MICROFILM

Engineering Product Document

GO Number	S/A Number	Page 1 of	Total Pages	Rev. Ltr/Chg. No. See Summary of Chg.	Number
97055	35620	62	62	NEW	RS-00003

Program Title
Closure of ETEC (R21-RF)

Document Title
Area 4064, Final Status Survey Report

Document Type
Final Report

Related Documents

Original Issue Date
3/30/99

Release Date 4-13-99
RELEASE TDC

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IR&D Program? Yes ☐ No ☒
If Yes, Enter Authorization No.

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Abstract

This Report presents the report of the Final Status Survey of Area 4064 of the Santa Susana Field Laboratory. All radiation exposure measurements and soil sample analyses confirm that the facility meets release limits approved by the Department of Energy and the State of California Department of Health Services. Accordingly, the facility is suitable for release for unrestricted use.

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EXECUTIVE SUMMARY

On September 1998, A Final Status Survey was completed in Area 4064 at the Santa Susana Field Laboratory confirming that the facility meets release limits approved by the Department of Energy and the State Department of Health Services. Accordingly, the facility is suitable for release for "unrestricted use".

The 4064 building at the SSFL was decontaminated, surveyed and released; then demolished and shipped off site in 1996. After all soil decontamination efforts were completed, a comprehensive Final Status Survey of the facility concluded in September 1998.

This report presents an extent of information regarding the Final Status Survey. The entire 2-acre lot was surveyed and sampled including a direct qualitative surface gamma scan (100%) for contamination and ambient gamma exposure measurements at 1 meter above the ground at 10-ft by 10-ft grids. Surrounding areas were surveyed. All measurements were tested statistically for compliance within the regulatory acceptable derived concentration guideline limits (DCGLs) of activation products, mixed fission products, and ambient exposure rates.

In soil samples taken after the excavation, the highest Cs-137 activity was 3.1 pCi/g, or 28% of the cleanup standard of the Cs-137 9.2 pCi/g guideline limits. All tests for soil concentrations confirmed that Area 4064 is suitable for release without radiological restrictions and posses no threat to the safety and health of the public.

1.0 BACKGROUND

1.1 LOCATION AND STRUCTURE

Area 4064 is located between 10th street and G Street within Area IV of the Santa Susana Field Laboratory (see Reference 1) on 2 acres of land. Originally Building 4064, a 175-feet by 150-feet facility used for storage existed on the site. The building itself consisted of galvanized steel walls and roof, with various types of internal walls and partitions. There was also a 25-ft by 50-ft loading dock, and parking lot access as shown in Figure 1.

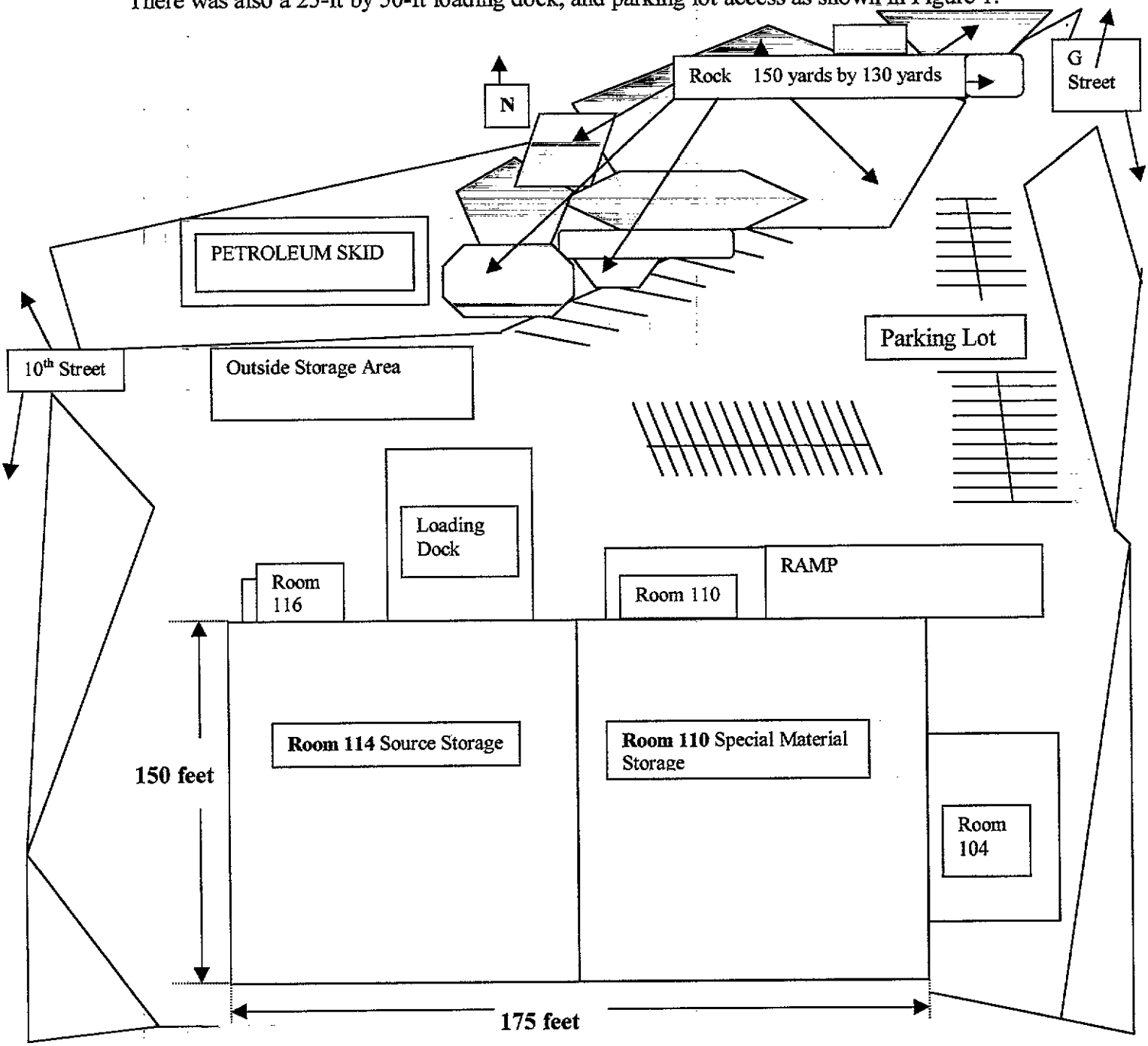


FIGURE 1: LAYOUT OF PRE-EXISTING BUILDING 4064

1.2 OPERATING HISTORY OF BUILDING 4064

Building 4064 was a facility used for the storage of non-irradiated uranium, fuel material, and fuel elements manufactured at the De Soto and Santa Susana Field Laboratories (see Reference 2). Equipment and containers of radioactive material were periodically stored in the building's side yard (see Reference 3). In 1989, operations at the facility were terminated. The building was emptied of all contents (both radioactive and non-radioactive) in 1993. In 1993, the building was decontaminated, the building and fenced yard were then surveyed (see References 7 and 19). In 1994, ORISE performed a verification survey (see Reference 6). In 1996, the building was approved for demolition by the United States Department of Energy (USDOE) (see Reference 8), the State of California Department of Health Services (CSDHS) (see Reference 9), and completely demolished, packaged and shipped off site in 1997.

1.3 RADIOLOGICAL ASSESSMENT OF BUILDING 4064 SIDE YARD

During the Building 4064 operating history, the concrete pad northeast of the building had also been built to store containers of radioactive material. At one time, a cask containing spent nuclear fuel and contaminated water, developed a leak and the side yard northeast of Building 4064 became contaminated with Cs-137.

In 1988, a Characterization Survey was performed (see Reference 3) which confirmed the location of contaminated soil. Remedial excavation was performed to remove the contaminated soil. A subsequent survey comprising of one meter (grided) exposure measurements and soil sampling was documented in 1990 (see Reference 4). A follow-up verification survey was performed by ORISE in 1992, and documented in October, 1993 (see Reference 5). Further excavation was performed in two locations in 1993, following imposition of more stringent clean-up standards by the Department of Energy, and documented in (see Reference 20).

During the Area IV Survey in 1994 through 1995 (see Reference 21), two locations, one in the original side yard and one located across the "G" Street road were identified as remaining above release limits. These areas were excavated in 1997 including the removal of an abandoned septic tank and leach field that had serviced Building 4064. Scoping surveys and soil samples conducted after excavation proved the 4064 area beneath the previous building foundations, and surrounding yard areas were below release limits.

In May 1998, core sampling and soil sampling were performed under the main access road, "G" street, and a 50-yard diameter area around "G" street. The soil sampling results proved free of radioactive contamination (see Reference 10 and Appendix C).

In September 1998, the Final Status Survey was conducted in the entire 2 acres of area 4064, including drainage pathways, former parking lot areas, surrounding areas, and the side yard area (see Reference 11). The soil sampling results were documented in Reference 12, which is provided in Appendix B.

This report, (R21-RF) RS-00003, documents the results of the Final Status Survey and results of sampling performed in September 1998; including the results of the core sampling performed in May 1998.

2.0 SURVEY PREPARATION

2.1 Identifying Survey Units

In preparation for the Final Status Survey, it was necessary to use the geodetic land survey maps drawn by the State of California Geodetic Agency in 1983. Wood or plastic stake markers (bench marks) on a grid map of two hundred feet by two hundred feet square (200-ft x 200-ft) land sectors were established throughout SSFL by geodetic surveys.

