.54)	(2.03)
658 - #72	12/15/1998	0	235	5	0.2	44.7	0.3738	0.4423	(0.54)	5.20
658 - #73	12/15/1998	0	235	5	0.2	44.7	0.3738	0.4423	(0.54)	5.20
659 - #68	12/15/1998	1	252	5	0.2	44.7	0.3738	0.4423	0.00	12.89
659 - #69	12/15/1998	1	195	5	0.2	44.7	0.3738	0.4423	0.00	(12.89)
659 - #70	12/15/1998	0	231	5	0.2	44.7	0.3738	0.4423	(0.54)	3.39
660 - #65	12/15/1998	2	219	5	0.2	44.7	0.3738	0.4423	0.54	(2.03)
660 - #66	12/15/1998	1	239	5	0.2	44.7	0.3738	0.4423	0.00	7.01
660 - #67	12/15/1998	0	217	5	0.2	44.7	0.3738	0.4423	(0.54)	(2.94)
661 - #62	12/15/1998	1	226	5	0.2	44.7	0.3738	0.4423	0.00	1.13
661 - #63	12/15/1998	2	220	5	0.2	44.7	0.3738	0.4423	0.54	(1.58)
661 - #64	12/15/1998	1	231	5	0.2	44.7	0.3738	0.4423	0.00	3.39
662 - #59	12/15/1998	0	208	5	0.2	44.7	0.3738	0.4423	(0.54)	(7.01)
662 - #60	12/15/1998	0	218	5	0.2	44.7	0.3738	0.4423	(0.54)	(2.49)
662 - #61	12/15/1998	1	239	5	0.2	44.7	0.3738	0.4423	0.00	7.01
663 - #56	12/10/1998	0	212	5	0.1	48.9	0.3738	0.4423	(0.27)	(14.70)
663 - #57	12/10/1998	2	221	5	0.1	48.9	0.3738	0.4423	0.80	(10.63)
663 - #58	12/10/1998	1	231	5	0.1	48.9	0.3738	0.4423	0.27	(6.10)
664 - #53	12/10/1998	0	220	5	0.1	48.9	0.3738	0.4423	(0.27)	(11.08)

BUILDING	DATE COUNTED	GROSS ALPHA RESULT	GROSS BETA RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)
664 - #54	12/10/1998	1	198	5	0.1	48.9	0.3738	0.4423	0.27	(21.03)
664 - #55	12/10/1998	2	221	5	0.1	48.9	0.3738	0.4423	0.80	(10.63)
665 - #1	12/10/1998	0	212	5	0.1	48.9	0.3738	0.4423	(0.27)	(14.70)
665 - #2	12/10/1998	2	242	5	0.1	48.9	0.3738	0.4423	0.80	(1.13)
665 - #3	12/10/1998	1	236	5	0.1	48.9	0.3738	0.4423	0.27	(3.84)
665 - #4	12/10/1998	2	212	5	0.1	48.9	0.3738	0.4423	0.80	(14.70)
665 - #5	12/10/1998	0	220	5	0.1	48.9	0.3738	0.4423	(0.27)	(11.08)
665 - #6	12/10/1998	0	208	5	0.1	48.9	0.3738	0.4423	(0.27)	(16.50)
665 - #7	12/10/1998	1	228	5	0.1	48.9	0.3738	0.4423	0.27	(7.46)
666 - #50	12/10/1998	0	201	5	0.1	48.9	0.3738	0.4423	(0.27)	(19.67)
666 - #51	12/10/1998	2	212	5	0.1	48.9	0.3738	0.4423	0.80	(14.70)
666 - #52	12/10/1998	1	219	5	0.1	48.9	0.3738	0.4423	0.27	(11.53)
667 - #47	12/10/1998	1	231	5	0.1	48.9	0.3738	0.4423	0.27	(6.10)
667 - #48	12/10/1998	1	209	5	0.1	48.9	0.3738	0.4423	0.27	(16.05)
667 - #49	12/10/1998	0	221	5	0.1	48.9	0.3738	0.4423	(0.27)	(10.63)
668 - #41	12/10/1998	0	219	5	0.1	48.9	0.3738	0.4423	(0.27)	(11.53)
668 - #42	12/10/1998	0	244	5	0.1	48.9	0.3738	0.4423	(0.27)	(0.23)
668 - #43	12/10/1998	1	229	5	0.1	48.9	0.3738	0.4423	0.27	(7.01)
669 - #44	12/10/1998	0	251	5	0.1	48.9	0.3738	0.4423	(0.27)	2.94
669 - #45	12/10/1998	1	226	5	0.1	48.9	0.3738	0.4423	0.27	(8.37)
669 - #46	12/10/1998	3	235	5	0.1	48.9	0.3738	0.4423	1.34	(4.30)
670 - #8	12/10/1998	0	204	5	0.1	48.9	0.3738	0.4423	(0.27)	(18.31)
670 - #9	12/10/1998	0	211	5	0.1	48.9	0.3738	0.4423	(0.27)	(15.15)
670 - #10	12/10/1998	0	237	5	0.1	48.9	0.3738	0.4423	(0.27)	(3.39)
670 - #11	12/10/1998	2	208	5	0.1	48.9	0.3738	0.4423	0.80	(16.50)
670 - #12	12/10/1998	0	232	5	0.1	48.9	0.3738	0.4423	(0.27)	(5.65)
670 - #13	12/10/1998	0	229	5	0.1	48.9	0.3738	0.4423	(0.27)	(7.01)
								Average	0.12	(3.12)

OLD STORAGE BUNKERS (Housings)

19-Mar-99

SWIPE SAMPLE RESULTS

BUILDING	DATE COUNTED	GROSS ALPHA RESULT	GROSS BETA RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)
652	2/1/1999	0	232	4	0.6	58.5	0.3738	0.4423	(1.61)	(1.13)
653	2/1/1999	0	243	4	0.6	58.5	0.3738	0.4423	(1.61)	5.09
654	2/1/1999	1	225	4	0.6	58.5	0.3738	0.4423	(0.94)	(5.09)
655	2/1/1999	0	237	4	0.6	58.5	0.3738	0.4423	(1.61)	1.70
655	12/19/1998	11	328	4	0.4	82.4	0.3738	0.4423	6.29	(0.90)
656	2/1/1999	1	220	4	0.6	58.5	0.3738	0.4423	(0.94)	(7.91)
657	2/1/1999	2	216	4	0.6	58.5	0.3738	0.4423	(0.27)	(10.17)
657	12/19/1998	2	312	4	0.4	82.4	0.3738	0.4423	0.27	(9.95)
658	2/1/1999	1	206	4	0.6	58.5	0.3738	0.4423	(0.94)	(15.83)
659	2/1/1999	0	195	4	0.6	58.5	0.3738	0.4423	(1.61)	(22.04)
660	2/1/1999	2	235	4	0.6	58.5	0.3738	0.4423	(0.27)	0.57
661	2/1/1999	0	232	4	0.6	58.5	0.3738	0.4423	(1.61)	(1.13)
662	2/1/1999	2	209	4	0.6	58.5	0.3738	0.4423	(0.27)	(14.13)
663	2/1/1999	0	202	4	0.6	58.5	0.3738	0.4423	(1.61)	(18.09)
664	2/1/1999	0	220	4	0.6	58.5	0.3738	0.4423	(1.61)	(7.91)
665	2/1/1999	1	223	4	0.6	58.5	0.3738	0.4423	(0.94)	(6.22)
666	2/1/1999	5	210	4	0.6	58.5	0.3738	0.4423	1.74	(13.57)
667	2/1/1999	0	211	4	0.6	58.5	0.3738	0.4423	(1.61)	(13.00)
668	2/1/1999	1	215	4	0.6	58.5	0.3738	0.4423	(0.94)	(10.74)
669	2/1/1999	0	221	4	0.6	58.5	0.3738	0.4423	(1.61)	(7.35)
670	2/1/1999	0	243	4	0.6	58.5	0.3738	0.4423	(1.61)	5.09
								Average	(0.63)	(7.27)

b Two smears taken on locations with elevated total alpha measurements.

NEW STORAGE BUNKERS

19-Mar-99

SWIPE SAMPLE RESULTS

BUILDING	DATE COUNTED	GROSS ALPHA RESULT	GROSS BETA RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm2)	NET BETA RESULT (dpm/100cm2)
760 - #1	12/8/1998	0	189	5	0.2	46.2	0.3738	0.4423	(0.54)	(18.99)
760 - #2	12/8/1998	0	230	5	0.2	46.2	0.3738	0.4423	(0.54)	(0.45)
760 - #3	12/8/1998	1	204	5	0.2	46.2	0.3738	0.4423	0.00	(12.21)
761 - #4	12/8/1998	0	231	5	0.2	46.2	0.3738	0.4423	(0.54)	0.00
761 - #5	12/8/1998	0	227	5	0.2	46.2	0.3738	0.4423	(0.54)	(1.81)
761 - #6	12/8/1998	0	232	5	0.2	46.2	0.3738	0.4423	(0.54)	0.45
762 - #7	12/8/1998	0	209	5	0.2	46.2	0.3738	0.4423	(0.54)	(9.95)
762 - #8	12/8/1998	1	232	5	0.2	46.2	0.3738	0.4423	0.00	0.45
762 - #9	12/8/1998	1	235	5	0.2	46.2	0.3738	0.4423	0.00	1.81
763 - #10	12/8/1998	1	219	5	0.2	46.2	0.3738	0.4423	0.00	(5.43)
763 - #11	12/8/1998	2	217	5	0.2	46.2	0.3738	0.4423	0.54	(6.33)
763 - #12	12/8/1998	0	224	5	0.2	46.2	0.3738	0.4423	(0.54)	(3.17)
764 - #13	12/8/1998	0	205	5	0.2	46.2	0.3738	0.4423	(0.54)	(11.76)
764 - #14	12/8/1998	1	236	5	0.2	46.2	0.3738	0.4423	0.00	2.26
764 - #15	12/8/1998	0	188	5	0.2	46.2	0.3738	0.4423	(0.54)	(19.44)
765 - #16	12/8/1998	1	222	5	0.2	46.2	0.3738	0.4423	0.00	(4.07)
765 - #17	12/8/1998	0	218	5	0.2	46.2	0.3738	0.4423	(0.54)	(5.88)
765 - #18	12/8/1998	2	252	5	0.2	46.2	0.3738	0.4423	0.54	9.50
766 - #19	12/8/1998	1	237	5	0.2	46.2	0.3738	0.4423	0.00	2.71
766 - #22	12/8/1998	1	220	5	0.2	46.2	0.3738	0.4423	0.00	(4.97)
766 - #20	12/8/1998	1	224	5	0.2	46.2	0.3738	0.4423	0.00	(3.17)
767 - #21	12/8/1998	2	204	5	0.2	46.2	0.3738	0.4423	0.54	(12.21)
767 - #23	12/8/1998	0	241	5	0.2	46.2	0.3738	0.4423	(0.54)	4.52
767 - #24	12/8/1998	0	193	5	0.2	46.2	0.3738	0.4423	(0.54)	(17.18)
768 - #25	12/8/1998	0	203	5	0.2	46.2	0.3738	0.4423	(0.54)	(12.66)
768 - #26	12/8/1998	0	189	5	0.2	46.2	0.3738	0.4423	(0.54)	(18.99)
768 - #27	12/8/1998	2	215	5	0.2	46.2	0.3738	0.4423	0.54	(7.23)
769 - #28	12/8/1998	1	240	5	0.2	46.2	0.3738	0.4423	0.00	4.07
769 - #29	12/8/1998	1	202	5	0.2	46.2	0.3738	0.4423	0.00	(13.11)
769 - #30	12/8/1998	0	231	5	0.2	46.2	0.3738	0.4423	(0.54)	0.00
770 - #31	12/9/1998	1	193	4	0	40.3	0.3738	0.4423	0.67	17.97
770 - #32	12/9/1998	0	198	4	0	40.3	0.3738	0.4423	0.00	20.80
770 - #33	12/9/1998	0	183	4	0	40.3	0.3738	0.4423	0.00	12.32
771 - #34	12/9/1998	0	170	4	0	40.3	0.3738	0.4423	0.00	4.97
771 - #35	12/9/1998	1	170	4	0	40.3	0.3738	0.4423	0.67	4.97
771 - #36	12/9/1998	1	189	4	0	40.3	0.3738	0.4423	0.67	15.71
772 - #37	12/9/1998	1	166	4	0	40.3	0.3738	0.4423	0.67	2.71
772 - #38	12/9/1998	1	195	4	0	40.3	0.3738	0.4423	0.67	19.10
772 - #39	12/9/1998	1	195	4	0	40.3	0.3738	0.4423	0.67	19.10
773 - #40	12/9/1998	0	173	4	0	40.3	0.3738	0.4423	0.00	6.67