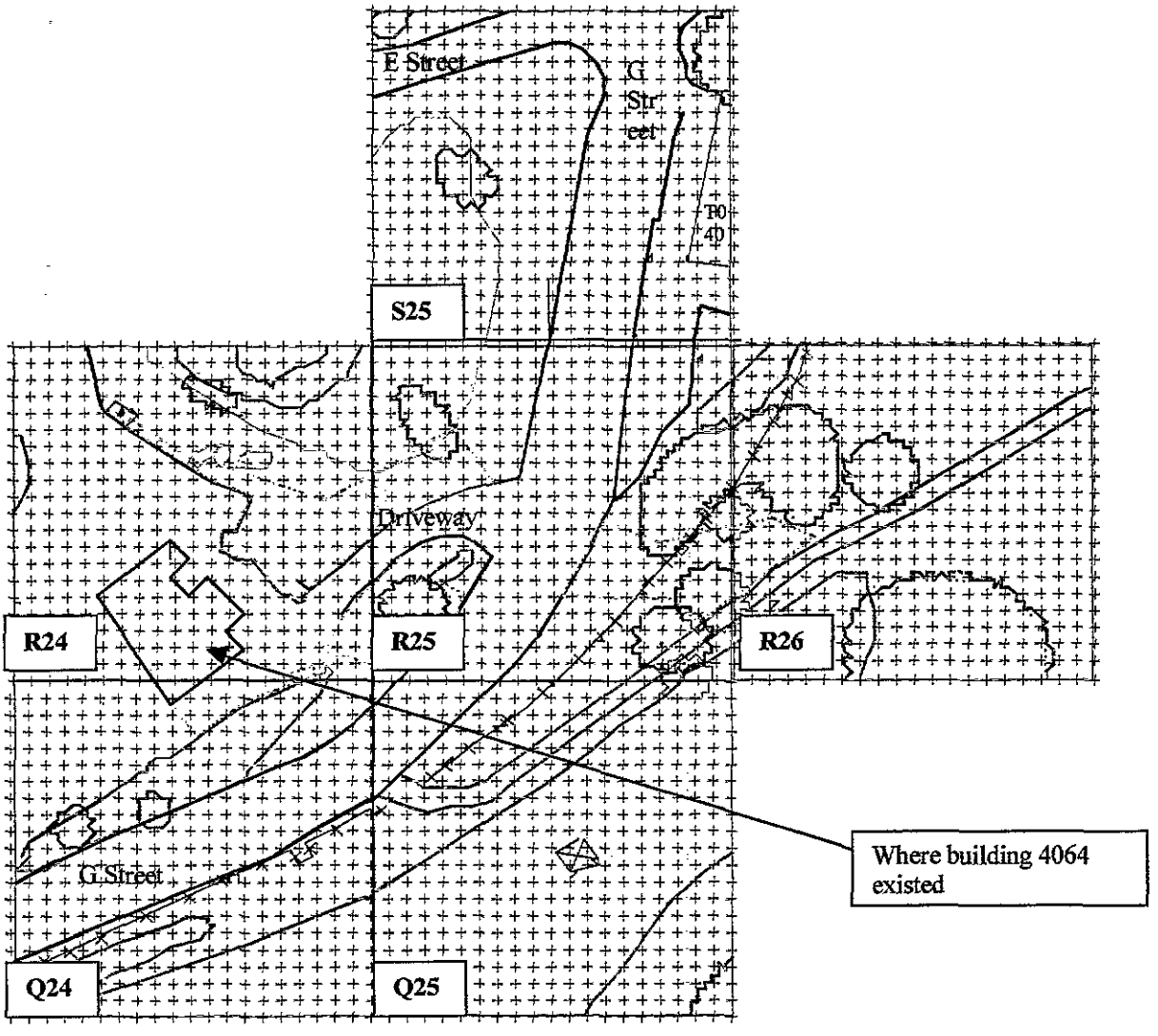


FIGURE 2: AREA 4064 GEODETIC SURVEY GRID LOCATIONS

Locations within each grid block were identified (described below) using block R-24 as an example. The survey team laid a measuring tape between two grid stake markers from R-24 to R-25. This line depicted a south boundary line of the block being surveyed. A second tape was placed at the R-24 to S-24 stakes to establish the west boundary line of the survey block (see Figure 3). The survey team then laid a third measuring tape from R-25 to S-25 to form the east boundary line. This action located the boundary of a 200-ft x 200-ft. square ***survey block***. Figure 3 shows a concept of the method used. The location of the survey points within the *survey block* were described in terms of rectangular distance coordinates of feet north and feet east from the southwest corner of the grid block to the survey location.

Within this *survey block*, the radiological survey measurements were made at 10-ft intervals of north/south, and east/west grid lines superimposed upon the grid. At each survey location, one-minute gamma dose rates were measured a 1-meter height from the ground.

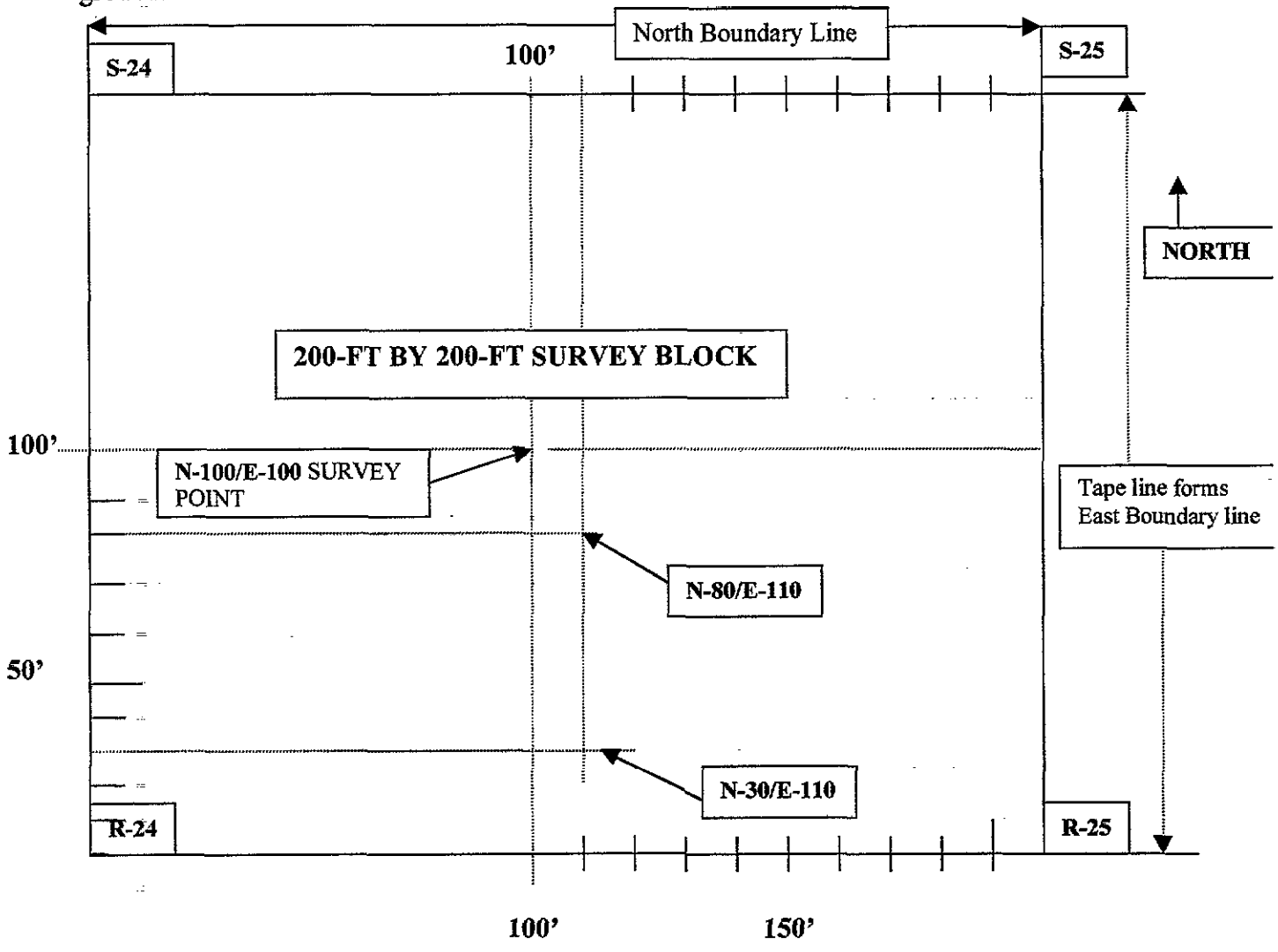


FIGURE 3: EXAMPLE OF BOUNDARY LINES AND RECTANGULAR DISTANCE COORDINANTS WITHIN A SURVEY BLOCK

2.2 Sampling Locations

The gamma activity of any hot spot located was measured at the ground surface and at a 1- meter height above the ground. If the ambient gamma activity at any potential hot spot was greater than 4040cpm (equivalent to 5μR/hr) over the normal background, measured at a 1-meter, or gamma peaks greater than 4100cpm, measured at the surface, then the location of that activity peak was marked. The coordinates were recorded using the measuring tape method described above. All hot spot data was entered on a Walk-about Survey Hot Spot Data Record. If an indicated hot spot prompted a marker during the ambient gamma survey, the HP noted this fact on the "Hot-Spot" Data Record for that survey block.

As the walk-about survey of ground surface gamma activity was an active search for "hot spots" or peaks in the gamma count-rate, wire stakes with colored flags were used to mark hot spots and coordinates. An iridescent pink hot spot flag marked any location where a local peak in gamma activity occurred. Locations where these flags were used were considered radiological suspect locations that required soil sampling and analysis.

2.3 *Sample Collection*

Several sampling locations were identified during the gamma survey that had elevated exposure levels. Soil samples were taken at these locations. The "hot spot" soil samples were in addition to a set of 133 surface samples taken at regular 25-ft intervals over the entire 4064 and surrounding area including south of "G" Street. (Refer to map in Appendix B). The location of the soil samples were centered around Building 4064, it's side yard and south of G street. In addition, soil samples were taken down the slope of 4064 to ensure that migration of contamination had not occurred. Areas with indications of contamination were investigated further to determine the need for additional remediation. Soil was collected into half-liter, maranelli beakers, labeled with a sample identifier, and sent to the laboratory for a gamma spectral analysis with the Canberra Series 100 MCA System with High-Purity Germanium Detector and a "Chain of Custody" tracking form.

The soil sample information was provided for each sample obtained, entered in the Field Logbook, and tracked by Chain of Custody by the Health Physics technician listed as follows:

- Bag Number
- Sample Location
- Sample Depth
- Sample Date
- Sample Personnel
- Sample Description
- Location/Soil Observation - recorded observations and information pertinent to the interpretation of results of the soil sample analyses (e.g. soil coloration, presence of foreign objects nearby, proximity to Geological features, etc.).

2.4 Survey Instrumentation and Techniques

Ambient Gamma Survey
To accurately obtain 1-meter survey measurements in the ambient gamma survey, the Ludlum Model 2221-ESG Scalar/Rate meter was used, with a Model 44-2 sodium iodide detector probe mounted on a lightweight PVC fixture tripod oriented towards the ground at a 1-meter height. Its use eliminated errors due to detector distance or orientation.

Walk-about Survey
The Ludlum Model 44-2 High-Energy Gamma, sodium iodide detector probe was also mounted at the end of a balanced boom, to enable the surveyor to sweep the detector over a large area while walking along the survey path. The fixture for this survey has a length of stainless steel tubing for the boom, with a bracket at one end to hold the detector upright to the ground, and a counterbalance weight at the other end, with a shoulder strap attached to the balance point of the fixture. The arrangement allowed the surveyor to sweep the detector over an area about 5 feet wide while stepping along a straight line.

2.5 Calibration and Checks

The gamma survey instruments are calibrated quarterly and measurement integrity of the instruments were monitored throughout all parts of gamma surveys by daily checks of the instrument's response to normal background radiation and to the Cs-137 check source. The conversion factor used was 215 cpm per mR/hr, based on comparisons with a Reuter-Stokes High Pressure Ion Chamber (HPIC). The daily records of Instrument Qualification Reports are maintained in Building 4487.

2.6 Detection

The principal contaminant of concern in the soil at Area 4064 has been Cs-137 as documented in References 4 and 5. Although other radionuclides including Uranium, Thorium, Plutonium, Strontium-90, Cobalt-60, Europium-152 and Europium154 had been stored in Building 4064, none of these isotopes had been found in the soil, without the accompanying presence of Cs-137. Cesium was therefore used as a tracer for all potential contaminants and MDCs for the scanning portion of the survey based on Cs-137 detectability.

The $DCGL_W$ for Cs-137 in soil is 9.2 pCi/g above background. Background Cs-137 in the vicinity of the site has an upper range of 0.2 to 0.8 pCi/ which is sufficiently less than the $DCGL_W$ that gross (not net or background subtracted) Cs-137 data is used.

3.0 SOIL RELEASE LIMITS

Acceptable contamination limits for releasing Area 4064 for unrestricted use are described in Table 1.

Radionuclide	Soil Guidelines (pCi/g)
Am-241	5.44
Co-60	1.94
Cs-134	3.33
Cs-137	9.20
Eu-152	4.51
Eu-154	4.11
Fe-55	629,000
H-3	31,900
K-40	27.6
Mn-54	6.11
Na-22	2.31
Ni-59	151,000
Ni-63	55,300
Pu-238	37.2
Pu-239	33.9
Pu-240	33.9
Pu-241	230
Pu-242	35.5
Ra-226	5 and 15
Sr-90	36.0
Th-228	5 and 15
Th-232	5 and 15
U-234	30
U-235	30
U-238	35

TABLE 1: SOIL GUIDELINE RELEASE LIMITS

4.0 DATA ANALYSIS

4.1 Ambient Gamma Analysis

The Final Status Survey had to confirm that Area 4064 and surrounding areas were acceptable for unrestricted use. Therefore, the results of the survey must be validated using statistical analysis. A distribution analysis was performed in which the activity was plotted against the cumulative probability using Cumplot 2.20 (see Reference 13). A statistical procedure was used to validate the applicability of the raw Ambient Survey data for selected sample lot areas. The statistical method known as "sampling inspection by variables" was used. This method is widely applied in the industry and military (see Reference 14).

In sampling inspection by variables, the data is assumed to be *normally* (i.e., Gaussian) distributed. The mean of the distribution $\bar{x}$, and its standard deviation s, are then related to a "test statistic," TS, as follows:

$$\mathbf{TS} = \bar{x} + k \cdot s$$

where $\bar{x}$ = average (arithmetic mean of measured values)

s = observed sample standard deviation

k = tolerance factor calculated from the number of samples to achieve the desired sensitivity for the test

TS and $\bar{x}$ are then compared with an acceptance limit, U, to determine acceptance or other plans of action, including rejection of the area as contaminated and requiring further remediation.

The sample mean and standard deviation are easily calculable quantities; the value of **k**, the tolerance factor, is examined. Of the various criteria for selecting plans for acceptance sampling by variables, the most appropriate is the method of *Lot Tolerance Percent Defective* (LTPD) also referred to as the *Rejectable Quality Level* (RQL). The LTPD is defined as the poorest quality that should be accepted in an individual lot. Associated with the LTPD is a parameter referred to as "consumer's risk" (β), the risk of accepting a lot of quality equal to or poorer than the LTPD.

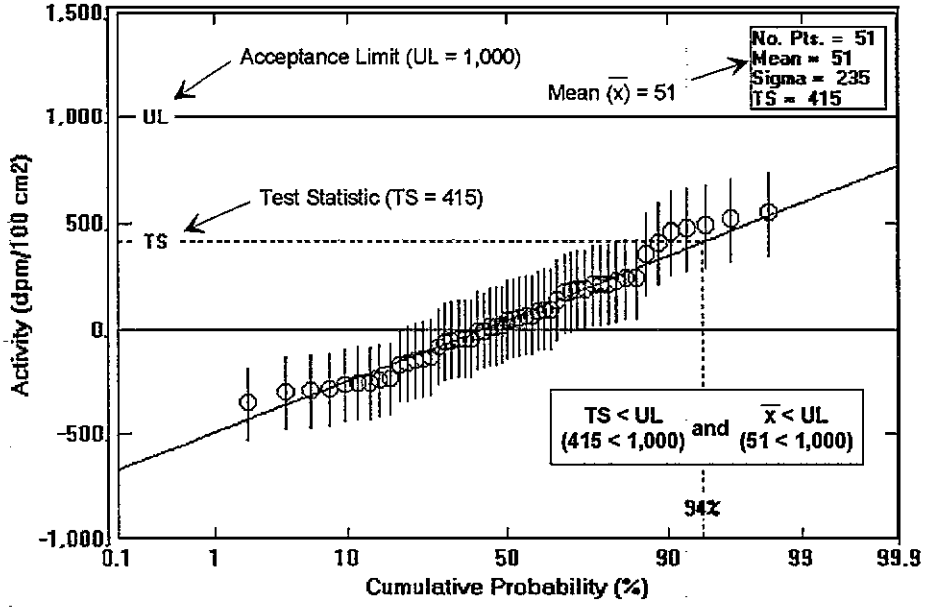
Assigning values for LTPD and β, and given the sample size ***n***, a value for ***k*** can be calculated as follows:

$$k = \frac{K_2 + \sqrt{K_2^2 - ab}}{a};\quad a = 1 - \frac{K_\beta}{2(n-1)};\quad b = K_2^2 - \frac{K_\beta^2}{n}$$

where k = tolerance factor,
K_2 = the normal deviate exceeded with probability equal to the LTPD,
K_β = the normal deviate exceeded with probability of b,
n = number of samples.

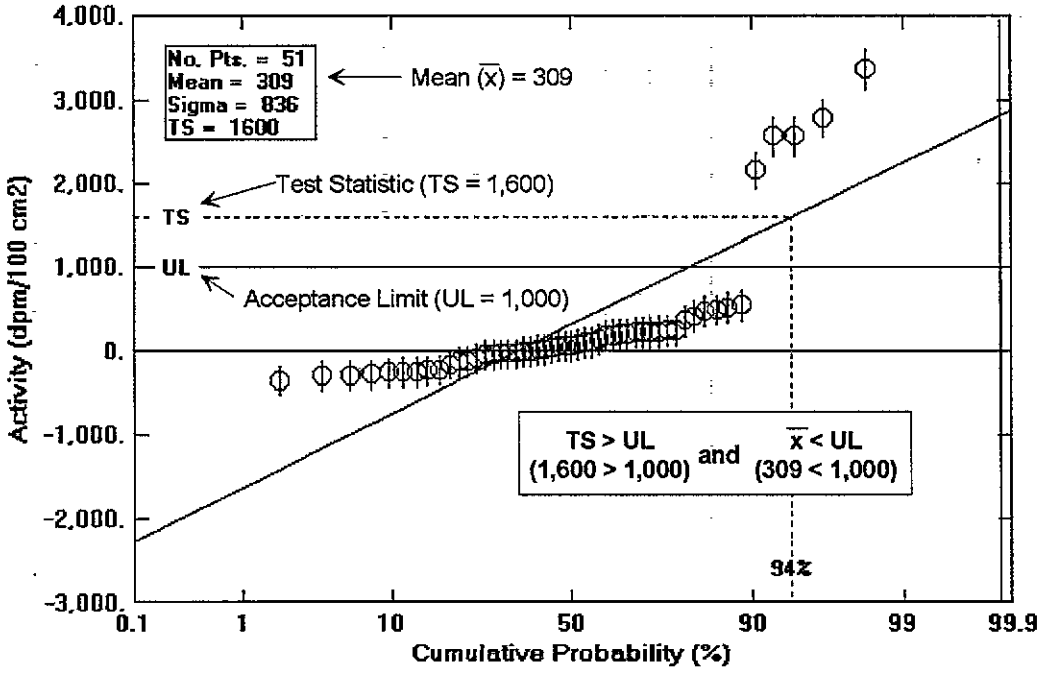
Depending on the data collected, the statistical test may result in one of three conclusions illustrated below:

1. **Acceptance**: If the test statistic ($\bar{x} + k \cdot s$) is less than or equal to the limit (U); accept the region as clean. If any single measured value exceeds 80% of the limit; decontaminate that location to as near background as is possible, but do not change the value in the analysis. Graph A is an example of the sample lot acceptance by the test.



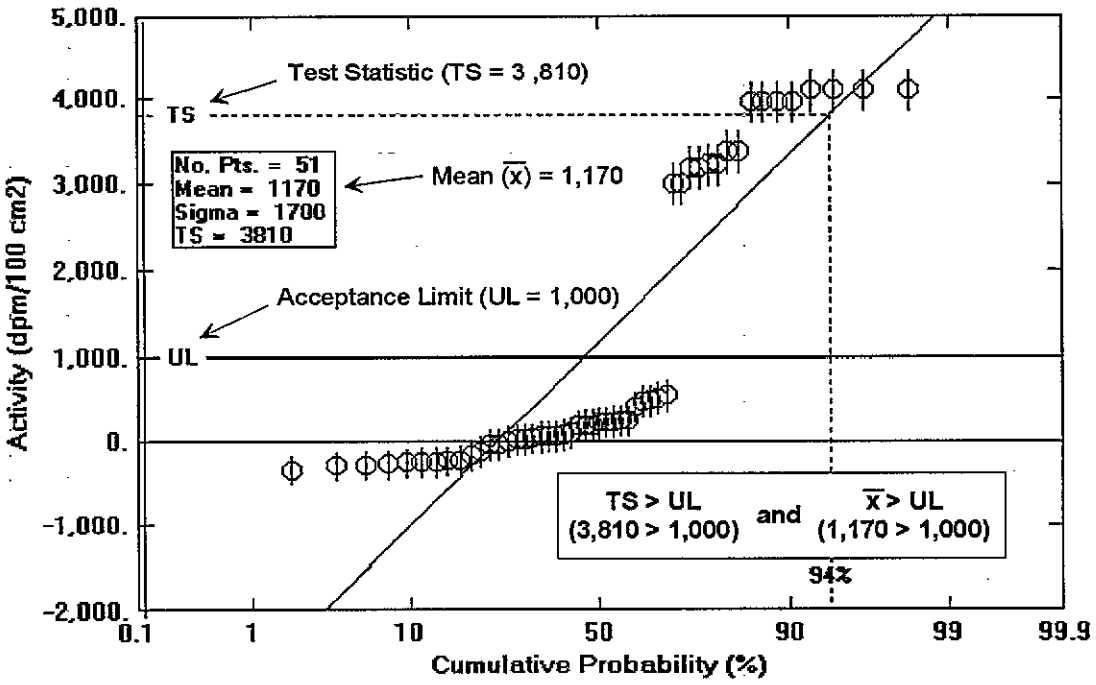
GRAPH A: EXAMPLE OF SAMPLE LOT ACCEPTANCE, WHERE TS ($=\bar{x} + k \cdot s$) ≤ UL and $\bar{x} \leq$ UL

2. **Collect additional measurements**: If the test statistic ($\bar{x} + k \cdot s$) is greater that the limit (U), but $\bar{x}$ itself is less than U, and if independently re-sampling and combining all measured values to determine if $\bar{x} + k \cdot s \leq U$ for the combined set occurs; then accept the region as clean. If not, the region is contaminated and must be remediated. Graph B gives an example of additional measurements that must be taken in the sample lot to accept or reject it.