BUILDING	DATE COUNTED	GROSS ALPHA RESULT	GROSS BETA RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm2)	NET BETA RESULT (dpm/100cm2)
773 - #41	12/9/1998	0	173	4	0	40.3	0.3738	0.4423	0.00	6.67
773 - #42	12/9/1998	2	185	4	0	40.3	0.3738	0.4423	1.34	13.45
774 - #43	12/9/1998	1	178	4	0	40.3	0.3738	0.4423	0.67	9.50
774 - #44	12/9/1998	2	175	4	0	40.3	0.3738	0.4423	1.34	7.80
774 - #45	12/9/1998	0	166	4	0	40.3	0.3738	0.4423	0.00	2.71
775 - #46	12/9/1998	0	179	4	0	40.3	0.3738	0.4423	0.00	10.06
775 - #47	12/9/1998	0	202	4	0	40.3	0.3738	0.4423	0.00	23.06
775 - #48	12/9/1998	1	181	4	0	40.3	0.3738	0.4423	0.67	11.19
776 - #49	12/9/1998	0	174	4	0	40.3	0.3738	0.4423	0.00	7.23
776 - #50	12/9/1998	0	160	4	0	40.3	0.3738	0.4423	0.00	(0.68)
776 - #51	12/9/1998	1	155	4	0	40.3	0.3738	0.4423	0.67	(3.50)
777 - #52	12/9/1998	1	187	4	0	40.3	0.3738	0.4423	0.67	14.58
777 - #53	12/9/1998	0	144	4	0	40.3	0.3738	0.4423	0.00	(9.72)
777 - #54	12/9/1998	0	166	4	0	40.3	0.3738	0.4423	0.00	2.71
778 - #55	12/9/1998	1	180	4	0	40.3	0.3738	0.4423	0.67	10.63
778 - #56	12/9/1998	0	178	4	0	40.3	0.3738	0.4423	0.00	9.50
778 - #57	12/9/1998	0	180	4	0	40.3	0.3738	0.4423	0.00	10.63
779 - #58	12/9/1998	1	186	4	0	40.3	0.3738	0.4423	0.67	14.02
779 - #59	12/9/1998	0	211	4	0	40.3	0.3738	0.4423	0.00	28.15
779 - #60	12/9/1998	0	170	4	0	40.3	0.3738	0.4423	0.00	4.97
780 - #61	12/9/1998	0	193	4	0	40.3	0.3738	0.4423	0.00	17.97
780 - #62	12/9/1998	3	184	4	0	40.3	0.3738	0.4423	2.01	12.89
780 - #63	12/9/1998	3	158	4	0	40.3	0.3738	0.4423	2.01	(1.81)
781 - #64	12/9/1998	0	189	4	0	40.3	0.3738	0.4423	0.00	15.71
781 - #65	12/9/1998	0	182	4	0	40.3	0.3738	0.4423	0.00	11.76
781 - #66	12/9/1998	0	153	4	0	40.3	0.3738	0.4423	0.00	(4.63)
782 - #67	12/9/1998	0	166	4	0	40.3	0.3738	0.4423	0.00	2.71
782 - #68	12/9/1998	0	175	4	0	40.3	0.3738	0.4423	0.00	7.80
782 - #69	12/9/1998	0	175	4	0	40.3	0.3738	0.4423	0.00	7.80
783 - #70	12/9/1998	0	163	4	0	40.3	0.3738	0.4423	0.00	1.02
783 - #71	12/9/1998	0	184	4	0	40.3	0.3738	0.4423	0.00	12.89
783 - #72	12/9/1998	0	199	4	0	40.3	0.3738	0.4423	0.00	21.37
784 - #73	12/9/1998	1	164	4	0	40.3	0.3738	0.4423	0.67	1.58
784 - #74	12/9/1998	0	157	4	0	40.3	0.3738	0.4423	0.00	(2.37)
784 - #75	12/9/1998	0	200	4	0	40.3	0.3738	0.4423	0.00	21.93
785 - #76	12/9/1998	0	173	4	0	40.3	0.3738	0.4423	0.00	6.67
785 - #77	12/9/1998	1	173	4	0	40.3	0.3738	0.4423	0.67	6.67
785 - #78	12/9/1998	0	153	4	0	40.3	0.3738	0.4423	0.00	(4.63)
786 - #35	12/9/1998	1	199	4	0	40.3	0.3738	0.4423	0.67	21.37
786 - #36	12/9/1998	0	182	4	0	40.3	0.3738	0.4423	0.00	11.76
786 - #37	12/9/1998	0	185	4	0	40.3	0.3738	0.4423	0.00	13.45
787 - #32	12/9/1998	0	187	4	0	40.3	0.3738	0.4423	0.00	14.58
787 - #33	12/9/1998	0	162	4	0	40.3	0.3738	0.4423	0.00	0.45
787 - #34	12/9/1998	0	184	4	0	40.3	0.3738	0.4423	0.00	12.89
788 - #77	12/7/1998	1	216	5	0.1	46.1	0.3738	0.4423	0.27	(6.56)
788 - #76	12/7/1998	0	234	5	0.1	46.1	0.3738	0.4423	(0.27)	1.58
788 - #75	12/7/1998	1	209	5	0.1	46.1	0.3738	0.4423	0.27	(9.72)

BUILDING	DATE COUNTED	GROSS ALPHA RESULT	GROSS BETA RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm2)	NET BETA RESULT (dpm/100cm2)
788 - #74	12/7/1998	0	207	5	0.1	46.1	0.3738	0.4423	(0.27)	(10.63)
788 - #90	12/7/1998	0	222	5	0.1	46.1	0.3738	0.4423	(0.27)	(3.84)
789 - #78	12/7/1998	0	215	5	0.1	46.1	0.3738	0.4423	(0.27)	(7.01)
789 - #79	12/7/1998	1	213	5	0.1	46.1	0.3738	0.4423	0.27	(7.91)
789 - #80	12/7/1998	1	212	5	0.1	46.1	0.3738	0.4423	0.27	(8.37)
789 - #81	12/7/1998	0	212	5	0.1	46.1	0.3738	0.4423	(0.27)	(8.37)
789 - #82	12/7/1998	0	213	5	0.1	46.1	0.3738	0.4423	(0.27)	(7.91)
790 - #83	12/7/1998	0	234	5	0.1	46.1	0.3738	0.4423	(0.27)	1.58
790 - #84	12/7/1998	0	207	5	0.1	46.1	0.3738	0.4423	(0.27)	(10.63)
790 - #85	12/7/1998	2	225	5	0.1	46.1	0.3738	0.4423	0.80	(2.49)
790 - #86	12/7/1998	0	215	5	0.1	46.1	0.3738	0.4423	(0.27)	(7.01)
790 - #87	12/7/1998	1	197	5	0.1	46.1	0.3738	0.4423	0.27	(15.15)
791 - #88	12/7/1998	1	215	5	0.1	46.1	0.3738	0.4423	0.27	(7.01)
791 - #89	12/7/1998	3	214	5	0.1	46.1	0.3738	0.4423	1.34	(7.46)
791 - #93	12/7/1998	1	203	5	0.1	46.1	0.3738	0.4423	0.27	(12.43)
791 - #91	12/7/1998	0	221	5	0.1	46.1	0.3738	0.4423	(0.27)	(4.30)
791 - #92	12/7/1998	2	193	5	0.1	46.1	0.3738	0.4423	0.80	(16.96)
791 - #94	12/7/1998	0	201	5	0.1	46.1	0.3738	0.4423	(0.27)	(13.34)
792 - #95	12/7/1998	3	226	5	0.1	46.1	0.3738	0.4423	1.34	(2.03)
792 - #96	12/7/1998	1	213	5	0.1	46.1	0.3738	0.4423	0.27	(7.91)
792 - #97	12/7/1998	2	188	5	0.1	46.1	0.3738	0.4423	0.80	(19.22)
792 - #98	12/7/1998	1	208	5	0.1	46.1	0.3738	0.4423	0.27	(10.17)
792 - #99	12/7/1998	1	220	5	0.1	46.1	0.3738	0.4423	0.27	(4.75)
793 - #100	12/7/1998	0	203	5	0.1	46.1	0.3738	0.4423	(0.27)	(12.43)
793 - #24	12/7/1998	1	227	5	0.1	46.1	0.3738	0.4423	0.27	(1.58)
793 - #25	12/7/1998	1	214	5	0.1	46.1	0.3738	0.4423	0.27	(7.46)
793 - #26	12/7/1998	1	196	5	0.1	46.1	0.3738	0.4423	0.27	(15.60)
793 - #27	12/7/1998	1	224	5	0.1	46.1	0.3738	0.4423	0.27	(2.94)
794 - #29	12/9/1998	1	171	4	0	40.3	0.3738	0.4423	0.67	5.54
794 - #30	12/9/1998	0	167	4	0	40.3	0.3738	0.4423	0.00	3.28
794 - #31	12/9/1998	0	197	4	0	40.3	0.3738	0.4423	0.00	20.24
795 - #26	12/9/1998	0	188	4	0	40.3	0.3738	0.4423	0.00	15.15
795 - #27	12/9/1998	1	147	4	0	40.3	0.3738	0.4423	0.67	(8.03)
795 - #28	12/9/1998	1	163	4	0	40.3	0.3738	0.4423	0.67	1.02
796 - #23	12/9/1998	0	187	4	0	40.3	0.3738	0.4423	0.00	14.58
796 - #24	12/9/1998	1	188	4	0	40.3	0.3738	0.4423	0.67	15.15
796 - #25	12/9/1998	1	176	4	0	40.3	0.3738	0.4423	0.67	8.37
797 - #14	12/9/1998	2	159	4	0	40.3	0.3738	0.4423	1.34	(1.24)
797 - #15	12/9/1998	2	176	4	0	40.3	0.3738	0.4423	1.34	8.37
797 - #16	12/9/1998	0	182	4	0	40.3	0.3738	0.4423	0.00	11.76
798 - #20	12/9/1998	1	181	4	0	40.3	0.3738	0.4423	0.67	11.19
798 - #21	12/9/1998	0	189	4	0	40.3	0.3738	0.4423	0.00	15.71
798 - #22	12/9/1998	1	157	4	0	40.3	0.3738	0.4423	0.67	(2.37)
799 - #17	12/9/1998	0	178	4	0	40.3	0.3738	0.4423	0.00	9.50
799 - #18	12/9/1998	1	188	4	0	40.3	0.3738	0.4423	0.67	15.15
799 - #19	12/9/1998	1	181	4	0	40.3	0.3738	0.4423	0.67	11.19
								Average Result =	0.19	1.88

Appendix D

Direct Survey Data Tables

Building 601
Building 617
Building 626
Old Storage Bunkers (Interior)
Old Storage Bunkers (Housings)
Measurement Differences between Housing Sample Locations with Smooth, Discolored Surfaces and those with Rough, Weathered Surfaces
New Storage Bunkers

BUILDING 601

DIRECT MEASUREMENT RESULTS

LOCATION	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	GROSS TRITIUM	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFF	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM RESULT (dpm/100cm^2)
Room 11 - #37	12/18/1998	1	122	120	1	1	94	210	0.1985	0.3033	0.3	0.00	73.27	(300.00)
Room 11 - #38	12/18/1998	0	121	96	1	1	94	210	0.1985	0.3033	0.3	(4.00)	70.65	(380.00)
Room 10 - #39	12/18/1998	0	130	154	1	1	94	210	0.1985	0.3033	0.3	(4.00)	94.20	(186.67)
Room 10 - #40	12/18/1998	1	133	155	1	1	94	210	0.1985	0.3033	0.3	0.00	102.05	(183.33)
Room 9 - #41	12/18/1998	0	110	197	1	1	94	210	0.1985	0.3033	0.3	(4.00)	41.87	(43.33)
Room 9 - #42	12/18/1998	1	139	185	1	1	94	210	0.1985	0.3033	0.3	0.00	117.75	(83.33)
Room 14 - #43	12/18/1998	0	128	106	1	1	94	210	0.1985	0.3033	0.3	(4.00)	88.97	(346.67)
Room 14 - #44	12/18/1998	0	125	148	1	1	94	210	0.1985	0.3033	0.3	(4.00)	81.12	(206.67)
Room 15 - #45	12/18/1998	0	140	117	1	1	94	210	0.1985	0.3033	0.3	(4.00)	120.37	(310.00)
Room 15 - #46	12/18/1998	0	125	95	1	1	94	210	0.1985	0.3033	0.3	(4.00)	81.12	(383.33)
Room 17 - #47	12/18/1998	2	132	191	1	1	94	210	0.1985	0.3033	0.3	4.00	99.44	(63.33)
Room 17 - #48	12/18/1998	2	123	127	1	1	94	210	0.1985	0.3033	0.3	4.00	75.88	(276.67)
Room 16 - #49	12/18/1998	2	97	144	1	1	94	210	0.1985	0.3033	0.3	4.00	7.85	(220.00)
Room 16 - #50	12/18/1998	1	144	154	1	1	94	210	0.1985	0.3033	0.3	0.00	130.84	(186.67)
Room 16 - #51	12/18/1998	1	148	170	1	1	94	210	0.1985	0.3033	0.3	0.00	141.30	(133.33)
Room 16 - #52	12/18/1998	0	146	189	1	1	94	210	0.1985	0.3033	0.3	(4.00)	136.07	(70.00)
Room 16 - #53	12/18/1998	0	137	181	1	1	94	210	0.1985	0.3033	0.3	(4.00)	112.52	(96.67)
Room 16 - #54	12/18/1998	2	142	143	1	1	94	210	0.1985	0.3033	0.3	4.00	125.60	(223.33)
Room 16 - #55	12/18/1998	1	159	175	1	1	94	210	0.1985	0.3033	0.3	0.00	170.09	(116.67)
Room 16 - #56	12/18/1998	2	152	227	1	1	94	210	0.1985	0.3033	0.3	4.00	151.77	56.67
Room 13 - #57	12/18/1998	1	129	166	1	1	94	210	0.1985	0.3033	0.3	0.00	91.59	(146.67)
Room 13 - #58	12/18/1998	1	136	98	1	1	94	210	0.1985	0.3033	0.3	0.00	109.90	(373.33)
Room 25 - #28	12/18/1998	4	132	216	1	1	94	210	0.1985	0.3033	0.3	11.99	99.44	20.00
Room 25 - #29	12/18/1998	1	143	179	1	1	94	210	0.1985	0.3033	0.3	0.00	128.22	(103.33)
Room 25 - #30	12/18/1998	1	152	256	1	1	94	210	0.1985	0.3033	0.3	0.00	151.77	153.33
Room 25 - #31	12/18/1998	5	110	169	1	1	94	210	0.1985	0.3033	0.3	15.99	41.87	(136.67)
Room 25 - #32	12/18/1998	0	140	231	1	1	94	210	0.1985	0.3033	0.3	(4.00)	120.37	70.00
Room 25 - #33	12/18/1998	2	115	158	1	1	94	210	0.1985	0.3033	0.3	4.00	54.95	(173.33)
Room 25 - #34	12/18/1998	2	137	175	1	1	94	210	0.1985	0.3033	0.3	4.00	112.52	(116.67)
Room 25 - #35	12/18/1998	1	170	262	1	1	94	210	0.1985	0.3033	0.3	0.00	198.87	173.33
Room 25 - #36	12/18/1998	1	131	243	1	1	94	210	0.1985	0.3033	0.3	0.00	96.82	110.00
Room 25 - #37	12/18/1998	4	131	146	1	1	94	210	0.1985	0.3033	0.3	11.99	96.82	(213.33)
Room 25 - #38	12/18/1998	3	140	237	1	1	94	210	0.1985	0.3033	0.3	8.00	120.37	90.00
Room 25 - #39	12/18/1998	0	162	225	1	1	94	210	0.1985	0.3033	0.3	(4.00)	177.94	50.00
Room 25 - #40	12/18/1998	5	117	171	1	1	94	210	0.1985	0.3033	0.3	15.99	60.18	(130.00)
Room 25 - #41	12/18/1998	1	162	150	1	1	94	210	0.1985	0.3033	0.3	0.00	177.94	(200.00)
Room 25 - #42	12/18/1998	NM	NM	NM	1	1	94	210	0.1985	0.3033	0.3	NM	NM	NM
Room 5 - #22	12/18/1998	1	128	103	1	1	94	210	0.1985	0.3033	0.3	0.00	88.97	(356.67)
Room 5 - #23	12/18/1998	1	131	119	1	1	94	210	0.1985	0.3033	0.3	0.00	96.82	(303.33)
Room 5 - #24	12/18/1998	1	129	121	1	1	94	210	0.1985	0.3033	0.3	0.00	91.59	(296.67)
Room 2 - #25	12/18/1998	0	122	62	1	1	94	210	0.1985	0.3033	0.3	(4.00)	73.27	(493.33)