GRAPH B: EXAMPLE OF SAMPLE LOT REQUIRING ADDITIONAL MEASUREMENTS, WHERE TS (= $\bar{x} + k \cdot s$) > UL and $\bar{x}$ < UL

3. **Rejection:** If the test statistic ($\bar{x} + k \cdot s$) is greater than the limit (U) and $\bar{x} \geq$ U; the region is contaminated and must be remediated. **Graph** C gives an example of sample lot rejection by the test.



GRAPH C: EXAMPLE OF SAMPLE LOT REJECTION, WHERE TS (= $\bar{x} + k \cdot s$) > UL and $\bar{x}$ > UL

The Area 4064 ambient gamma survey was analyzed using a Lot Tolerance Percent Defect of β = LTPD = 5%, for the choices $K_\beta = K_2 = 1.645$ for a region of rejection, one-tailed test. The 5% value used in the example is more conservative than the 10% LTPD Consumer Risk (see Reference 15) used by the USNRC [Regulatory Guide 6.6], and State of California (see Reference 16).

If the statistical tests met the acceptance criteria above, we were willing to accept the hypothesis that the probability of accepting a Sample Lot as not being contaminated, which is in fact 5% or more contaminated. In other words, if the test statistic is less than the release criteria, we are 95% confident that over 95% of the Sample Lot has residual contamination below 100% of the release criteria. This is referred to as the (95/95/100) test (see Reference 14).

Ambient gamma counts were tested against the acceptance criteria for gamma radiation. Measurements for the survey were taken over the period from 8/5/98 through 9/5/98, based on entries from the D&D logbook from Area 4064. Raw data measurements were adjusted for daily instrument background and statistically tested using the Cumplot method. Data was plotted on a cumulative probability graph (Refer to Appendix A). The more linear the data, the closer it approached normal distribution. The test statistic ($TS = \bar{x} + k \cdot s$) was calculated and applicable exposure acceptance limits were compared.

4.2 Soil Collection and Analysis

The minimum number of samples collected was determined through statistical analysis using the following equation from *The Hazardous Waste Consultant November/December 1992*:

$$n = t_\alpha^2 CV^2/p^2$$

where:

n = number of samples

t_α = two tailed t-value at an α level of significance and (n-1) degrees of freedom (obtained from standard statistical tables) = approximately 1.99 for 95% confidence level

CV = coefficient of variation = 95%

p = allowable margin of error = 20% (suggested by *Mason, Benjamin J., Preparation of Soil Sampling Protocol: Techniques and Strategies, EPA-600/4-83-020, August 1983*)

Using the above equation and assumptions, the *minimum* number of soil samples is 90 regardless of area size. More sampling locations were added based on past history practice and further ambient or walkabout survey results. A total of one hundred thirty three (133) grid systematic soil samples were taken in addition to six samples at hot spot areas identified by exposure measurement.

5.0 SURVEY RESULTS

5.1 Subsurface Core Sampling

In April 1998, fifty-two (52) subsurface core samples were obtained from Area 4064 and analyzed. No contamination was found. The results are presented in Appendix C.

5.2 Ambient Gamma Measurements

Prior to the systematic soil sampling, five-hundred fifty three (553) ambient gamma survey points were taken from sectors R-24, R-25, R-26, Q-24, Q-25: wherever Area 4064 was located in those sectors. The ambient gamma background corrected measurements ranged from 0.1 μR/hr to 6.2 μR/hr (see Appendix A) with four potential hot spots shown in Table 2 below, which exceeded 5μR/hr. The potential hot spots required further analysis.

AMBIENT GAMMA MEASUREMENTS		COUNTS/MIN	
Location	GRID SECTOR	Exposure Rate (minus background)	1" NaI Probe @ 1 meter
N130/E130	R-24	6.2 μR/hr	4239
N140/E130	R-24	5.9 μR/hr	4187
N150/E130	R-24	5.3 μR/hr	4051
N110/E180	R-24	5.1 μR/hr	3876

TABLE 2: AMBIENT GAMMA MEASUREMENTS (CORRECTED) FOR POTENTIAL HOT SPOTS

The statistical analysis of the highest ambient gamma measurements (>5.0 μR/hr) or hot spots revealed a slight deviation from normal distribution (Refer to Appendix A). Soil samples were subsequently taken from these locations and measured in a one-minute count using a 3"x3" NaI probe attached to a multi-channel analyzer (MCA). During the one-minute survey, each sample was placed in a half cylindrical lead pig with the NaI probe pointing down at the sample. All the samples were cooled to room temperature before conducting the radiation survey. The results of the NaI screening are shown in Table 3 (Table 1 of Appendix B: samples 064-98-0199 through 064-98-0202).

LOCATION	BAG NO. 064-98-	GRID SECTOR	SAMPLE DEPTH	3" NaI PROBE CTS/MIN
N130/E130	0199	R-24	<0.5 FEET	9095
N140/E130	0200	R-24	<0.5 FEET	9534
N150/E130	0201	R-24	<0.5 FEET	9188
N110/E180	0202	R-24	<0.5 FEET	8579

TABLE 3: GAMMA EXPOSURE MEASUREMENTS OF SOIL SAMPLES

Since each screening result is less than the mean value of all the samples screened, (see Appendix B) it can be concluded that all four ambient gamma samples in Table 5 were less then the cleanup level of 9.2 pCi/g. The high ambient gamma measurements at these locations were likely due to the nearby large rocks which have higher naturally occuring Thorium content than alluvial soil.

5.3 Ambient Gamma Test Statistic Results

The survey data results, shown in Figure A2 of Appendix A, demonstrates for the acceptance limit (UL), the corresponding test statistic (TS) value is less than the upper limit UL, (TS < UL). Therefore, the ambient measurements (lot) pass the "sampling inspection by variables" test and are "accepted" as radiologically clean. The Area 4064 background-subtracted gamma exposure corresponds with a 95% confidence that 95% of the ambient gamma measurements are below 100% (a 95/95/100 test) of the applicable DOE and State of California approved limit for radiation exposure shown in Table 4.

Criteria	Exposure Rates
Acceptance Limit (UL)	5 μR/h
Corrected Ambient Gamma Measurements (TS)	4 μR/h

TABLE 4: COMPARATIVE ACCEPTANCE LIMITS

5.4 Soil Sample Analysis Results

Appendix B shows the results of the systematic and "hot spot" soil sampling. A total of 133 soil samples were taken as shown in Appendix B, Figure 1. Three areas of slightly elevated Cs-137 levels were identified in Appendix B, Table 3. Cesium 137 levels were above background, but below the release limit for 9.2 pCi/gm. However, these locations were excavated to reduce Cs-137 levels even further. The highest post-excavation Cs-137 measured in the locations was 1.3 pCi/gm (14% of the clean-up standard of 9.2 pCi/gm).

5.5 ORISE Sample and Remediation

During the subsequent ORISE verification survey in September 1998, only one hot spot was discovered. The sloping area to the southwest of the Area 4064 parking lot, shown in Figure 4, revealed a hot spot at sector R-23, location N8/E114 with Cs-137 in the range of 7 to 5100 pCi/gm. This was immediately remediated and post-excavation soil samples were obtained. The post-excavation soil samples found a maximum of 3.1 pCi/gm of Cs-137 well below the clean-up standard of 9.2 pCi/gm.

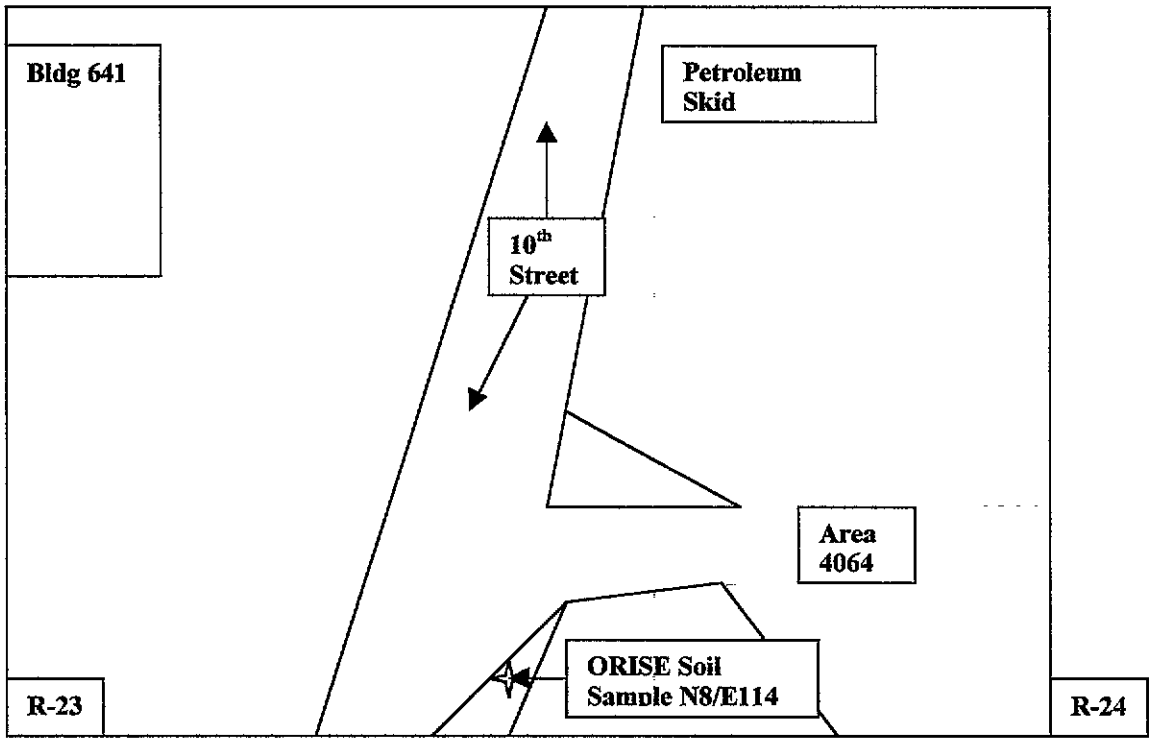


FIGURE 4: ORISE SOIL SAMPLE LOCATION

6.0 CONCLUSION

The test statistic for the distribution of the background-subtracted gamma exposure rate is 4.1 μR/hr, which is below the acceptance limit of 5μR/hr.

The [post-remediation] soil samples indicate that the Cs-137 contamination, historically observed at Area 4064, has been remediated and is now below the clean-up standard of 9.2 pCi/gm. Most samples indicated no Cs-137, while a small number of samples showed trace levels of Cs-137 above background levels with a maximum level of 3.1 pCi/gm.

All soil sample and radiation exposure measurements are below the Department of Energy's and California Department of Health Services' approved release limits. The 4064 area, including surrounding areas, is suitable for release for unrestricted use.

7.0 References

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11. 064-SP-0002 Rocketdyne Procedure, "Area 4064 Final Survey Plan", August 1998.

12. SHEA-16228, Rev 1, "Soil Sampling Results for Building 4064 Area At SSFL", J. Shao, September 1998.

13. Cumplot, Rocketdyne Proprietary Statistical Program.

7.0 References Continued.....

14. MIL-STD-414, "Sampling Procedures and Tables for Inspection by Variables for Percent Defective", June 11, 1957.

15. USNRC Regulatory Guide 6.6,"Acceptance Sampling Procedures for Exempted and Generally Licensed Items Containing By-Product Material".

16. DECON-1, "State of California for Decontaminating Facilities and Equipment Prior to Release for Unrestricted Use", June 1977.

17. DOE Order 5400.5 "Radiation Protection of the Public and Environment", Department of Energy, January 1992, (Figure IV-1).

18. N001SRR140131, Approved Sitewide Release Criteria for Remediation of Facilities at the Santa Susana Field Lab", February 1999.

19. N704SRR990035, "Radiological Assessment of the Building T064 Fenced-in Yard", January 12, 1994.

20. N704SRR990031"Final Decontamination and Radiological Survey of the Building T064 Side Yard", Rev. A, September 1993.

21. A4CM-2R-0011, "Area IV Radiological Characterization Survey", Rev. A, August 15, 1996.

8.0 APPENDICES

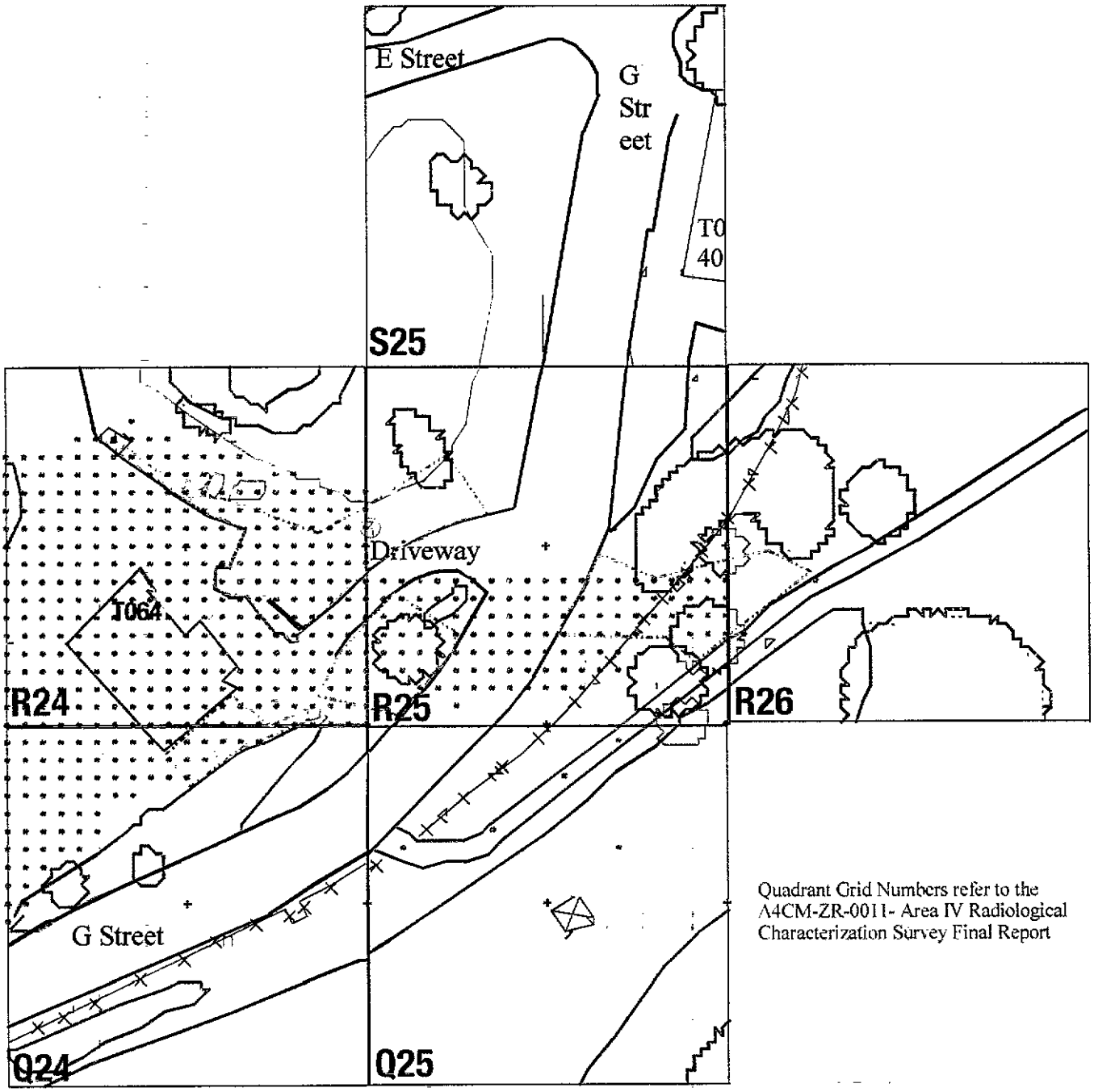
Appendix A

AMBIENT GAMMA SURVEY RESULTS

Appendix B

SURFACE SOIL SAMPLE RESULTS

Figure A1: 4064 Sideyard and "G" Street Area
Ambient Gamma Survey Locations



Quadrant Grid Numbers refer to the A4CM-ZR-0011- Area IV Radiological Characterization Survey Final Report

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t064amb.dsf

Figure A2: Ambient Gamma Measurements (Area 4064)

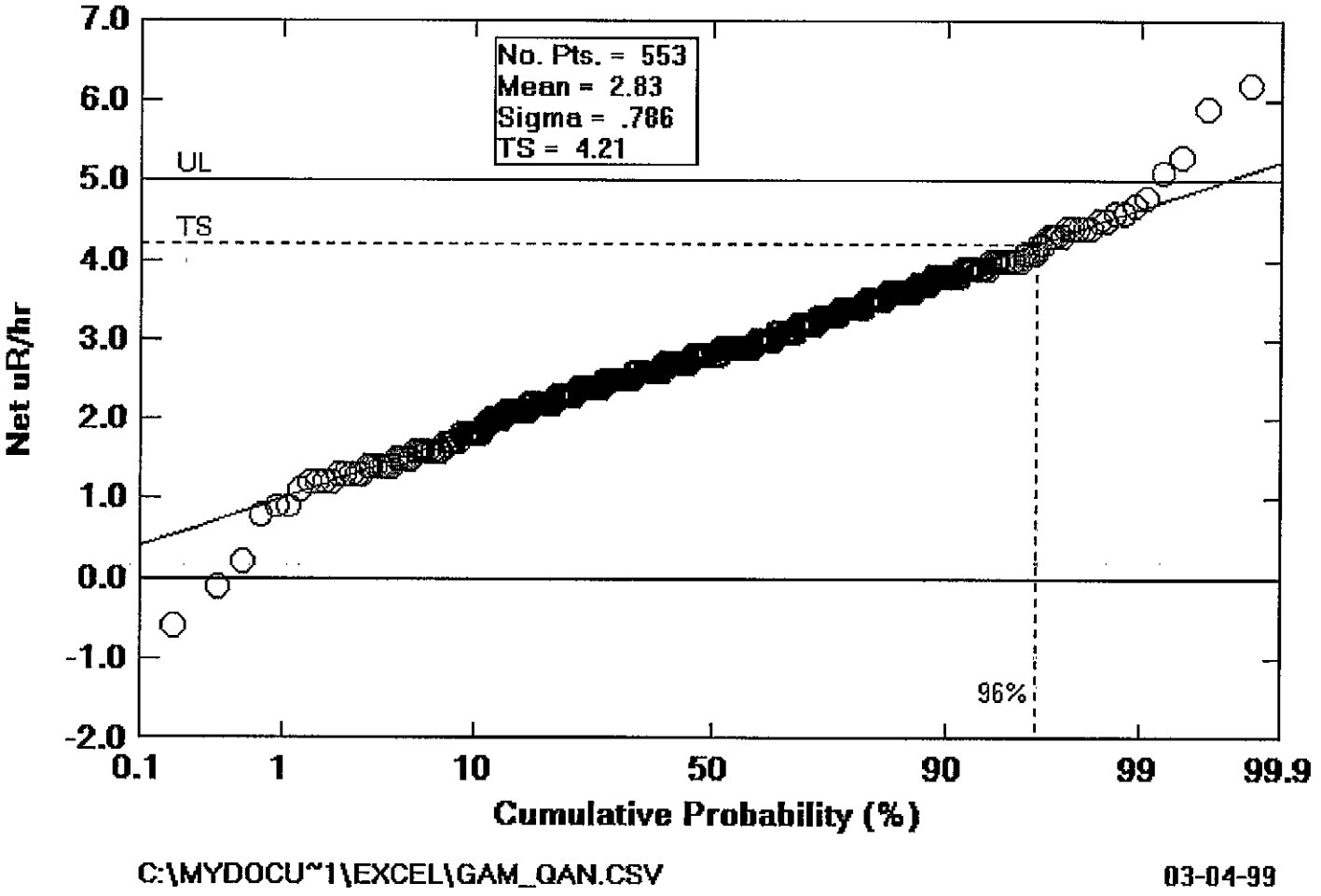

TABLE: A1

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QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

AFFECTED AREA		COUNT DATA Counts Gross	Bkgd	Time (Min)	RESULT DATA Result	MDA	Limit	Result Units
GRID Q24								
N100 E0	08/03/1998	3479.0	2744.5	1.0	3.4	0.60	5.0	uR/hr [net]
N100 E10	08/03/1998	3438.0	2744.5	1.0	3.2	0.60	5.0	uR/hr [net]
N110 E0	08/03/1998	3572.0	2744.5	1.0	3.8	0.60	5.0	uR/hr [net]
N110 E10	08/03/1998	3564.0	2744.5	1.0	3.8	0.60	5.0	uR/hr [net]
N110 E20	08/03/1998	3495.0	2744.5	1.0	3.5	0.60	5.0	uR/hr [net]
N120 E0	08/03/1998	3670.0	2744.5	1.0	4.3	0.60	5.0	uR/hr [net]
N120 E10	08/03/1998	3572.0	2744.5	1.0	3.8	0.60	5.0	uR/hr [net]
N120 E20	08/03/1998	3507.0	2744.5	1.0	3.5	0.60	5.0	uR/hr [net]
N130 E0	08/03/1998	3553.0	2744.5	1.0	3.8	0.60	5.0	uR/hr [net]
N130 E10	08/03/1998	3508.0	2744.5	1.0	3.6	0.60	5.0	uR/hr [net]
N130 E20	08/03/1998	3467.0	2744.5	1.0	3.4	0.60	5.0	uR/hr [net]
N130 E30	08/03/1998	3453.0	2744.5	1.0	3.3	0.60	5.0	uR/hr [net]
N130 E40	08/03/1998	3481.0	2744.5	1.0	3.4	0.60	5.0	uR/hr [net]
N140 E0	08/03/1998	3517.0	2744.5	1.0	3.6	0.60	5.0	uR/hr [net]
N140 E10	08/03/1998	3547.0	2744.5	1.0	3.7	0.60	5.0	uR/hr [net]
N140 E20	08/03/1998	3443.0	2744.5	1.0	3.2	0.60	5.0	uR/hr [net]
N140 E30	08/03/1998	3479.0	2744.5	1.0	3.4	0.60	5.0	uR/hr [net]
N140 E40	08/03/1998	3377.0	2744.5	1.0	2.9	0.60	5.0	uR/hr [net]
N140 E50	08/03/1998	3370.0	2744.5	1.0	2.9	0.60	5.0	uR/hr [net]
N150 E0	08/03/1998	3481.0	2744.5	1.0	3.4	0.60	5.0	uR/hr [net]
N150 E20	08/03/1998	3541.0	2744.5	1.0	3.7	0.60	5.0	uR/hr [net]
N150 E30	08/03/1998	3495.0	2744.5	1.0	3.5	0.60	5.0	uR/hr [net]
N150 E40	08/03/1998	3443.0	2744.5	1.0	3.2	0.60	5.0	uR/hr [net]
N150 E50	08/03/1998	3528.0	2744.5	1.0	3.6	0.60	5.0	uR/hr [net]
N160 E0	08/03/1998	3259.0	2744.5	1.0	2.4	0.60	5.0	uR/hr [net]
N160 E10	08/03/1998	3454.0	2744.5	1.0	3.3	0.60	5.0	uR/hr [net]
N160 E20	08/03/1998	3526.0	2744.5	1.0	3.6	0.60	5.0	uR/hr [net]
N160 E30	08/03/1998	3522.0	2744.5	1.0	3.6	0.60	5.0	uR/hr [net]
N160 E40	08/03/1998	3527.0	2744.5	1.0	3.6	0.60	5.0	uR/hr [net]
N160 E50	08/03/1998	3465.0	2744.5	1.0	3.4	0.60	5.0	uR/hr [net]
N160 E60	08/03/1998	3510.0	2744.5	1.0	3.6	0.60	5.0	uR/hr [net]