LOCATION	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	GROSS TRITIUM	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFF	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM RESULT (dpm/100cm^2)
Room 2 - #26	12/18/1998	3	128	61	1	1	94	210	0.1985	0.3033	0.3	8.00	88.97	(496.67)
Room 4 - #27	12/18/1998	1	117	133	1	1	94	210	0.1985	0.3033	0.3	0.00	60.18	(256.67)
Room 3 - #28	12/18/1998	2	293	200	1	1	94	210	0.1985	0.3033	0.3	4.00	520.73	(33.33)
Room 3 - #29	12/18/1998	5	295	247	1	1	94	210	0.1985	0.3033	0.3	15.99	525.96	123.33
Room 6 - #30	12/18/1998	2	137	127	1	1	94	210	0.1985	0.3033	0.3	4.00	112.52	(276.67)
Room 6 - #31	12/18/1998	0	134	104	1	1	94	210	0.1985	0.3033	0.3	(4.00)	104.67	(353.33)
Room 7 - #32	12/18/1998	0	122	106	1	1	94	210	0.1985	0.3033	0.3	(4.00)	73.27	(346.67)
Room 7 - #33	12/18/1998	0	114	120	1	1	94	210	0.1985	0.3033	0.3	(4.00)	52.33	(300.00)
Room 8 - #34	12/18/1998	1	112	116	1	1	94	210	0.1985	0.3033	0.3	0.00	47.10	(313.33)
Room 12 - #35	12/18/1998	2	109	89	1	1	94	210	0.1985	0.3033	0.3	4.00	39.25	(403.33)
Room 12 - #36	12/18/1998	2	137	93	1	1	94	210	0.1985	0.3033	0.3	4.00	112.52	(390.00)
Room 19 - #59	12/19/1998	2	113	127	1	0	94	202	0.1985	0.3033	0.3	8.00	49.72	(250.00)
Room 19 - #60	12/19/1998	0	126	194	1	0	94	202	0.1985	0.3033	0.3	0.00	83.73	(26.67)
Room 19 - #61	12/19/1998	2	138	75	1	0	94	202	0.1985	0.3033	0.3	8.00	115.14	(423.33)
Room 19 - #62	12/19/1998	0	136	209	1	0	94	202	0.1985	0.3033	0.3	0.00	109.90	23.33
Room 19 - #63	12/19/1998	2	94	149	1	0	94	202	0.1985	0.3033	0.3	8.00	0.00	(176.67)
Room 20 - #64	12/19/1998	0	105	103	1	0	94	202	0.1985	0.3033	0.3	0.00	28.78	(330.00)
Room 20 - #65	12/19/1998	0	127	65	1	0	94	202	0.1985	0.3033	0.3	0.00	86.35	(456.67)
Room 20 - #66	12/19/1998	1	124	106	1	0	94	202	0.1985	0.3033	0.3	4.00	78.50	(320.00)
Room 20 - #67	12/19/1998	3	107	107	1	0	94	202	0.1985	0.3033	0.3	11.99	34.02	(316.67)
Room 21 - #68	12/19/1998	0	136	145	1	0	94	202	0.1985	0.3033	0.3	0.00	109.90	(190.00)
Room 21 - #69	12/19/1998	1	117	85	1	0	94	202	0.1985	0.3033	0.3	4.00	60.18	(390.00)
Room 21 - #70	12/19/1998	0	119	48	1	0	94	202	0.1985	0.3033	0.3	0.00	65.42	(513.33)
Room 21 - #71	12/19/1998	0	114	31	1	0	94	202	0.1985	0.3033	0.3	0.00	52.33	(570.00)
Room 22 - #72	12/19/1998	0	129	209	1	0	94	202	0.1985	0.3033	0.3	0.00	91.59	23.33
Room 22 - #73	12/19/1998	1	114	199	1	0	94	202	0.1985	0.3033	0.3	4.00	52.33	(10.00)
Room 22 - #74	12/19/1998	0	113	142	1	0	94	202	0.1985	0.3033	0.3	0.00	49.72	(200.00)
Room 24 - #78	12/19/1998	0	129	155	1	0	94	202	0.1985	0.3033	0.3	0.00	91.59	(156.67)
Room 24 - #79	12/19/1998	0	129	181	1	0	94	202	0.1985	0.3033	0.3	0.00	91.59	(70.00)
Room 24 - #80	12/19/1998	0	136	178	1	0	94	202	0.1985	0.3033	0.3	0.00	109.90	(80.00)
Room 24 - #81	12/19/1998	2	135	192	1	0	94	202	0.1985	0.3033	0.3	8.00	107.29	(33.33)
											Average	1.41	116.67	(179.93)

NM = Not measured

BUILDING 617

DIRECT MEASUREMENT RESULTS

LOCATION	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	TRITIUM RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFF	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM (dpm/100cm^2)
Room 7 - #77	12/19/1998	3	146	497	1	0	99	202	0.1985	0.3033	0.3	11.99	122.99	983.33
Room 7 - #78	12/19/1998	0	153	482	1	0	99	202	0.3738	0.4423	0.3	0.00	96.90	933.33
Room 7 - #79	12/19/1998	1	147	399	1	0	99	202	0.3738	0.4423	0.3	2.12	86.13	656.67
Room 7 - #80	12/19/1998	0	146	491	1	0	99	202	0.3738	0.4423	0.3	0.00	84.34	963.33
Room 7 - #81	12/19/1998	1	111	365	1	0	99	202	0.3738	0.4423	0.3	2.12	21.53	543.33
Room 7 - #82	12/19/1998	1	127	428	1	0	99	202	0.3738	0.4423	0.3	2.12	50.24	753.33
Room 7 - #83	12/19/1998	1	157	559	1	0	99	202	0.3738	0.4423	0.3	2.12	104.07	1190.00
Room 7 - #84	12/19/1998	2	152	432	1	0	99	202	0.3738	0.4423	0.3	4.25	95.10	766.67
Room 7 - #85	12/19/1998	0	155	486	1	0	99	202	0.3738	0.4423	0.3	0.00	100.48	946.67
Room 7 - #86	12/19/1998	0	156	411	1	0	99	202	0.3738	0.4423	0.3	0.00	102.28	696.67
Room 7 - #87	12/19/1998	2	161	545	1	0	99	202	0.3738	0.4423	0.3	4.25	111.25	1143.33
Room 7 - #88	12/19/1998	0	143	476	1	0	99	202	0.3738	0.4423	0.3	0.00	78.95	913.33
Room 7 - #89	12/19/1998	1	159	413	1	0	99	202	0.3738	0.4423	0.3	2.12	107.66	703.33
Room 7 - #90	12/19/1998	0	140	193	1	0	99	202	0.3738	0.4423	0.3	0.00	73.57	(30.00)
Room 7 - #91	12/19/1998	2	116	635	1	0	99	202	0.3738	0.4423	0.3	4.25	30.50	1443.33
Room 7 - #92	12/19/1998	3	131	412	1	0	99	202	0.3738	0.4423	0.3	6.37	57.42	700.00
Room 7 - #93	12/19/1998	0	161	161	1	0	99	202	0.3738	0.4423	0.3	0.00	111.25	(136.67)
Room 7 - #94	12/19/1998	0	137	409	1	0	99	202	0.3738	0.4423	0.3	0.00	68.19	690.00
Room 7 - #95	12/19/1998	4	154	497	1	0	99	202	0.3738	0.4423	0.3	8.49	98.69	983.33
Room 7 - #96	12/19/1998	2	146	709	1	0	99	202	0.3738	0.4423	0.3	4.25	84.34	1690.00
Room 7 - #97	12/19/1998	6	128	199	1	0	99	202	0.3738	0.4423	0.3	12.74	52.04	(10.00)
Room 7 - #98	12/19/1998	2	157	470	1	0	99	202	0.3738	0.4423	0.3	4.25	104.07	893.33
Room 7 - #99	12/19/1998	1	143	480	1	0	99	202	0.3738	0.4423	0.3	2.12	78.95	926.67
Room 7 - #100	12/19/1998	1	146	275	1	0	99	202	0.3738	0.4423	0.3	2.12	84.34	243.33
Room 7 - #43	12/19/1998	0	129	309	1	0	99	202	0.3738	0.4423	0.3	0.00	53.83	356.67
Room 7 - #44	12/19/1998	5	154	396	1	0	99	202	0.3738	0.4423	0.3	10.62	98.69	646.67
Room 7 - #45	12/19/1998	2	141	203	1	0	99	202	0.3738	0.4423	0.3	4.25	75.36	3.33
Room 7 - #46	12/19/1998	3	153	314	1	0	99	202	0.3738	0.4423	0.3	6.37	96.90	373.33
Room 7 - #47	12/19/1998	0	138	262	1	0	99	202	0.3738	0.4423	0.3	0.00	69.98	200.00
Room 7 - #48	12/19/1998	1	154	239	1	0	99	202	0.3738	0.4423	0.3	2.12	98.69	123.33
Room 7 - #49	12/19/1998	1	139	192	1	0	99	202	0.3738	0.4423	0.3	2.12	71.77	(33.33)
Room 7 - #50	12/19/1998	1	131	315	1	0	99	202	0.3738	0.4423	0.3	2.12	57.42	376.67
Room 7 - #51	12/19/1998	1	136	342	1	0	99	202	0.3738	0.4423	0.3	2.12	66.39	466.67
Room 7 - #52	12/19/1998	3	120	414	1	0	99	202	0.3738	0.4423	0.3	6.37	37.68	706.67
Room 7 - #53	12/19/1998	0	123	257	1	0	99	202	0.3738	0.4423	0.3	0.00	43.06	183.33
Room 8 - #54	12/19/1998	2	120	275	1	0	99	202	0.3738	0.4423	0.3	4.25	37.68	243.33
Room 8 - #55	12/19/1998	0	147	431	1	0	99	202	0.3738	0.4423	0.3	0.00	86.13	763.33
Room 8 - #56	12/19/1998	3	122	286	1	0	99	202	0.3738	0.4423	0.3	6.37	41.27	280.00
Room 8 - #57	12/19/1998	3	110	262	1	0	99	202	0.3738	0.4423	0.3	6.37	19.74	200.00
Room 8 - #58	12/19/1998	0	134	302	1	0	99	202	0.3738	0.4423	0.3	0.00	62.80	333.33
Room 1 - #59	12/19/1998	0	129	669	1	0	99	202	0.3738	0.4423	0.3	0.00	53.83	1556.67
Room 1 - #60	12/19/1998	0	117	160	1	0	99	202	0.3738	0.4423	0.3	0.00	32.30	(140.00)
Room 1 - #61	12/19/1998	0	121	430	1	0	99	202	0.3738	0.4423	0.3	0.00	39.48	760.00

LOCATION	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	TRITIUM RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFF	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM (dpm/100cm^2)
Room 9 - #62	12/19/1998	2	131	621	1	0	99	202	0.3738	0.4423	0.3	4.25	57.42	1396.67
Room 9 - #63	12/19/1998	0	114	327	1	0	99	202	0.3738	0.4423	0.3	0.00	26.92	416.67
Room 9 - #64	12/19/1998	1	99	313	1	0	99	202	0.3738	0.4423	0.3	2.12	0.00	370.00
Room 9 - #65	12/19/1998	4	132	250	1	0	99	202	0.3738	0.4423	0.3	8.49	59.21	160.00
Room 9 - #66	12/19/1998	3	152	149	1	0	99	202	0.3738	0.4423	0.3	6.37	95.10	(176.67)
Room 9 - #67	12/19/1998	1	128	348	1	0	99	202	0.3738	0.4423	0.3	2.12	52.04	486.67
Room 9 - #68	12/19/1998	1	132	349	1	0	99	202	0.3738	0.4423	0.3	2.12	59.21	490.00
Room 9 - #69	12/19/1998	3	144	536	1	0	99	202	0.3738	0.4423	0.3	6.37	80.75	1113.33
Room 9 - #70	12/19/1998	2	144	572	1	0	99	202	0.3738	0.4423	0.3	4.25	80.75	1233.33
Room 9 - #71	12/19/1998	3	129	610	1	0	99	202	0.3738	0.4423	0.3	6.37	53.83	1360.00
Room 9 - #72	12/19/1998	3	137	256	1	0	99	202	0.3738	0.4423	0.3	6.37	68.19	180.00
Room Hall - #73	12/19/1998	1	134	1147	1	0	99	202	0.3738	0.4423	0.3	2.12	62.80	3150.00
Room Hall - #98	12/19/1998	3	150	847	1	0	99	202	0.3738	0.4423	0.3	6.37	91.51	2150.00
Room Hall - #99	12/19/1998	1	129	1020	1	0	99	202	0.3738	0.4423	0.3	2.12	53.83	2726.67
Room Hall - #100	12/19/1998	2	155	1055	1	0	99	202	0.3738	0.4423	0.3	4.25	100.48	2843.33
Room Hall - #76	12/19/1998	1	299	1088	1	0	99	202	0.3738	0.4423	0.3	2.12	358.87	2953.33
Room Hall - #77	12/19/1998	2	127	353	1	0	99	202	0.3738	0.4423	0.3	4.25	50.24	503.33
Room 2 - #82	12/19/1998	1	117	288	1	0	99	202	0.3738	0.4423	0.3	2.12	32.30	286.67
Room 2 - #83	12/19/1998	3	123	298	1	0	99	202	0.3738	0.4423	0.3	6.37	43.06	320.00
Room 2 - #84	12/19/1998	2	112	296	1	0	99	202	0.3738	0.4423	0.3	4.25	23.33	313.33
Room 2 - #85	12/19/1998	3	126	938	1	0	99	202	0.3738	0.4423	0.3	6.37	48.45	2453.33
Room 2 - #86	12/19/1998	0	118	787	1	0	99	202	0.3738	0.4423	0.3	0.00	34.09	1950.00
Room 3 - #87	12/19/1998	6	319	723	1	0	99	202	0.3738	0.4423	0.3	12.74	394.76	1736.67
Room 3 - #88	12/19/1998	6	336	665	1	0	99	202	0.3738	0.4423	0.3	12.74	425.27	1543.33
Room 4 - #89	12/19/1998	2	145	256	1	0	99	202	0.3738	0.4423	0.3	4.25	82.54	180.00
Room 4 - #90	12/19/1998	1	124	210	1	0	99	202	0.3738	0.4423	0.3	2.12	44.86	26.67
Room 5 - #91	12/19/1998	2	147	186	1	0	99	202	0.3738	0.4423	0.3	4.25	86.13	(53.33)
Room 5 - #92	12/19/1998	0	137	164	1	0	99	202	0.3738	0.4423	0.3	0.00	68.19	(126.67)
Room 6 - #93	12/19/1998	1	136	217	1	0	99	202	0.3738	0.4423	0.3	2.12	66.39	50.00
Room 6 - #94	12/19/1998	0	156	199	1	0	99	202	0.3738	0.4423	0.3	0.00	102.28	(10.00)
											Average	3.51	81.52	767.31

BUILDING 626

DIRECT MEASUREMENT RESULTS

LOCATION	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	GROSS TRITIUM	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFF	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM RESULT (dpm/100cm^2)
Room 1 - #79	12/17/1998	0	171	239	1	0	146	202	0.3738	0.4423	0.3	0.00	44.86	310.00
Room 1 - #80	12/17/1998	1	187	214	1	0	146	202	0.3738	0.4423	0.3	2.12	73.57	226.67
Room 1 - #81	12/17/1998	2	177	237	1	0	146	202	0.3738	0.4423	0.3	4.25	55.63	303.33
Room 1 - #82	12/17/1998	1	187	231	1	0	146	202	0.3738	0.4423	0.3	2.12	73.57	283.33
Room 1 - #83	12/17/1998	0	183	212	1	0	146	202	0.3738	0.4423	0.3	0.00	66.39	220.00
Room 1 - #84	12/17/1998	0	146	232	1	0	146	202	0.3738	0.4423	0.3	0.00	0.00	286.67
Room 1 - #85	12/17/1998	0	162	201	1	0	146	202	0.3738	0.4423	0.3	0.00	28.71	183.33
Room 1 - #86	12/17/1998	0	166	223	1	0	146	202	0.3738	0.4423	0.3	0.00	35.89	256.67
Room 2 - #87	12/17/1998	0	195	113	1	0	146	202	0.3738	0.4423	0.3	0.00	87.92	(110.00)
Room 2 - #88	12/17/1998	0	150	169	1	0	146	202	0.3738	0.4423	0.3	0.00	7.18	76.67
Room 3 - #89	12/17/1998	0	177	99	1	0	146	202	0.3738	0.4423	0.3	0.00	55.63	(156.67)
Room 3 - #90	12/17/1998	2	184	86	1	0	146	202	0.3738	0.4423	0.3	4.25	68.19	(200.00)
Room 4 - #91	12/17/1998	1	176	157	1	0	146	202	0.3738	0.4423	0.3	2.12	53.83	36.67
Room 4 - #92	12/17/1998	0	168	274	1	0	146	202	0.3738	0.4423	0.3	0.00	39.48	426.67
Room 5 - #93	12/17/1998	1	178	170	1	0	146	202	0.3738	0.4423	0.3	2.12	57.42	80.00
Room 5 - #94	12/17/1998	1	162	192	1	0	146	202	0.3738	0.4423	0.3	2.12	28.71	153.33
Room 5 - #95	12/17/1998	0	176	163	1	0	146	202	0.3738	0.4423	0.3	0.00	53.83	56.67
Room 5 - #96	12/17/1998	1	168	138	1	0	146	202	0.3738	0.4423	0.3	2.12	39.48	(26.67)
Room 9 - #97	12/17/1998	0	163	109	1	0	146	202	0.3738	0.4423	0.3	0.00	30.50	(123.33)
Room 9 - #98	12/17/1998	0	172	149	1	0	146	202	0.3738	0.4423	0.3	0.00	46.65	10.00
Room 10 - #99	12/17/1998	1	189	156	1	0	146	202	0.3738	0.4423	0.3	2.12	77.16	33.33
Room 6 - #100	12/18/1998	0	170	151	1	1	146	202	0.3738	0.4423	0.3	(2.12)	43.06	16.67
Room 6 - #1	12/18/1998	1	174	142	1	1	146	202	0.3738	0.4423	0.3	0.00	50.24	(13.33)
Room 6 - #2	12/18/1998	2	175	199	1	1	146	202	0.3738	0.4423	0.3	2.12	52.04	176.67
Room 6 - #3	12/18/1998	1	162	163	1	1	146	202	0.3738	0.4423	0.3	0.00	28.71	56.67
Room 6 - #4	12/18/1998	2	171	177	1	1	146	202	0.3738	0.4423	0.3	2.12	44.86	103.33
Room 6 - #5	12/18/1998	2	172	183	1	1	146	202	0.3738	0.4423	0.3	2.12	46.65	123.33
Room 7 - #6	12/18/1998	0	195	178	1	1	146	202	0.3738	0.4423	0.3	(2.12)	87.92	106.67
Room 7 - #7	12/18/1998	1	190	168	1	1	146	202	0.3738	0.4423	0.3	0.00	78.95	73.33
Room 7 - #8	12/18/1998	0	164	200	1	1	146	202	0.3738	0.4423	0.3	(2.12)	32.30	180.00
Room 7 - #9	12/18/1998	1	164	151	1	1	146	202	0.3738	0.4423	0.3	0.00	32.30	16.67
Room 7 - #10	12/18/1998	1	186	154	1	1	146	202	0.3738	0.4423	0.3	0.00	71.77	26.67
Room 7 - #11	12/18/1998	0	203	118	1	1	146	202	0.3738	0.4423	0.3	(2.12)	102.28	(93.33)
Room 8 - #12	12/18/1998	0	179	207	1	1	146	202	0.3738	0.4423	0.3	(2.12)	59.21	203.33
Room 8 - #13	12/18/1998	0	195	220	1	1	146	202	0.3738	0.4423	0.3	(2.12)	87.92	246.67
Room 8 - #14	12/18/1998	1	197	147	1	1	146	202	0.3738	0.4423	0.3	0.00	91.51	3.33
Room 8 - #15	12/18/1998	0	203	194	1	1	146	202	0.3738	0.4423	0.3	(2.12)	102.28	160.00
Room 8 - #16	12/18/1998	1	186	223	1	1	146	202	0.3738	0.4423	0.3	0.00	71.77	256.67
Room 11 - #17	12/18/1998	1	169	140	1	1	146	202	0.3738	0.4423	0.3	0.00	41.27	(20.00)
Room 11 - #18	12/18/1998	0	186	132	1	1	146	202	0.3738	0.4423	0.3	(2.12)	71.77	(46.67)
Room 11 - #19	12/18/1998	0	201	166	1	1	146	202	0.3738	0.4423	0.3	(2.12)	98.69	66.67
Room 11 - #20	12/18/1998	0	180	195	1	1	146	202	0.3738	0.4423	0.3	(2.12)	61.01	163.33
Room 11 - #21	12/18/1998	0	176	187	1	1	146	202	0.3738	0.4423	0.3	(2.12)	53.83	136.67
										Average		0.15	56.63	99.30

OLD STORAGE BUNKERS (Interiors)

DIRECT MEASUREMENT RESULTS

BUILDING	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	GROSS TRITIUM RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM RESULT (dpm/100cm^2)
650 - #95	12/18/1998	3	127	302	1	1	98	202	0.1985	0.3033	0.3	8.00	75.88	333.33
650 - #96	12/18/1998	2	123	NM	1	1	98	NM	0.1985	0.3033	NM	4.00	65.42	NM
650 - #97	12/18/1998	1	138	NM	1	1	98	NM	0.1985	0.3033	NM	0.00	104.67	NM
651 - #92	12/18/1998	2	117	229	1	1	98	202	0.1985	0.3033	0.3	4.00	49.72	90.00
651 - #93	12/18/1998	1	115	NM	1	1	98	NM	0.1985	0.3033	NM	0.00	44.48	NM
651 - #94	12/18/1998	1	136	NM	1	1	98	NM	0.1985	0.3033	NM	0.00	99.44	NM
652 - #89	12/17/1998	1	122	280	1	0	98	202	0.1985	0.3033	0.3	4.00	62.80	260.00
652 - #90	12/17/1998	4	112	NM	1	0	98	NM	0.1985	0.3033	NM	15.99	36.63	NM
652 - #91	12/17/1998	2	136	NM	1	0	98	NM	0.1985	0.3033	NM	8.00	99.44	NM
653 - #86	12/17/1998	2	156	243	1	0	98	202	0.1985	0.3033	0.3	8.00	151.77	136.67
653 - #87	12/17/1998	2	134	NM	1	0	98	NM	0.1985	0.3033	NM	8.00	94.20	NM
653 - #88	12/17/1998	2	141	NM	1	0	98	NM	0.1985	0.3033	NM	8.00	112.52	NM
654 - #83	12/16/1998	5	105	362	1	0	98	202	0.1985	0.3033	0.3	19.99	18.32	533.33
654 - #84	12/16/1998	7	98	NM	1	0	98	NM	0.1985	0.3033	NM	27.99	0.00	NM
654 - #85	12/16/1998	5	166	NM	1	0	98	NM	0.1985	0.3033	NM	19.99	177.94	NM
655 - #80	12/16/1998	1	124	317	1	0	98	202	0.1985	0.3033	0.3	4.00	68.03	383.33
655 - #81	12/16/1998	2	120	NM	1	0	98	NM	0.1985	0.3033	NM	8.00	57.57	NM
655 - #82	12/16/1998	3	137	NM	1	0	98	NM	0.1985	0.3033	NM	11.99	102.05	NM
656 - #77	12/15/1998	2	137	257	1	2	98	202	0.1985	0.3033	0.3	0.00	102.05	183.33
656 - #78	12/15/1998	3	132	NM	1	2	98	NM	0.1985	0.3033	NM	4.00	88.97	NM
656 - #79	12/15/1998	2	156	NM	1	2	98	NM	0.1985	0.3033	NM	0.00	151.77	NM
657 - #74	12/15/1998	1	141	232	1	2	98	202	0.1985	0.3033	0.3	(4.00)	112.52	100.00
657 - #75	12/15/1998	1	167	NM	1	2	98	NM	0.1985	0.3033	NM	(4.00)	180.55	NM
657 - #76	12/15/1998	1	146	NM	1	2	98	NM	0.1985	0.3033	NM	(4.00)	125.60	NM
658 - #71	12/15/1998	2	173	260	1	2	98	202	0.1985	0.3033	0.3	0.00	196.25	193.33
658 - #72	12/15/1998	0	145	NM	1	2	98	NM	0.1985	0.3033	NM	(8.00)	122.99	NM
658 - #73	12/15/1998	1	189	NM	1	2	98	NM	0.1985	0.3033	NM	(4.00)	238.12	NM
659 - #68	12/15/1998	3	149	271	1	2	98	202	0.1985	0.3033	0.3	4.00	133.45	230.00
659 - #69	12/15/1998	0	160	NM	1	2	98	NM	0.1985	0.3033	NM	(8.00)	162.24	NM
659 - #70	12/15/1998	1	123	NM	1	2	98	NM	0.1985	0.3033	NM	(4.00)	65.42	NM
660 - #65	12/14/1998	1	115	323	1	2	98	202	0.1985	0.3033	0.3	(4.00)	44.48	403.33
660 - #66	12/14/1998	1	115	NM	1	2	98	NM	0.1985	0.3033	NM	(4.00)	44.48	NM
660 - #67	12/14/1998	2	127	NM	1	2	98	NM	0.1985	0.3033	NM	0.00	75.88	NM
661 - #62	12/14/1998	2	137	302	1	2	98	202	0.1985	0.3033	0.3	0.00	102.05	333.33
661 - #63	12/14/1998	3	123	NM	1	2	98	NM	0.1985	0.3033	NM	4.00	65.42	NM
661 - #64	12/14/1998	0	129	NM	1	2	98	NM	0.1985	0.3033	NM	(8.00)	81.12	NM
662 - #59	12/8/1998	1	136	296	1	0	98	202	0.1985	0.3033	0.3	4.00	99.44	313.33
662 - #60	12/8/1998	2	141	NM	1	0	98	NM	0.1985	0.3033	NM	8.00	112.52	NM
662 - #61	12/8/1998	2	142	NM	1	0	98	NM	0.1985	0.3033	NM	8.00	115.14	NM
663 - #56	12/10/1998	2	124	305	1	0	98	202	0.1985	0.3033	0.3	8.00	68.03	343.33
663 - #57	12/10/1998	4	136	NM	1	0	98	NM	0.1985	0.3033	NM	15.99	99.44	NM
663 - #58	12/10/1998	2	127	NM	1	0	98	NM	0.1985	0.3033	NM	8.00	75.88	NM
664 - #53	12/10/1998	1	133	324	1	0	98	202	0.1985	0.3033	0.3	4.00	91.59	406.67