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TABLE: A1

QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N160 E70	08/03/1998	3487.0	2744.5	1.0	3.5	0.60	5.0	uR/hr [net]
N170 E0	08/03/1998	3227.0	2744.5	1.0	2.2	0.60	5.0	uR/hr [net]
N170 E10	08/03/1998	3413.0	2744.5	1.0	3.1	0.60	5.0	uR/hr [net]
N170 E100	08/03/1998	3479.0	2744.5	1.0	3.4	0.60	5.0	uR/hr [net]
N170 E20	08/03/1998	3268.0	2744.5	1.0	2.4	0.60	5.0	uR/hr [net]
N170 E30	08/03/1998	3349.0	2744.5	1.0	2.8	0.60	5.0	uR/hr [net]
N170 E40	08/03/1998	3331.0	2744.5	1.0	2.7	0.60	5.0	uR/hr [net]
N170 E50	08/03/1998	3412.0	2744.5	1.0	3.1	0.60	5.0	uR/hr [net]
N170 E60	08/03/1998	3429.0	2744.5	1.0	3.2	0.60	5.0	uR/hr [net]
N170 E70	08/03/1998	3362.0	2744.5	1.0	2.9	0.60	5.0	uR/hr [net]
N170 E80	08/03/1998	3372.0	2744.5	1.0	2.9	0.60	5.0	uR/hr [net]
N170 E90	08/03/1998	3509.0	2744.5	1.0	3.6	0.60	5.0	uR/hr [net]
N180 E0	08/04/1998	3163.0	2807.0	1.0	1.7	0.60	5.0	uR/hr [net]
N180 E10	08/04/1998	3333.0	2807.0	1.0	2.4	0.60	5.0	uR/hr [net]
N180 E100	08/04/1998	3345.0	2807.0	1.0	2.5	0.60	5.0	uR/hr [net]
N180 E110	08/04/1998	3404.0	2807.0	1.0	2.8	0.60	5.0	uR/hr [net]
N180 E20	08/04/1998	3462.0	2807.0	1.0	3.0	0.60	5.0	uR/hr [net]
N180 E30	08/04/1998	3312.0	2807.0	1.0	2.3	0.60	5.0	uR/hr [net]
N180 E40	08/04/1998	3261.0	2807.0	1.0	2.1	0.60	5.0	uR/hr [net]
N180 E50	08/04/1998	3362.0	2807.0	1.0	2.6	0.60	5.0	uR/hr [net]
N180 E60	08/04/1998	3327.0	2807.0	1.0	2.4	0.60	5.0	uR/hr [net]
N180 E70	08/04/1998	3484.0	2807.0	1.0	3.1	0.60	5.0	uR/hr [net]
N180 E80	08/04/1998	3364.0	2807.0	1.0	2.6	0.60	5.0	uR/hr [net]
N180 E90	08/04/1998	3381.0	2807.0	1.0	2.7	0.60	5.0	uR/hr [net]
N190 E0	08/04/1998	3368.0	2807.0	1.0	2.6	0.60	5.0	uR/hr [net]
N190 E10	08/04/1998	3325.0	2807.0	1.0	2.4	0.60	5.0	uR/hr [net]
N190 E100	08/04/1998	3361.0	2807.0	1.0	2.6	0.60	5.0	uR/hr [net]
N190 E110	08/04/1998	3462.0	2807.0	1.0	3.0	0.60	5.0	uR/hr [net]
N190 E120	08/04/1998	3435.0	2807.0	1.0	2.9	0.60	5.0	uR/hr [net]
N190 E130	08/04/1998	3508.0	2807.0	1.0	3.3	0.60	5.0	uR/hr [net]
N190 E140	08/04/1998	3276.0	2807.0	1.0	2.2	0.60	5.0	uR/hr [net]
N190 E20	08/04/1998	3176.0	2807.0	1.0	1.7	0.60	5.0	uR/hr [net]
N190 E30	08/04/1998	3371.0	2807.0	1.0	2.6	0.60	5.0	uR/hr [net]
N190 E40	08/04/1998	3267.0	2807.0	1.0	2.1	0.60	5.0	uR/hr [net]
N190 E50	08/04/1998	3340.0	2807.0	1.0	2.5	0.60	5.0	uR/hr [net]

TABLE: A1

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QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N190 E60	08/04/1998	3322.0	2807.0	1.0	2.4	0.60	5.0	uR/hr [net]
N190 E70	08/04/1998	3313.0	2807.0	1.0	2.4	0.60	5.0	uR/hr [net]
N190 E80	08/04/1998	3422.0	2807.0	1.0	2.9	0.60	5.0	uR/hr [net]
N190 E90	08/04/1998	3310.0	2807.0	1.0	2.3	0.60	5.0	uR/hr [net]
N200 E0	08/04/1998	3443.0	2807.0	1.0	3.0	0.60	5.0	uR/hr [net]
N200 E10	08/04/1998	3327.0	2807.0	1.0	2.4	0.60	5.0	uR/hr [net]
N200 E100	08/04/1998	3310.0	2807.0	1.0	2.3	0.60	5.0	uR/hr [net]
N200 E110	08/04/1998	3254.0	2807.0	1.0	2.1	0.60	5.0	uR/hr [net]
N200 E120	08/04/1998	3309.0	2807.0	1.0	2.3	0.60	5.0	uR/hr [net]
N200 E130	08/04/1998	3388.0	2807.0	1.0	2.7	0.60	5.0	uR/hr [net]
N200 E140	08/04/1998	3454.0	2807.0	1.0	3.0	0.60	5.0	uR/hr [net]
N200 E150	08/04/1998	3415.0	2807.0	1.0	2.8	0.60	5.0	uR/hr [net]
N200 E160	08/04/1998	3436.0	2807.0	1.0	2.9	0.60	5.0	uR/hr [net]
N200 E170	08/04/1998	3538.0	2807.0	1.0	3.4	0.60	5.0	uR/hr [net]
N200 E190	08/04/1998	3604.0	2807.0	1.0	3.7	0.60	5.0	uR/hr [net]
N200 E20	08/04/1998	3143.0	2807.0	1.0	1.6	0.60	5.0	uR/hr [net]
N200 E200	08/04/1998	3603.0	2807.0	1.0	3.7	0.60	5.0	uR/hr [net]
N200 E30	08/04/1998	3197.0	2807.0	1.0	1.8	0.60	5.0	uR/hr [net]
N200 E40	08/04/1998	3248.0	2807.0	1.0	2.1	0.60	5.0	uR/hr [net]
N200 E50	08/04/1998	3189.0	2807.0	1.0	1.8	0.60	5.0	uR/hr [net]
N200 E60	08/04/1998	3349.0	2807.0	1.0	2.5	0.60	5.0	uR/hr [net]
N200 E70	08/04/1998	3368.0	2807.0	1.0	2.6	0.60	5.0	uR/hr [net]
N200 E80	08/04/1998	3381.0	2807.0	1.0	2.7	0.60	5.0	uR/hr [net]
N200 E90	08/04/1998	3360.0	2807.0	1.0	2.6	0.60	5.0	uR/hr [net]
N90 E0	08/03/1998	3505.0	2744.5	1.0	3.5	0.60	5.0	uR/hr [net]
GRID Q25								
N130 E140	08/05/1998	3398.0	2807.0	1.0	2.7	0.60	5.0	uR/hr [net]
N130 E20	08/05/1998	3254.0	2807.0	1.0	2.1	0.60	5.0	uR/hr [net]
N140 E70	08/05/1998	3410.0	2807.0	1.0	2.8	0.60	5.0	uR/hr [net]
N170 E110	08/05/1998	3416.0	2807.0	1.0	2.8	0.60	5.0	uR/hr [net]
N190 E140	08/05/1998	3389.0	2807.0	1.0	2.7	0.60	5.0	uR/hr [net]