BUILDING	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	GROSS TRITIUM RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFF	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM RESULT (dpm/100cm^2)
664 - #54	12/10/1998	0	136	NM	1	0	98	NM	0.1985	0.3033	NM	0.00	99.44	NM
664 - #55	12/10/1998	0	121	NM	1	0	98	NM	0.1985	0.3033	NM	0.00	60.18	NM
665 - #1	12/8/1998	3	113	296	1	0	98	202	0.1985	0.3033	0.3	11.99	39.25	313.33
665 - #2	12/8/1998	0	194	NM	1	0	98	NM	0.1985	0.3033	NM	0.00	251.20	NM
665 - #3	12/8/1998	6	130	NM	1	0	98	NM	0.1985	0.3033	NM	23.99	83.73	NM
665 - #4	12/8/1998	1	132	NM	1	0	98	NM	0.1985	0.3033	NM	4.00	88.97	NM
665 - #5	12/8/1998	4	140	NM	1	0	98	NM	0.1985	0.3033	NM	15.99	109.90	NM
665 - #6	12/8/1998	2	137	NM	1	0	98	NM	0.1985	0.3033	NM	8.00	102.05	NM
665 - #7	12/8/1998	5	170	NM	1	0	98	NM	0.1985	0.3033	NM	19.99	188.40	NM
666 - #50	12/10/1998	6	135	171	1	0	98	202	0.1985	0.3033	0.3	23.99	96.82	(103.33)
666 - #51	12/10/1998	1	171	NM	1	0	98	NM	0.1985	0.3033	NM	4.00	191.02	NM
666 - #52	12/10/1998	4	154	NM	1	0	98	NM	0.1985	0.3033	NM	15.99	146.54	NM
667 - #47	12/9/1998	1	156	276	1	1	98	202	0.1985	0.3033	0.3	0.00	151.77	246.67
667 - #48	12/9/1998	4	138	NM	1	1	98	NM	0.1985	0.3033	NM	11.99	104.67	NM
667 - #49	12/9/1998	8	128	NM	1	1	98	NM	0.1985	0.3033	NM	27.99	78.50	NM
668 - #41	12/9/1998	0	122	581	1	1	98	202	0.1985	0.3033	0.3	(4.00)	62.80	1263.33
668 - #42	12/9/1998	0	141	NM	1	1	98	NM	0.1985	0.3033	NM	(4.00)	112.52	NM
668 - #43	12/9/1998	0	137	NM	1	1	98	NM	0.1985	0.3033	NM	(4.00)	102.05	NM
669 - #44	12/9/1998	2	100	190	1	1	98	202	0.1985	0.3033	0.3	4.00	5.23	(40.00)
669 - #45	12/9/1998	2	100	NM	1	1	98	NM	0.1985	0.3033	NM	4.00	5.23	NM
669 - #46	12/9/1998	2	133	NM	1	1	98	NM	0.1985	0.3033	NM	4.00	91.59	NM
670 - #8	12/8/1998	1	119	350	1	0	98	202	0.1985	0.3033	0.3	4.00	54.95	493.33
670 - #9	12/8/1998	3	107	NM	1	0	98	NM	0.1985	0.3033	NM	11.99	23.55	NM
670 - #10	12/8/1998	1	125	NM	1	0	98	NM	0.1985	0.3033	NM	4.00	70.65	NM
670 - #11	12/8/1998	4	159	NM	1	0	98	NM	0.1985	0.3033	NM	15.99	159.62	NM
670 - #12	12/8/1998	2	184	NM	1	0	98	NM	0.1985	0.3033	NM	8.00	225.04	NM
670 - #13	12/8/1998	0	156	NM	1	0	98	NM	0.1985	0.3033	NM	0.00	151.77	NM
											Average =	5.54	100.48	305.56
											Median =	4.00	99.44	313.33
											Std Dev =	8.51	53.43	271.66
											Max Value	27.99	251.20	1,263.33
											Min Value :	(8.00)	0.00	(103.33)
											Range =	35.98	251.20	1,366.67

NM = Not measured

OLD STORAGE BUNKERS (Housings)

DIRECT MEASUREMENTS RESULTS

BUILDING	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	GROSS TRITIUM RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM RESULT (dpm/100cm^2)
650-27	2/1/1999	4	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	15.85	NM	NM
651-24	2/1/1999	6	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	26.41	NM	NM
651-25	2/1/1999	14	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	68.67	NM	NM
652-21	2/1/1999	2	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	5.28	NM	NM
652-22	2/1/1999	29	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	147.91	NM	NM
653-18	2/1/1999	3	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	10.57	NM	NM
653-19	2/1/1999	22	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	110.94	NM	NM
654-15	2/1/1999	5	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	21.13	NM	NM
654-16	2/1/1999	22	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	110.94	NM	NM
655-14	2/1/1999	1	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	0.00	NM	NM
656-10	2/1/1999	10	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	47.54	NM	NM
656-11	2/1/1999	18	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	89.80	NM	NM
656-12	2/1/1999	13	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	63.39	NM	NM
656-13	2/1/1999	12	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	58.11	NM	NM
657-9	2/1/1999	2	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	5.28	NM	NM
658-8	2/1/1999	4	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	15.85	NM	NM
659-7	2/1/1999	8	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	36.98	NM	NM
660-3	2/1/1999	6	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	26.41	NM	NM
660-4	2/1/1999	9	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	42.26	NM	NM
660-5	2/1/1999	27	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	137.35	NM	NM
660-6	2/1/1999	17	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	84.52	NM	NM
661-2	2/1/1999	6	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	26.41	NM	NM
662-1	2/1/1999	6	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	26.41	NM	NM
663-30	2/1/1999	2	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	5.28	NM	NM
664-29	2/1/1999	7	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	31.70	NM	NM
665-25	2/1/1999	8	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	36.98	NM	NM
665-26	2/1/1999	31	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	158.48	NM	NM
665-27	2/1/1999	12	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	58.11	NM	NM
665-28	2/1/1999	5	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	21.13	NM	NM
666-21	2/1/1999	14	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	68.67	NM	NM
666-22	2/1/1999	17	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	84.52	NM	NM
666-23	2/1/1999	27	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	137.35	NM	NM
666-24	2/1/1999	3	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	10.57	NM	NM
667-17	2/1/1999	5	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	21.13	NM	NM
667-18	2/1/1999	59	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	306.39	NM	NM
667-19	2/1/1999	10	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	47.54	NM	NM
667-20	2/1/1999	2	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	5.28	NM	NM
668-12	2/1/1999	4	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	15.85	NM	NM
668-13	2/1/1999	39	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	200.74	NM	NM
668-14	2/1/1999	38	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	195.46	NM	NM
668-15	2/1/1999	8	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	36.98	NM	NM

BUILDING	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	GROSS TRITIUM RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFF	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM RESULT (dpm/100cm^2)
668-16	2/1/1999	2	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	5.28	NM	NM
669-7	2/1/1999	5	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	21.13	NM	NM
669-8	2/1/1999	26	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	132.07	NM	NM
669-9	2/1/1999	26	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	132.07	NM	NM
669-10	2/1/1999	5	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	21.13	NM	NM
669-11	2/1/1999	4	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	15.85	NM	NM
670-1	2/1/1999	5	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	21.13	NM	NM
670-2	2/1/1999	33	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	169.04	NM	NM
670-3	2/1/1999	18	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	89.80	NM	NM
670-4	2/1/1999	43	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	221.87	NM	NM
670-5	2/1/1999	5	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	21.13	NM	NM
670-6	2/1/1999	3	Inst. Inoperable	NM	1	1	NM	NM	0.1893	0.2903	NM	10.57	NM	NM
655-2	12/19/1998	28	190	NM	1	0	110	NM	0.1985	0.3033	NM	141.06	263.77	NM
655-3	12/19/1998	38	220	NM	1	0	110	NM	0.1985	0.3033	NM	191.44	362.68	NM
655-4	12/19/1998	63	459	NM	1	0	110	NM	0.1985	0.3033	NM	317.38	1,150.68	NM
655-5	12/19/1998	5	131	NM	1	0	110	NM	0.1985	0.3033	NM	25.19	69.24	NM
655-6	12/19/1998	21	161	NM	1	0	110	NM	0.1985	0.3033	NM	105.79	168.15	NM
655-7	12/19/1998	12	146	NM	1	0	110	NM	0.1985	0.3033	NM	60.45	118.69	NM
657-9	12/19/1998	64	389	NM	1	0	110	NM	0.1985	0.3033	NM	322.42	919.88	NM
657-10	12/19/1998	11	150	NM	1	0	110	NM	0.1985	0.3033	NM	55.42	131.88	NM
657-11	12/19/1998	51	407	NM	1	0	110	NM	0.1985	0.3033	NM	256.93	979.23	NM
657-12	12/19/1998	26	251	NM	1	0	110	NM	0.1985	0.3033	NM	130.98	464.89	NM
657-13	12/19/1998	2	132	NM	1	0	110	NM	0.1985	0.3033	NM	10.08	72.54	NM
657-14	12/19/1998	4	145	NM	1	0	110	NM	0.1985	0.3033	NM	20.15	115.40	NM
658-16	12/19/1998	24	293	NM	1	0	110	NM	0.1985	0.3033	NM	120.91	603.36	NM
658-17	12/19/1998	3	134	NM	1	0	110	NM	0.1985	0.3033	NM	15.11	79.13	NM
658-18	12/19/1998	19	181	NM	1	0	110	NM	0.1985	0.3033	NM	95.72	234.09	NM
658-19	12/19/1998	11	135	NM	1	0	110	NM	0.1985	0.3033	NM	55.42	82.43	NM
659-21	12/19/1998	22	212	NM	1	0	110	NM	0.1985	0.3033	NM	110.83	336.30	NM
659-22	12/19/1998	24	280	NM	1	0	110	NM	0.1985	0.3033	NM	120.91	560.50	NM
659-23	12/19/1998	51	368	NM	1	0	110	NM	0.1985	0.3033	NM	256.93	850.64	NM
661-25	12/19/1998	41	306	NM	1	0	110	NM	0.1985	0.3033	NM	206.55	646.22	NM
661-26	12/19/1998	13	171	NM	1	0	110	NM	0.1985	0.3033	NM	65.49	201.12	NM
661-27	12/19/1998	35	353	NM	1	0	110	NM	0.1985	0.3033	NM	176.32	801.19	NM
661-28	12/19/1998	20	208	NM	1	0	110	NM	0.1985	0.3033	NM	100.76	323.11	NM
661-29	12/19/1998	6	151	NM	1	0	110	NM	0.1985	0.3033	NM	30.23	135.18	NM
661-30	12/19/1998	11	143	NM	1	0	110	NM	0.1985	0.3033	NM	55.42	108.80	NM
662-2	12/19/1998	49	361	NM	1	0	110	NM	0.1985	0.3033	NM	246.85	827.56	NM
662-3	12/19/1998	50	277	NM	1	0	110	NM	0.1985	0.3033	NM	251.89	550.61	NM
662-4	12/19/1998	5	123	NM	1	0	110	NM	0.1985	0.3033	NM	25.19	42.86	NM
662-5	12/19/1998	16	189	NM	1	0	110	NM	0.1985	0.3033	NM	80.60	260.47	NM
662-6	12/19/1998	15	195	NM	1	0	110	NM	0.1985	0.3033	NM	75.57	280.25	NM
662-7	12/19/1998	11	138	NM	1	0	110	NM	0.1985	0.3033	NM	55.42	92.32	NM
663-9	12/19/1998	20	235	NM	1	0	110	NM	0.1985	0.3033	NM	100.76	412.13	NM
663-10	12/19/1998	28	201	NM	1	0	110	NM	0.1985	0.3033	NM	141.06	300.03	NM
663-11	12/19/1998	51	417	NM	1	0	110	NM	0.1985	0.3033	NM	256.93	1,012.20	NM
663-12	12/19/1998	49	254	NM	1	0	110	NM	0.1985	0.3033	NM	246.85	474.78	NM
663-13	12/19/1998	5	113	NM	1	0	110	NM	0.1985	0.3033	NM	25.19	9.89	NM
663-14	12/19/1998	6	110	NM	1	0	110	NM	0.1985	0.3033	NM	30.23	0.00	NM
664-16	12/19/1998	22	233	NM	1	0	110	NM	0.1985	0.3033	NM	110.83	405.54	NM

BUILDING	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	GROSS TRITIUM RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM RESULT (dpm/100cm^2)
664-17	12/19/1998	35	228	NM	1	0	110	NM	0.1985	0.3033	NM	176.32	389.05	NM
664-18	12/19/1998	15	127	NM	1	0	110	NM	0.1985	0.3033	NM	75.57	56.05	NM
664-19	12/19/1998	9	140	NM	1	0	110	NM	0.1985	0.3033	NM	45.34	98.91	NM
650-21	12/19/1998	23	218	NM	1	0	110	NM	0.1985	0.3033	NM	115.87	356.08	NM
650-22	12/19/1998	41	320	NM	1	0	110	NM	0.1985	0.3033	NM	206.55	692.38	NM
650-23	12/19/1998	23	244	NM	1	0	110	NM	0.1985	0.3033	NM	115.87	441.81	NM
650-24	12/19/1998	23	199	NM	1	0	110	NM	0.1985	0.3033	NM	115.87	293.44	NM
650-25	12/19/1998	3	141	NM	1	0	110	NM	0.1985	0.3033	NM	15.11	102.21	NM
										Average		120.91	366.91	

NM = Not measured

MEASUREMENT DIFFERENCES BETWEEN HOUSING SAMPLE LOCATIONS WITH SMOOTH, DISCOLORED SURFACES AND THOSE WITH ROUGH, WEATHERED SURFACES

SMOOTH, DISCOLORED SURFACE

BUILDING	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	GROSS TRITIUM RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM RESULT (dpm/100cm^2)
655-2	12/19/1998	28	190	NM	1	0	110	NM	0.1985	0.3033	NM	141.06	626.44	NM
655-3	12/19/1998	38	220	NM	1	0	110	NM	0.1985	0.3033	NM	191.44	725.35	NM
655-4	12/19/1998	63	459	NM	1	0	110	NM	0.1985	0.3033	NM	317.38	1,513.35	NM
657-9	12/19/1998	64	389	NM	1	0	110	NM	0.1985	0.3033	NM	322.42	1,282.56	NM
657-11	12/19/1998	51	407	NM	1	0	110	NM	0.1985	0.3033	NM	256.93	1,341.91	NM
657-12	12/19/1998	26	251	NM	1	0	110	NM	0.1985	0.3033	NM	130.98	827.56	NM
658-16	12/19/1998	24	293	NM	1	0	110	NM	0.1985	0.3033	NM	120.91	966.04	NM
658-18	12/19/1998	19	181	NM	1	0	110	NM	0.1985	0.3033	NM	95.72	596.77	NM
659-21	12/19/1998	22	212	NM	1	0	110	NM	0.1985	0.3033	NM	110.83	698.98	NM
659-22	12/19/1998	24	280	NM	1	0	110	NM	0.1985	0.3033	NM	120.91	923.18	NM
659-23	12/19/1998	51	368	NM	1	0	110	NM	0.1985	0.3033	NM	256.93	1,213.32	NM
661-25	12/19/1998	41	306	NM	1	0	110	NM	0.1985	0.3033	NM	206.55	1,008.90	NM
661-27	12/19/1998	35	353	NM	1	0	110	NM	0.1985	0.3033	NM	176.32	1,163.86	NM
661-28	12/19/1998	20	208	NM	1	0	110	NM	0.1985	0.3033	NM	100.76	685.79	NM
662-2	12/19/1998	49	361	NM	1	0	110	NM	0.1985	0.3033	NM	246.85	1,190.24	NM
662-3	12/19/1998	50	277	NM	1	0	110	NM	0.1985	0.3033	NM	251.89	913.29	NM
662-5	12/19/1998	16	189	NM	1	0	110	NM	0.1985	0.3033	NM	80.60	623.15	NM
663-10	12/19/1998	28	201	NM	1	0	110	NM	0.1985	0.3033	NM	141.06	662.71	NM
663-11	12/19/1998	51	417	NM	1	0	110	NM	0.1985	0.3033	NM	256.93	1,374.88	NM
663-12	12/19/1998	49	254	NM	1	0	110	NM	0.1985	0.3033	NM	246.85	837.45	NM
664-16	12/19/1998	22	233	NM	1	0	110	NM	0.1985	0.3033	NM	110.83	768.22	NM
664-17	12/19/1998	35	228	NM	1	0	110	NM	0.1985	0.3033	NM	176.32	751.73	NM
650-21	12/19/1998	23	218	NM	1	0	110	NM	0.1985	0.3033	NM	115.87	718.76	NM
650-22	12/19/1998	41	320	NM	1	0	110	NM	0.1985	0.3033	NM	206.55	1,055.06	NM
650-23	12/19/1998	23	244	NM	1	0	110	NM	0.1985	0.3033	NM	115.87	804.48	NM
650-24	12/19/1998	23	199	NM	1	0	110	NM	0.1985	0.3033	NM	115.87	656.12	NM
											Average	177.48	920.39	

ROUGH, WEATHERED SURFACE

BUILDING	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	GROSS TRITIUM RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFF	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM RESULT (dpm/100cm^2)
655-5	12/19/1998	5	131	NM	1	0	110	NM	0.1985	0.3033	NM	25.19	431.92	NM
655-6	12/19/1998	21	161	NM	1	0	110	NM	0.1985	0.3033	NM	105.79	530.83	NM
655-7	12/19/1998	12	146	NM	1	0	110	NM	0.1985	0.3033	NM	60.45	481.37	NM
657-10	12/19/1998	11	150	NM	1	0	110	NM	0.1985	0.3033	NM	55.42	494.56	NM
657-13	12/19/1998	2	132	NM	1	0	110	NM	0.1985	0.3033	NM	10.08	435.21	NM
657-14	12/19/1998	4	145	NM	1	0	110	NM	0.1985	0.3033	NM	20.15	478.07	NM
658-17	12/19/1998	3	134	NM	1	0	110	NM	0.1985	0.3033	NM	15.11	441.81	NM
658-19	12/19/1998	11	135	NM	1	0	110	NM	0.1985	0.3033	NM	55.42	445.10	NM
661-26	12/19/1998	13	171	NM	1	0	110	NM	0.1985	0.3033	NM	65.49	563.80	NM
661-29	12/19/1998	6	151	NM	1	0	110	NM	0.1985	0.3033	NM	30.23	497.86	NM
661-30	12/19/1998	11	143	NM	1	0	110	NM	0.1985	0.3033	NM	55.42	471.48	NM
662-4	12/19/1998	5	123	NM	1	0	110	NM	0.1985	0.3033	NM	25.19	405.54	NM
662-6	12/19/1998	15	195	NM	1	0	110	NM	0.1985	0.3033	NM	75.57	642.93	NM
662-7	12/19/1998	11	138	NM	1	0	110	NM	0.1985	0.3033	NM	55.42	455.00	NM
663-9	12/19/1998	20	235	NM	1	0	110	NM	0.1985	0.3033	NM	100.76	774.81	NM
663-13	12/19/1998	5	113	NM	1	0	110	NM	0.1985	0.3033	NM	25.19	372.57	NM
663-14	12/19/1998	6	110	NM	1	0	110	NM	0.1985	0.3033	NM	30.23	362.68	NM
664-18	12/19/1998	15	127	NM	1	0	110	NM	0.1985	0.3033	NM	75.57	418.73	NM
664-19	12/19/1998	9	140	NM	1	0	110	NM	0.1985	0.3033	NM	45.34	461.59	NM
650-25	12/19/1998	3	141	NM	1	0	110	NM	0.1985	0.3033	NM	15.11	464.89	NM
											Average	47.36	459.94	

NM = Not measured

	Smooth	Rough
Mean =	177.48	47.36
Median =	158.69	50.38
Standard Deviation =	72.11	28.00
Max Value =	322.42	105.79
Min Value =	80.60	10.08
Range =	241.81	95.72

NEW STORAGE BUNKERS

DIRECT MEASUREMENT RESULTS

BUILDING	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	GROSS TRITIUM RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM RESULT (dpm/100cm^2)
760 - #1	12/8/1998	1	218	589	1	1	131	202	0.1899	0.3005	0.3	0.00	229.78	1290.00
760 - #2	12/8/1998	0	216	NM	1	1	131	NM	0.1899	0.3005	NM	(4.18)	224.49	NM
760 - #3	12/8/1998	0	242	NM	1	1	131	NM	0.1899	0.3005	NM	(4.18)	293.16	NM
761 - #4	12/8/1998	1	309	268	1	1	131	202	0.1899	0.3005	0.3	0.00	470.12	220.00
761 - #5	12/8/1998	3	268	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	361.83	NM
761 - #6	12/8/1998	3	240	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	287.88	NM
762 - #7	12/8/1998	1	207	207	1	1	131	202	0.1899	0.3005	0.3	0.00	200.72	16.67
762 - #8	12/8/1998	3	208	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	203.36	NM
762 - #9	12/8/1998	2	208	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	203.36	NM
763 - #10	12/8/1998	1	216	260	1	1	131	202	0.1899	0.3005	0.3	0.00	224.49	193.33
763 - #11	12/8/1998	3	194	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	166.39	NM
763 - #12	12/8/1998	3	214	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	219.21	NM
764 - #13	12/8/1998	2	253	337	1	1	131	202	0.1899	0.3005	0.3	4.18	322.21	450.00
764 - #14	12/8/1998	2	228	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	256.19	NM
764 - #15	12/8/1998	2	228	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	256.19	NM
765 - #16	12/8/1998	3	240	480	1	1	131	202	0.1899	0.3005	0.3	8.36	287.88	926.67
765 - #17	12/8/1998	1	241	NM	1	1	131	NM	0.1899	0.3005	NM	0.00	290.52	NM
765 - #18	12/8/1998	1	203	NM	1	1	131	NM	0.1899	0.3005	NM	0.00	190.16	NM
766 - #19	12/8/1998	1	260	267	1	1	131	202	0.1899	0.3005	0.3	0.00	340.70	216.67
766 - #20	12/8/1998	6	263	NM	1	1	131	NM	0.1899	0.3005	NM	20.90	348.63	NM
766 - #22	12/8/1998	1	210	NM	1	1	131	NM	0.1899	0.3005	NM	0.00	208.65	NM
767 - #21	12/8/1998	NM	NM	265	1	1	131	202	0.1899	0.3005	0.3	NM	NM	210.00
767 - #23	12/8/1998	0	237	NM	1	1	131	NM	0.1899	0.3005	NM	(4.18)	279.96	NM
767 - #24	12/8/1998	6	225	NM	1	1	131	NM	0.1899	0.3005	NM	20.90	248.26	NM
768 - #25	12/8/1998	1	264	196	1	1	131	202	0.1899	0.3005	0.3	0.00	351.27	(20.00)
768 - #26	12/8/1998	0	225	NM	1	1	131	NM	0.1899	0.3005	NM	(4.18)	248.26	NM
768 - #27	12/8/1998	2	223	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	242.98	NM
769 - #28	12/8/1998	1	227	286	1	1	131	202	0.1899	0.3005	0.3	0.00	253.55	280.00
769 - #29	12/8/1998	2	205	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	195.44	NM
769 - #30	12/8/1998	2	185	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	142.62	NM
770 - #31	12/9/1998	4	185	290	1	1	131	202	0.1899	0.3005	0.3	12.54	142.62	293.33
770 - #32	12/9/1998	2	215	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	221.85	NM
770 - #33	12/9/1998	1	195	NM	1	1	131	NM	0.1899	0.3005	NM	0.00	169.03	NM
771 - #34	12/9/1998	2	195	693	1	1	131	202	0.1899	0.3005	0.3	4.18	169.03	1636.67
771 - #35	12/9/1998	3	218	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	229.78	NM
771 - #36	12/9/1998	3	213	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	216.57	NM
772 - #37	12/9/1998	0	237	230	1	1	131	202	0.1899	0.3005	0.3	(4.18)	279.96	93.33
772 - #38	12/9/1998	1	209	NM	1	1	131	NM	0.1899	0.3005	NM	0.00	206.01	NM
772 - #39	12/9/1998	1	213	NM	1	1	131	NM	0.1899	0.3005	NM	0.00	216.57	NM
773 - #40	12/9/1998	3	186	258	1	1	131	202	0.1899	0.3005	0.3	8.36	145.26	186.67
773 - #41	12/9/1998	1	175	NM	1	1	131	NM	0.1899	0.3005	NM	0.00	116.21	NM
773 - #42	12/9/1998	3	204	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	192.80	NM
774 - #43	12/9/1998	1	281	303	1	1	131	202	0.1899	0.3005	0.3	0.00	396.17	336.67

BUILDING	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	GROSS TRITIUM RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM RESULT (dpm/100cm^2)
774 - #44	12/9/1998	1	211	NM	1	1	131	NM	0.1899	0.3005	NM	0.00	211.29	NM
774 - #45	12/9/1998	1	221	NM	1	1	131	NM	0.1899	0.3005	NM	0.00	237.70	NM
775 - #46	12/9/1998	1	248	364	1	1	131	202	0.1899	0.3005	0.3	0.00	309.01	540.00
775 - #47	12/9/1998	2	211	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	211.29	NM
775 - #48	12/9/1998	2	189	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	153.18	NM
776 - #49	12/9/1998	1	189	302	1	1	131	202	0.1899	0.3005	0.3	0.00	153.18	333.33
776 - #50	12/9/1998	2	182	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	134.70	NM
776 - #51	12/9/1998	4	204	NM	1	1	131	NM	0.1899	0.3005	NM	12.54	192.80	NM
777 - #52	12/9/1998	2	238	264	1	1	131	202	0.1899	0.3005	0.3	4.18	282.60	206.67
777 - #53	12/9/1998	1	192	NM	1	1	131	NM	0.1899	0.3005	NM	0.00	161.11	NM
777 - #54	12/9/1998	4	186	NM	1	1	131	NM	0.1899	0.3005	NM	12.54	145.26	NM
778 - #55	12/9/1998	3	197	250	1	0	131	202	0.1899	0.3005	0.3	12.54	174.31	160.00
778 - #56	12/9/1998	0	232	NM	1	0	131	NM	0.1899	0.3005	NM	0.00	266.75	NM
778 - #57	12/9/1998	1	304	NM	1	0	131	NM	0.1899	0.3005	NM	4.18	456.91	NM
779 - #58	12/9/1998	3	217	271	1	0	131	202	0.1899	0.3005	0.3	12.54	227.13	230.00
779 - #59	12/9/1998	1	221	NM	1	0	131	NM	0.1899	0.3005	NM	4.18	237.70	NM
779 - #60	12/9/1998	0	185	NM	1	0	131	NM	0.1899	0.3005	NM	0.00	142.62	NM
780 - #61	12/9/1998	4	198	243	1	0	131	202	0.1899	0.3005	0.3	16.72	176.95	136.67
780 - #62	12/9/1998	2	173	NM	1	0	131	NM	0.1899	0.3005	NM	8.36	110.93	NM
780 - #63	12/9/1998	3	202	NM	1	0	131	NM	0.1899	0.3005	NM	12.54	187.52	NM
781 - #64	12/9/1998	0	214	371	1	0	131	202	0.1899	0.3005	0.3	0.00	219.21	563.33
781 - #65	12/9/1998	1	211	NM	1	0	131	NM	0.1899	0.3005	NM	4.18	211.29	NM
781 - #66	12/9/1998	2	318	NM	1	0	131	NM	0.1899	0.3005	NM	8.36	493.89	NM
782 - #67	12/9/1998	3	251	216	1	0	131	202	0.1899	0.3005	0.3	12.54	316.93	46.67
782 - #68	12/9/1998	1	200	NM	1	0	131	NM	0.1899	0.3005	NM	4.18	182.24	NM
782 - #69	12/9/1998	0	200	NM	1	0	131	NM	0.1899	0.3005	NM	0.00	182.24	NM
783 - #70	12/9/1998	3	237	296	1	0	131	202	0.1899	0.3005	0.3	12.54	279.96	313.33
783 - #71	12/9/1998	0	205	NM	1	0	131	NM	0.1899	0.3005	NM	0.00	195.44	NM
783 - #72	12/9/1998	3	200	NM	1	0	131	NM	0.1899	0.3005	NM	12.54	182.24	NM
784 - #73	12/9/1998	1	265	321	1	0	131	202	0.1899	0.3005	0.3	4.18	353.91	396.67
784 - #74	12/9/1998	0	160	NM	1	0	131	NM	0.1899	0.3005	NM	0.00	76.59	NM
784 - #75	12/9/1998	3	251	NM	1	0	131	NM	0.1899	0.3005	NM	12.54	316.93	NM
785 - #76	12/9/1998	0	278	426	1	0	131	202	0.1899	0.3005	0.3	0.00	388.24	746.67
785 - #77	12/9/1998	2	196	NM	1	0	131	NM	0.1899	0.3005	NM	8.36	171.67	NM
785 - #78	12/9/1998	4	258	NM	1	0	131	NM	0.1899	0.3005	NM	16.72	335.42	NM
786 - #35	12/8/1998	1	140	346	1	0	131	202	0.1899	0.3005	0.3	4.18	23.77	480.00
786 - #36	12/8/1998	0	144	NM	1	0	131	NM	0.1899	0.3005	NM	0.00	34.33	NM
786 - #37	12/8/1998	NM	NM	NM	1	0	131	NM	0.1899	0.3005	NM	NM	NM	NM
787 - #32	12/8/1998	1	180	296	1	0	131	202	0.1899	0.3005	0.3	4.18	129.41	313.33
787 - #33	12/8/1998	1	171	NM	1	0	131	NM	0.1899	0.3005	NM	4.18	105.64	NM
787 - #34	12/8/1998	2	183	NM	1	0	131	NM	0.1899	0.3005	NM	8.36	137.34	NM
788 - #77	12/8/1998	NM	240	324	1	1	131	202	0.1899	0.3005	0.3	NM	287.88	406.67
788 - #76	12/8/1998	2	247	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	306.37	NM
788 - #75	12/8/1998	3	175	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	116.21	NM
788 - #74	12/8/1998	2	218	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	229.78	NM
788 - #90	12/8/1998	1	154	NM	1	1	131	NM	0.1899	0.3005	NM	0.00	60.75	NM
789 - #78	12/8/1998	1	143	327	1	1	131	202	0.1899	0.3005	0.3	0.00	31.69	416.67
789 - #79	12/8/1998	0	205	NM	1	1	131	NM	0.1899	0.3005	NM	(4.18)	195.44	NM
789 - #80	12/8/1998	3	178	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	124.13	NM
789 - #81	12/8/1998	2	171	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	105.64	NM
789 - #82	12/8/1998	0	183	NM	1	1	131	NM	0.1899	0.3005	NM	(4.18)	137.34	NM