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TABLE: A1

QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

GRID R24		COUNT DATA Counts Gross	Bkgd	Time (Min)	RESULT DATA Result	MDA	Limit	Result Units
N0 E0	08/01/1998	3342.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N0 E10	08/01/1998	3382.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N0 E100	08/01/1998	3397.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N0 E110	08/01/1998	3322.0	2782.7	1.0	2.5	0.60	5.0	uR/hr [net]
N0 E120	08/01/1998	3331.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N0 E130	08/01/1998	3405.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N0 E140	08/01/1998	3441.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N0 E150	08/01/1998	3511.0	2782.7	1.0	3.4	0.60	5.0	uR/hr [net]
N0 E160	08/01/1998	3419.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]
N0 E170	08/01/1998	3397.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N0 E180	08/01/1998	3481.0	2782.7	1.0	3.2	0.60	5.0	uR/hr [net]
N0 E190	08/01/1998	3625.0	2782.7	1.0	3.9	0.60	5.0	uR/hr [net]
N0 E20	08/01/1998	3212.0	2782.7	1.0	2.0	0.60	5.0	uR/hr [net]
N0 E200	08/01/1998	3483.0	2782.7	1.0	3.3	0.60	5.0	uR/hr [net]
N0 E30	08/01/1998	3309.0	2782.7	1.0	2.4	0.60	5.0	uR/hr [net]
N0 E40	08/01/1998	3146.0	2782.7	1.0	1.7	0.60	5.0	uR/hr [net]
N0 E50	08/01/1998	3221.0	2782.7	1.0	2.0	0.60	5.0	uR/hr [net]
N0 E50	08/01/1998	3221.0	2782.7	1.0	2.0	0.60	5.0	uR/hr [net]
N0 E60	08/01/1998	3196.0	2782.7	1.0	1.9	0.60	5.0	uR/hr [net]
N0 E70	08/01/1998	3254.0	2782.7	1.0	2.2	0.60	5.0	uR/hr [net]
N0 E80	08/01/1998	3352.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N0 E90	08/01/1998	3290.0	2782.7	1.0	2.4	0.60	5.0	uR/hr [net]
N10 E0	08/01/1998	3539.0	2782.7	1.0	3.5	0.60	5.0	uR/hr [net]
N10 E10	08/01/1998	3640.0	2782.7	1.0	4.0	0.60	5.0	uR/hr [net]
N10 E100	08/01/1998	3265.0	2782.7	1.0	2.2	0.60	5.0	uR/hr [net]
N10 E110	08/01/1998	3436.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]
N10 E120	08/01/1998	3167.0	2782.7	1.0	1.8	0.60	5.0	uR/hr [net]
N10 E130	08/01/1998	3257.0	2782.7	1.0	2.2	0.60	5.0	uR/hr [net]
N10 E140	08/01/1998	3399.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N10 E150	08/01/1998	3318.0	2782.7	1.0	2.5	0.60	5.0	uR/hr [net]
N10 E160	08/01/1998	3362.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N10 E170	08/01/1998	3409.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N10 E180	08/01/1998	3406.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]

TABLE: A1

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[GAM_QAN]

QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N10 E190	08/01/1998	3644.0	2782.7	1.0	4.0	0.60	5.0	uR/hr [net]
N10 E20	08/01/1998	3640.0	2782.7	1.0	4.0	0.60	5.0	uR/hr [net]
N10 E200	08/01/1998	3539.0	2782.7	1.0	3.5	0.60	5.0	uR/hr [net]
N10 E30	08/01/1998	3401.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N10 E40	08/01/1998	3413.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N10 E50	08/01/1998	3168.0	2782.7	1.0	1.8	0.60	5.0	uR/hr [net]
N10 E60	08/01/1998	3244.0	2782.7	1.0	2.1	0.60	5.0	uR/hr [net]
N10 E70	08/01/1998	3349.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N10 E80	08/01/1998	3377.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N10 E90	08/01/1998	3445.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N100 E0	08/01/1998	3445.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N100 E10	08/01/1998	3322.0	2782.7	1.0	2.5	0.60	5.0	uR/hr [net]
N100 E100	08/01/1998	3416.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N100 E110	08/01/1998	3441.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N100 E120	08/01/1998	3454.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N100 E130	08/01/1998	3465.0	2782.7	1.0	3.2	0.60	5.0	uR/hr [net]
N100 E140	08/01/1998	3496.0	2782.7	1.0	3.3	0.60	5.0	uR/hr [net]
N100 E150	08/01/1998	3537.0	2782.7	1.0	3.5	0.60	5.0	uR/hr [net]
N100 E160	08/01/1998	3750.0	2782.7	1.0	4.5	0.60	5.0	uR/hr [net]
N100 E170	08/01/1998	3818.0	2782.7	1.0	4.8	0.60	5.0	uR/hr [net]
N100 E180	08/01/1998	3619.0	2782.7	1.0	3.9	0.60	5.0	uR/hr [net]
N100 E190	08/01/1998	3644.0	2782.7	1.0	4.0	0.60	5.0	uR/hr [net]
N100 E20	08/01/1998	3423.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]
N100 E200	08/01/1998	3538.0	2782.7	1.0	3.5	0.60	5.0	uR/hr [net]
N100 E30	08/01/1998	3372.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N100 E40	08/01/1998	3250.0	2782.7	1.0	2.2	0.60	5.0	uR/hr [net]
N100 E50	08/01/1998	3249.0	2782.7	1.0	2.2	0.60	5.0	uR/hr [net]
N100 E60	08/01/1998	3254.0	2782.7	1.0	2.2	0.60	5.0	uR/hr [net]
N100 E70	08/01/1998	3279.0	2782.7	1.0	2.3	0.60	5.0	uR/hr [net]
N100 E80	08/01/1998	3369.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N100 E90	08/01/1998	3236.0	2782.7	1.0	2.1	0.60	5.0	uR/hr [net]
N110 E0	08/01/1998	3405.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N110 E10	08/01/1998	3299.0	2782.7	1.0	2.4	0.60	5.0	uR/hr [net]
N110 E100	08/01/1998	3601.0	2782.7	1.0	3.8	0.60	5.0	uR/hr [net]
N110 E110	08/01/1998	3553.0	2782.7	1.0	3.6	0.60	5.0	uR/hr [net]

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TABLE A1

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QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N110 E120	08/01/1998	3624.0	2782.7	1.0	3.9	0.60	5.0	uR/hr [net]
N110 E130	08/01/1998	3631.0	2782.7	1.0	3.9	0.60	5.0	uR/hr [net]
N110 E140	08/01/1998	3797.0	2782.7	1.0	4.7	0.60	5.0	uR/hr [net]
N110 E150	08/01/1998	3560.0	2782.7	1.0	3.6	0.60	5.0	uR/hr [net]
N110 E160	08/01/1998	3765.0	2782.7	1.0	4.6	0.60	5.0	uR/hr [net]
N110 E170	08/01/1998	3566.0	2782.7	1.0	3.6	0.60	5.0	uR/hr [net]
N110 E180	08/01/1998	3876.0	2782.7	1.0	5.1	0.60	5.0	uR/hr [net]
N110 E190	08/01/1998	3696.0	2782.7	1.0	4.2	0.60	5.0	uR/hr [net]
N110 E20	08/01/1998	3337.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N110 E200	08/01/1998	3646.0	2782.7	1.0	4.0	0.60	5.0	uR/hr [net]
N110 E30	08/01/1998	3290.0	2782.7	1.0	2.4	0.60	5.0	uR/hr [net]
N110 E40	08/01/1998	3241.0	2782.7	1.0	2.1	0.60	5.0	uR/hr [net]
N110 E50	08/01/1998	3279.0	2782.7	1.0	2.3	0.60	5.0	uR/hr [net]
N110 E60	08/01/1998	3376.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N110 E70	08/01/1998	3354.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N110 E80	08/01/1998	3284.0	2782.7	1.0	2.3	0.60	5.0	uR/hr [net]
N110 E90	08/01/1998	3362.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N120 E0	08/02/1998	3455.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net]
N120 E10	08/02/1998	3388.0	2909.3	1.0	2.2	0.60	5.0	uR/hr [net]
N120 E100	08/02/1998	3628.0	2909.3	1.0	3.3	0.60	5.0	uR/hr [net]
N120 E110	08/02/1998	3663.0	2909.3	1.0	3.5	0.60	5.0	uR/hr [net]
N120 E120	08/02/1998	3779.0	2909.3	1.0	4.0	0.60	5.0	uR/hr [net]
N120 E130	08/02/1998	3838.0	2909.3	1.0	4.3	0.60	5.0	uR/hr [net]
N120 E140	08/02/1998	3762.0	2909.3	1.0	4.0	0.60	5.0	uR/hr [net]
N120 E150	08/02/1998	3848.0	2909.3	1.0	4.4	0.60	5.0	uR/hr [net]
N120 E160	08/02/1998	3603.0	2909.3	1.0	3.2	0.60	5.0	uR/hr [net]
N120 E170	08/02/1998	3736.0	2909.3	1.0	3.8	0.60	5.0	uR/hr [net]
N120 E180	08/02/1998	3733.0	2909.3	1.0	3.8	0.60	5.0	uR/hr [net]
N120 E190	08/02/1998	3861.0	2909.3	1.0	4.4	0.60	5.0	uR/hr [net]
N120 E20	08/02/1998	3318.0	2909.3	1.0	1.9	0.60	5.0	uR/hr [net]
N120 E200	08/02/1998	3700.0	2909.3	1.0	3.7	0.60	5.0	uR/hr [net]
N120 E30	08/02/1998	3448.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net]
N120 E40	08/02/1998	3222.0	2909.3	1.0	1.5	0.60	5.0	uR/hr [net]
N120 E50	08/02/1998	3343.0	2909.3	1.0	2.0	0.60	5.0	uR/hr [net]
N120 E60	08/02/1998	3454.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net]

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QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N120 E70	08/02/1998	3495.0	2909.3	1.0	2.7	0.60	5.0	uR/hr [net]
N120 E80	08/02/1998	3413.0	2909.3	1.0	2.3	0.60	5.0	uR/hr [net]
N120 E90	08/02/1998	3506.0	2909.3	1.0	2.8	0.60	5.0	uR/hr [net]
N130 E0	08/02/1998	3415.0	2909.3	1.0	2.4	0.60	5.0	uR/hr [net]
N130 E10	08/02/1998	3264.0	2909.3	1.0	1.6	0.60	5.0	uR/hr [net]
N130 E100	08/02/1998	3733.0	2909.3	1.0	3.8	0.60	5.0	uR/hr [net]
N130 E110	08/02/1998	3676.0	2909.3	1.0	3.6	0.60	5.0	uR/hr [net]
N130 E120	08/02/1998	3867.0	2909.3	1.0	4.5	0.60	5.0	uR/hr [net]
N130 E130	08/02/1998	4239.0	2909.3	1.0	6.2	0.60	5.0	uR/hr [net]
N130 E140	08/02/1998	3710.0	2909.3	1.0	3.7	0.60	5.0	uR/hr [net]
N130 E150	08/02/1998	3743.0	2909.3	1.0	3.9	0.60	5.0	uR/hr [net]
N130 E160	08/02/1998	3738.0	2909.3	1.0	3.9	0.60	5.0	uR/hr [net]
N130 E170	08/02/1998	3837.0	2909.3	1.0	4.3	0.60	5.0	uR/hr [net]
N130 E180	08/02/1998	3802.0	2909.3	1.0	4.2	0.60	5.0	uR/hr [net]
N130 E190	08/02/1998	3860.0	2909.3	1.0	4.4	0.60	5.0	uR/hr [net]
N130 E20	08/02/1998	3233.0	2909.3	1.0	1.5	0.60	5.0	uR/hr [net]
N130 E200	08/02/1998	3596.0	2909.3	1.0	3.2	0.60	5.0	uR/hr [net]
N130 E30	08/02/1998	3301.0	2909.3	1.0	1.8	0.60	5.0	uR/hr [net]
N130 E40	08/02/1998	3351.0	2909.3	1.0	2.1	0.60	5.0	uR/hr [net]
N130 E50	08/02/1998	3392.0	2909.3	1.0	2.2	0.60	5.0	uR/hr [net]
N130 E60	08/02/1998	3419.0	2909.3	1.0	2.4	0.60	5.0	uR/hr [net]
N130 E70	08/02/1998	3511.0	2909.3	1.0	2.8	0.60	5.0	uR/hr [net]
N130 E80	08/02/1998	3538.0	2909.3	1.0	2.9	0.60	5.0	uR/hr [net]
N130 E90	08/02/1998	3463.0	2909.3	1.0	2.6	0.60	5.0	uR/hr [net]
N140 E0	08/02/1998	3109.0	2909.3	1.0	0.9	0.60	5.0	uR/hr [net]
N140 E10	08/02/1998	3309.0	2909.3	1.0	1.9	0.60	5.0	uR/hr [net]
N140 E100	08/02/1998	3673.0	2909.3	1.0	3.6	0.60	5.0	uR/hr [net]
N140 E110	08/02/1998	3572.0	2909.3	1.0	3.1	0.60	5.0	uR/hr [net]
N140 E130	08/02/1998	4187.0	2909.3	1.0	5.9	0.60	5.0	uR/hr [net]
N140 E150	08/02/1998	3828.0	2909.3	1.0	4.3	0.60	5.0	uR/hr [net]
N140 E160	08/02/1998	3632.0	2909.3	1.0	3.4	0.60	5.0	uR/hr [net]
N140 E20	08/02/1998	3249.0	2909.3	1.0	1.6	0.60	5.0	uR/hr [net]
N140 E30	08/02/1998	3233.0	2909.3	1.0	1.5	0.60	5.0	uR/hr [net]
N140 E40	08/02/1998	3289.0	2909.3	1.0	1.8	0.60	5.0	uR/hr [net]
N140 E50	08/02/1998	3440.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net]