BUILDING	DATE MEASURED	GROSS ALPHA RESULT	GROSS BETA RESULT	GROSS TRITIUM RESULT	COUNT TIME	ALPHA BKGD	BETA BKGD	TRITIUM BKGD	ALPHA EFFIC-IENCY	BETA EFFIC-IENCY	TRITIUM EFFIC-IENCY	NET ALPHA RESULT (dpm/100cm^2)	NET BETA RESULT (dpm/100cm^2)	NET TRITIUM RESULT (dpm/100cm^2)
790 - #83	12/8/1998	1	140	318	1	1	131	202	0.1899	0.3005	0.3	0.00	23.77	386.67
790 - #84	12/8/1998	0	195	NM	1	1	131	NM	0.1899	0.3005	NM	(4.18)	169.03	NM
790 - #85	12/8/1998	0	170	NM	1	1	131	NM	0.1899	0.3005	NM	(4.18)	103.00	NM
790 - #86	12/8/1998	3	219	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	232.42	NM
790 - #87	12/8/1998	4	202	NM	1	1	131	NM	0.1899	0.3005	NM	12.54	187.52	NM
791 - #88	12/8/1998	2	174	261	1	1	131	202	0.1899	0.3005	0.3	4.18	113.57	196.67
791 - #89	12/8/1998	0	183	NM	1	1	131	NM	0.1899	0.3005	NM	(4.18)	137.34	NM
791 - #93	12/8/1998	1	193	NM	1	1	131	NM	0.1899	0.3005	NM	0.00	163.75	NM
791 - #91	12/8/1998	0	182	NM	1	1	131	NM	0.1899	0.3005	NM	(4.18)	134.70	NM
791 - #92	12/8/1998	1	181	NM	1	1	131	NM	0.1899	0.3005	NM	0.00	132.06	NM
791 - #94	12/8/1998	0	211	NM	1	1	131	NM	0.1899	0.3005	NM	(4.18)	211.29	NM
792 - #95	12/8/1998	2	167	406	1	1	131	202	0.1899	0.3005	0.3	4.18	95.08	680.00
792 - #96	12/8/1998	0	214	NM	1	1	131	NM	0.1899	0.3005	NM	(4.18)	219.21	NM
792 - #97	12/8/1998	0	188	NM	1	1	131	NM	0.1899	0.3005	NM	(4.18)	150.54	NM
792 - #98	12/8/1998	3	206	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	198.08	NM
792 - #99	12/8/1998	3	171	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	105.64	NM
793 - #100	12/8/1998	1	171	267	1	1	131	202	0.1899	0.3005	0.3	0.00	105.64	216.67
793 - #24	12/8/1998	3	204	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	192.80	NM
793 - #25	12/8/1998	2	164	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	87.16	NM
793 - #26	12/8/1998	2	155	NM	1	1	131	NM	0.1899	0.3005	NM	4.18	63.39	NM
793 - #27	12/8/1998	3	141	NM	1	1	131	NM	0.1899	0.3005	NM	8.36	26.41	NM
794 - #29	12/8/1998	1	153	225	1	0	131	202	0.1899	0.3005	0.3	4.18	58.10	76.67
794 - #30	12/8/1998	0	176	NM	1	0	131	NM	0.1899	0.3005	NM	0.00	118.85	NM
794 - #31	12/8/1998	0	154	NM	1	0	131	NM	0.1899	0.3005	NM	0.00	60.75	NM
795 - #26	12/8/1998	0	156	196	1	0	131	202	0.1899	0.3005	0.3	0.00	66.03	(20.00)
795 - #27	12/8/1998	2	156	NM	1	0	131	NM	0.1899	0.3005	NM	8.36	66.03	NM
795 - #28	12/8/1998	1	185	NM	1	0	131	NM	0.1899	0.3005	NM	4.18	142.62	NM
796 - #23	12/8/1998	0	155	333	1	0	131	202	0.1899	0.3005	0.3	0.00	63.39	436.67
796 - #24	12/8/1998	3	168	NM	1	0	131	NM	0.1899	0.3005	NM	12.54	97.72	NM
796 - #25	12/8/1998	1	143	NM	1	0	131	NM	0.1899	0.3005	NM	4.18	31.69	NM
797 - #14	12/8/1998	2	169	276	1	0	131	202	0.1899	0.3005	0.3	8.36	100.36	246.67
797 - #15	12/8/1998	1	163	NM	1	0	131	NM	0.1899	0.3005	NM	4.18	84.52	NM
797 - #16	12/8/1998	1	158	NM	1	0	131	NM	0.1899	0.3005	NM	4.18	71.31	NM
798 - #20	12/8/1998	0	149	246	1	0	131	202	0.1899	0.3005	0.3	0.00	47.54	146.67
798 - #21	12/8/1998	2	141	NM	1	0	131	NM	0.1899	0.3005	NM	8.36	26.41	NM
798 - #22	12/8/1998	5	132	NM	1	0	131	NM	0.1899	0.3005	NM	20.90	2.64	NM
799 - #17	12/8/1998	0	131	222	1	0	131	202	0.1899	0.3005	0.3	0.00	0.00	66.67
799 - #18	12/8/1998	1	166	NM	1	0	131	NM	0.1899	0.3005	NM	4.18	92.44	NM
799 - #19	12/8/1998	2	168	NM	1	0	131	NM	0.1899	0.3005	NM	8.36	97.72	NM
											Mean =	4.15	186.53	351.33
											Median =	4.18	187.52	263.33
											Standard De	5.64	99.10	331.64
											Max Value =	20.90	493.89	1,636.67
											Min Value =	(4.18)	0.00	(20.00)
											Range =	25.08	493.89	1,656.67

NM = Not measured

Appendix E

Outdoor Gamma Scan

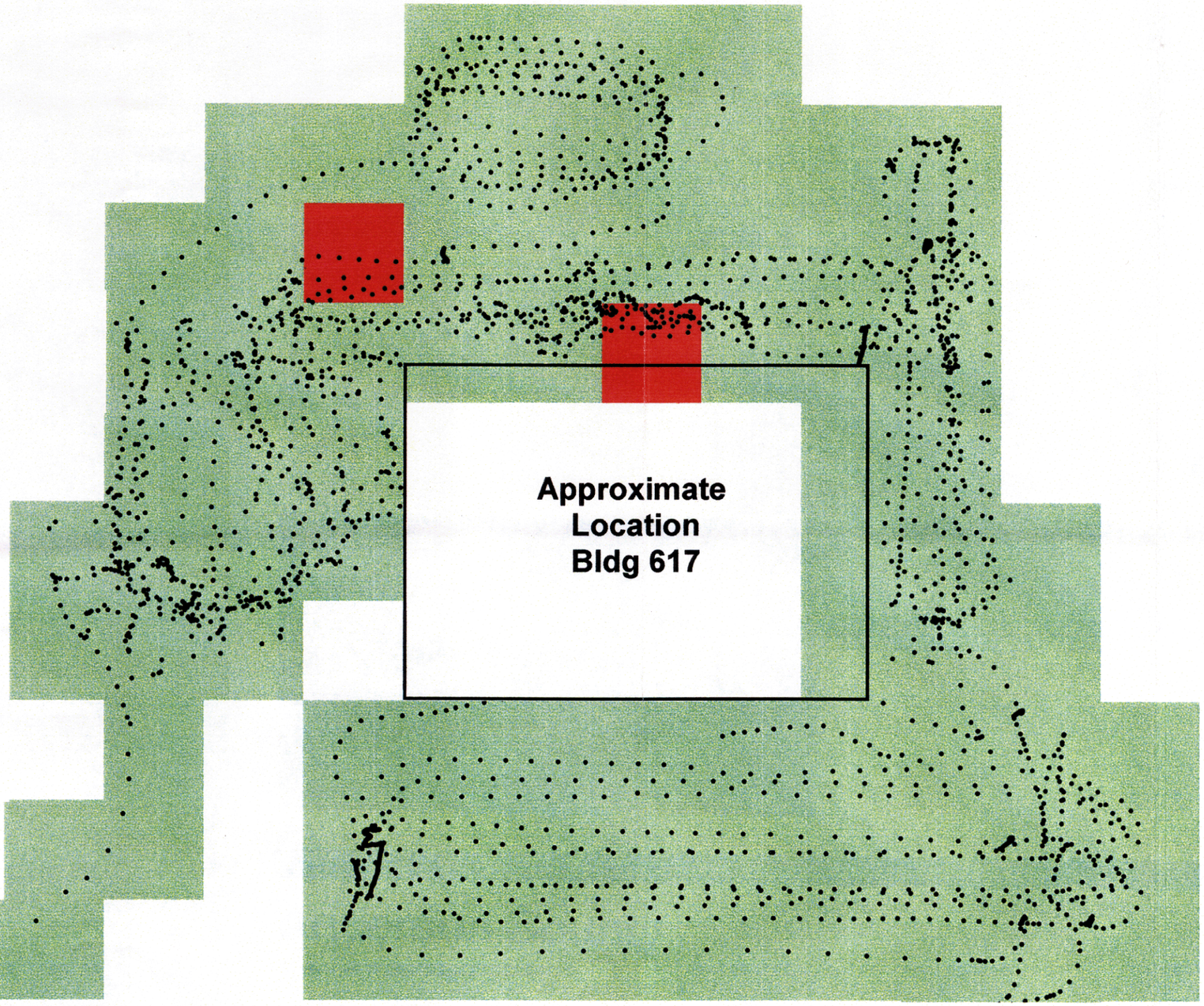


Figure 2
Bldg 617

• Rad Survey
Avg Counts Per Second
< 440
> 440

N
W E
S

0 20 40 Feet

January 8, 1998

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knoxn8/vol1/projects/rad/jacksvl/arcvw/fig2.lay

04143.1 IB3Y

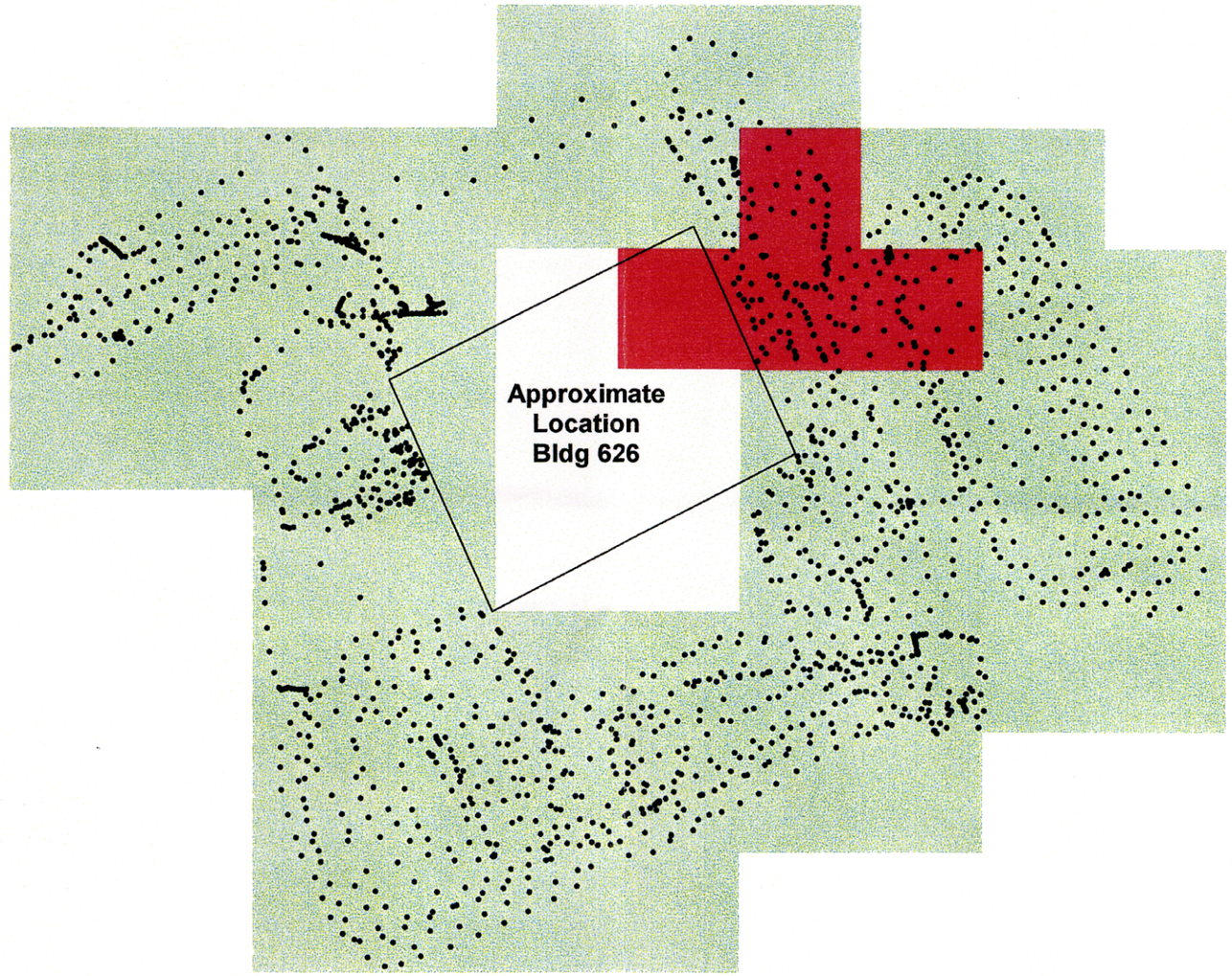

Figure 4
Bldg 626

• Rad Survey
Avg Counts Per Second
< 575
> 575
No Data

N
W E
S

0 20 40 Feet

January 8, 1998

IT CORPORATION
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knoxn8/vol1/projects/rad/jacksvl/arcvw/fig3.lay

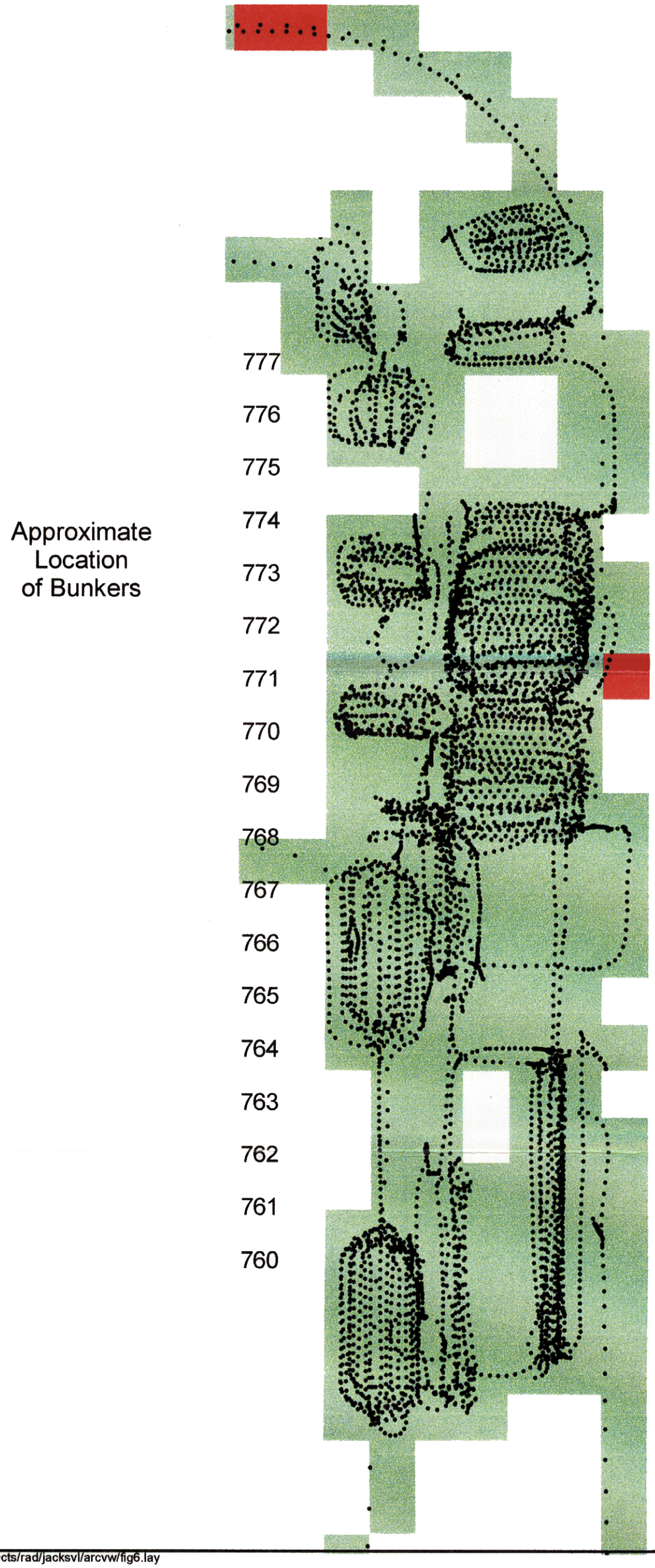


Figure 6
Bldg 760-777

• Rad Survey
Avg Counts Per Second
< 530
> 530

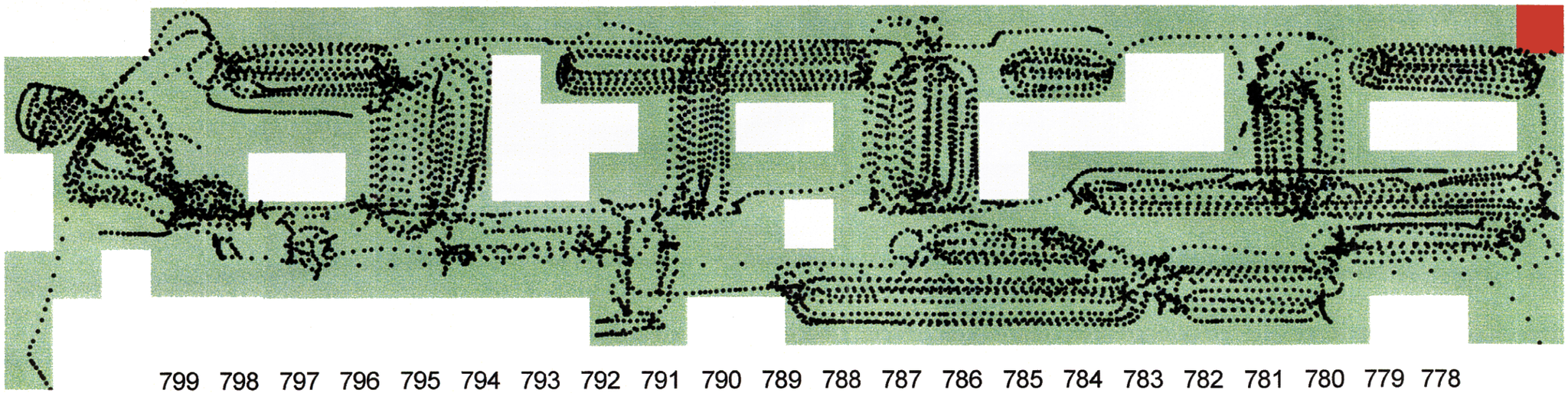
N
W E
S

0 40 80 Feet

January 8, 1998

IT CORPORATION
A Member of The IT Group

knoxn8/vol1/projects/rad/jacksvl/arcvw/fig6.lay



Approximate Location of Bunkers

Figure 8
Bldg 778-790

• Rad Survey
Avg Counts Per Second
< 530
> 530

N
W E
S

0 40 80 Feet

January 8, 1998

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knoxn8/vol1/projects/rad/jacksvl/arcvw/fig8.lay

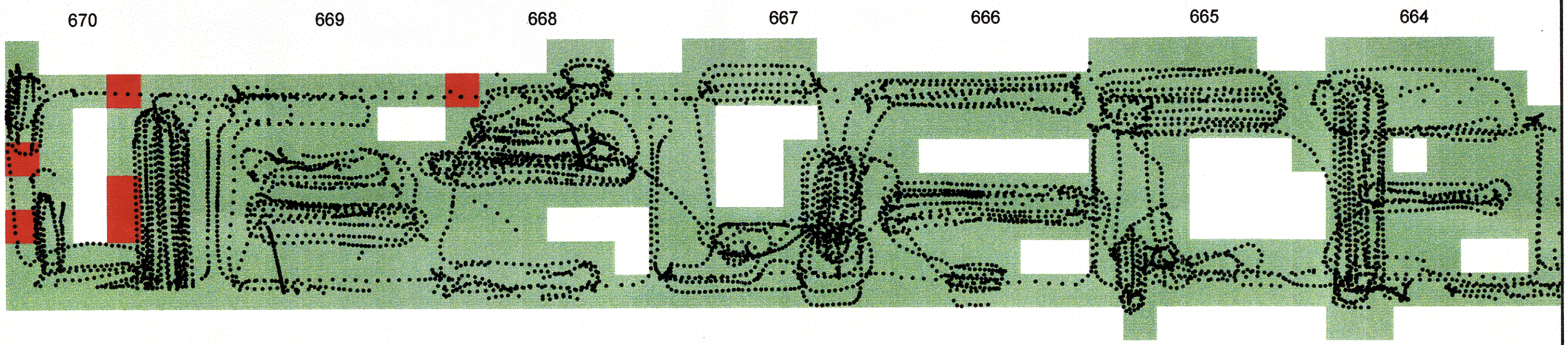

Figure 10a
Bldg 664-670

- Rad Survey

Avg Counts Per Second

- < 700
- > 700
- No Data

N
W E
S

0 50 100 Feet

January 8, 1998

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knoxn8/vol1/projects/rad/jacksvl/arcvw/fig10a.lay

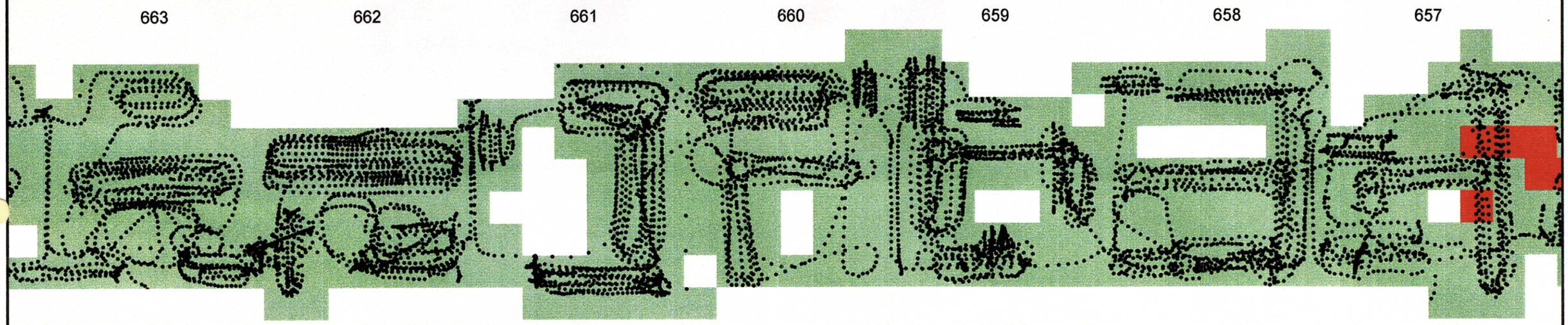

Figure 10b
Bldg 657-663

- Rad Survey

Avg Counts Per Second

< 700

> 700

No Data

N
W E
S

0 50 100 Feet

January 8, 1998

IT CORPORATION
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knoxn8/vol1/projects/rad/jacksvl/arcvw/fig10b.lay

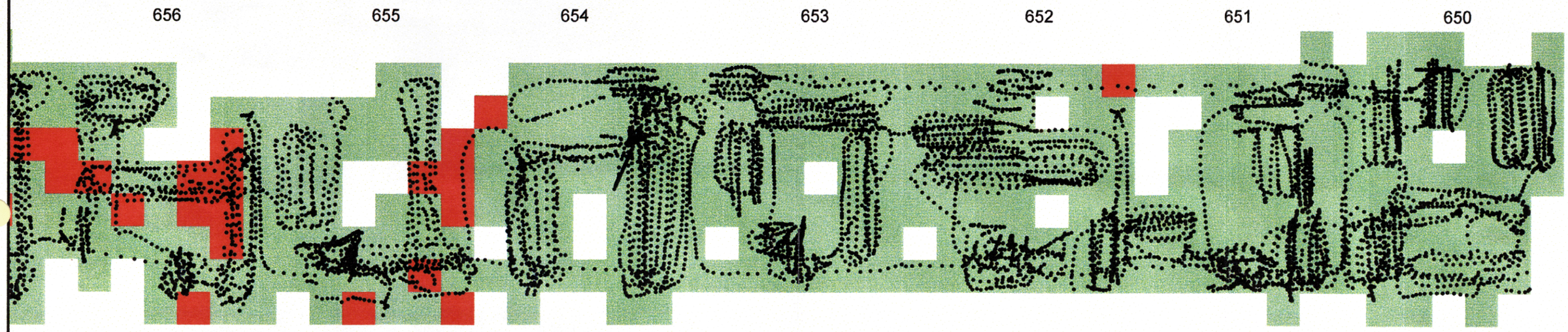

Figure 10c
Bldg 650-656

- Rad Survey

Avg Counts Per Second

- < 700
- > 700
- No Data

N
W E
S

0 50 100 Feet

January 8, 1998

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knoxn8/vol1/projects/rad/jacksvl/arcvw/fig10c.lay