TABLE: A1

QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N140 E60	08/02/1998	3450.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net]
N140 E70	08/02/1998	3506.0	2909.3	1.0	2.8	0.60	5.0	uR/hr [net]
N140 E80	08/02/1998	3626.0	2909.3	1.0	3.3	0.60	5.0	uR/hr [net]
N140 E90	08/02/1998	3691.0	2909.3	1.0	3.6	0.60	5.0	uR/hr [net]
N150 E0	08/02/1998	2783.0	2909.3	1.0	-0.6	0.60	5.0	uR/hr [net]
N150 E10	08/02/1998	2948.0	2909.3	1.0	0.2	0.60	5.0	uR/hr [net]
N150 E100	08/02/1998	3863.0	2909.3	1.0	4.4	0.60	5.0	uR/hr [net]
N150 E110	08/02/1998	3800.0	2909.3	1.0	4.1	0.60	5.0	uR/hr [net]
N150 E120	08/02/1998	3738.0	2909.3	1.0	3.9	0.60	5.0	uR/hr [net]
N150 E130	08/02/1998	4051.0	2909.3	1.0	5.3	0.60	5.0	uR/hr [net]
N150 E20	08/02/1998	3145.0	2909.3	1.0	1.1	0.60	5.0	uR/hr [net]
N150 E30	08/02/1998	3255.0	2909.3	1.0	1.6	0.60	5.0	uR/hr [net]
N150 E40	08/02/1998	3381.0	2909.3	1.0	2.2	0.60	5.0	uR/hr [net]
N150 E50	08/02/1998	3262.0	2909.3	1.0	1.6	0.60	5.0	uR/hr [net]
N150 E60	08/02/1998	3343.0	2909.3	1.0	2.0	0.60	5.0	uR/hr [net]
N150 E70	08/02/1998	3659.0	2909.3	1.0	3.5	0.60	5.0	uR/hr [net]
N150 E80	08/02/1998	3716.0	2909.3	1.0	3.8	0.60	5.0	uR/hr [net]
N150 E90	08/02/1998	3790.0	2909.3	1.0	4.1	0.60	5.0	uR/hr [net]
N160 E40	08/02/1998	3232.0	2909.3	1.0	1.5	0.60	5.0	uR/hr [net]
N160 E50	08/02/1998	3379.0	2909.3	1.0	2.2	0.60	5.0	uR/hr [net]
N160 E60	08/02/1998	2880.0	2909.3	1.0	-0.1	0.60	5.0	uR/hr [net]
N160 E70	08/02/1998	3380.0	2909.3	1.0	2.2	0.60	5.0	uR/hr [net]
N160 E80	08/02/1998	3717.0	2909.3	1.0	3.8	0.60	5.0	uR/hr [net]
N160 E90	08/02/1998	3754.0	2909.3	1.0	3.9	0.60	5.0	uR/hr [net]
N170 E70	08/02/1998	3680.0	2909.3	1.0	3.6	0.60	5.0	uR/hr [net]
N20 E0	08/01/1998	3394.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N20 E10	08/01/1998	3409.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N20 E100	08/01/1998	3265.0	2782.7	1.0	2.2	0.60	5.0	uR/hr [net]
N20 E110	08/01/1998	3397.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N20 E120	08/01/1998	3391.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N20 E130	08/01/1998	3362.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N20 E140	08/01/1998	3367.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N20 E150	08/01/1998	3381.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N20 E160	08/01/1998	3374.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N20 E170	08/01/1998	3420.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]

TABLE: A1

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QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N20 E180	08/01/1998	3516.0	2782.7	1.0	3.4	0.60	5.0	uR/hr [net]
N20 E190	08/01/1998	3667.0	2782.7	1.0	4.1	0.60	5.0	uR/hr [net]
N20 E20	08/01/1998	3272.0	2782.7	1.0	2.3	0.60	5.0	uR/hr [net]
N20 E200	08/01/1998	3767.0	2782.7	1.0	4.6	0.60	5.0	uR/hr [net]
N20 E30	08/01/1998	3371.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N20 E40	08/01/1998	3264.0	2782.7	1.0	2.2	0.60	5.0	uR/hr [net]
N20 E50	08/01/1998	3305.0	2782.7	1.0	2.4	0.60	5.0	uR/hr [net]
N20 E60	08/01/1998	3274.0	2782.7	1.0	2.3	0.60	5.0	uR/hr [net]
N20 E70	08/01/1998	3279.0	2782.7	1.0	2.3	0.60	5.0	uR/hr [net]
N20 E80	08/01/1998	3333.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N20 E90	08/01/1998	3336.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N30 E0	08/01/1998	3362.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N30 E10	08/01/1998	3398.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N30 E100	08/01/1998	3318.0	2782.7	1.0	2.5	0.60	5.0	uR/hr [net]
N30 E110	08/01/1998	3370.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N30 E120	08/01/1998	3389.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N30 E130	08/01/1998	3393.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N30 E140	08/01/1998	3329.0	2782.7	1.0	2.5	0.60	5.0	uR/hr [net]
N30 E150	08/01/1998	3335.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N30 E160	08/01/1998	3360.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N30 E170	08/01/1998	3414.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N30 E180	08/01/1998	3432.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]
N30 E190	08/01/1998	3595.0	2782.7	1.0	3.8	0.60	5.0	uR/hr [net]
N30 E20	08/01/1998	3347.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N30 E200	08/01/1998	3719.0	2782.7	1.0	4.4	0.60	5.0	uR/hr [net]
N30 E30	08/01/1998	3301.0	2782.7	1.0	2.4	0.60	5.0	uR/hr [net]
N30 E40	08/01/1998	3386.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N30 E50	08/01/1998	3448.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N30 E60	08/01/1998	3437.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]
N30 E70	08/01/1998	3357.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N30 E80	08/01/1998	3290.0	2782.7	1.0	2.4	0.60	5.0	uR/hr [net]
N30 E90	08/01/1998	3283.0	2782.7	1.0	2.3	0.60	5.0	uR/hr [net]
N40 E0	08/01/1998	3341.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N40 E10	08/01/1998	3360.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N40 E100	08/01/1998	3372.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]

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TABLE: A1

QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N40 E110	08/01/1998	3331.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N40 E120	08/01/1998	3416.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N40 E130	08/01/1998	3410.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N40 E140	08/01/1998	3414.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N40 E150	08/01/1998	3361.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N40 E160	08/01/1998	3248.0	2782.7	1.0	2.2	0.60	5.0	uR/hr [net]
N40 E170	08/01/1998	3292.0	2782.7	1.0	2.4	0.60	5.0	uR/hr [net]
N40 E180	08/01/1998	3325.0	2782.7	1.0	2.5	0.60	5.0	uR/hr [net]
N40 E190	08/01/1998	3499.0	2782.7	1.0	3.3	0.60	5.0	uR/hr [net]
N40 E20	08/01/1998	3327.0	2782.7	1.0	2.5	0.60	5.0	uR/hr [net]
N40 E200	08/01/1998	3549.0	2782.7	1.0	3.6	0.60	5.0	uR/hr [net]
N40 E30	08/01/1998	3385.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N40 E40	08/01/1998	3323.0	2782.7	1.0	2.5	0.60	5.0	uR/hr [net]
N40 E50	08/01/1998	3342.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N40 E60	08/01/1998	3467.0	2782.7	1.0	3.2	0.60	5.0	uR/hr [net]
N40 E70	08/01/1998	3419.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]
N40 E80	08/01/1998	3391.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N40 E90	08/01/1998	3403.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N50 E0	08/01/1998	3555.0	2782.7	1.0	3.6	0.60	5.0	uR/hr [net]
N50 E10	08/01/1998	3494.0	2782.7	1.0	3.3	0.60	5.0	uR/hr [net]
N50 E100	08/01/1998	3543.0	2782.7	1.0	3.5	0.60	5.0	uR/hr [net]
N50 E110	08/01/1998	3459.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N50 E120	08/01/1998	3482.0	2782.7	1.0	3.3	0.60	5.0	uR/hr [net]
N50 E130	08/01/1998	3472.0	2782.7	1.0	3.2	0.60	5.0	uR/hr [net]
N50 E140	08/01/1998	3407.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N50 E150	08/01/1998	3441.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N50 E160	08/01/1998	3524.0	2782.7	1.0	3.4	0.60	5.0	uR/hr [net]
N50 E170	08/01/1998	3457.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N50 E180	08/01/1998	3409.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N50 E190	08/01/1998	3514.0	2782.7	1.0	3.4	0.60	5.0	uR/hr [net]
N50 E20	08/01/1998	3401.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N50 E200	08/01/1998	3624.0	2782.7	1.0	3.9	0.60	5.0	uR/hr [net]
N50 E30	08/01/1998	3304.0	2782.7	1.0	2.4	0.60	5.0	uR/hr [net]
N50 E40	08/01/1998	3339.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N50 E50	08/01/1998	3338.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]

TABLE: A1

QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N50 E60	08/01/1998	3491.0	2782.7	1.0	3.3	0.60	5.0	uR/hr [net]
N50 E70	08/01/1998	3459.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N50 E80	08/01/1998	3608.0	2782.7	1.0	3.8	0.60	5.0	uR/hr [net]
N50 E90	08/01/1998	3641.0	2782.7	1.0	4.0	0.60	5.0	uR/hr [net]
N60 E0	08/01/1998	3288.0	2782.7	1.0	2.4	0.60	5.0	uR/hr [net]
N60 E10	08/01/1998	3443.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N60 E100	08/01/1998	3512.0	2782.7	1.0	3.4	0.60	5.0	uR/hr [net]
N60 E110	08/01/1998	3317.0	2782.7	1.0	2.5	0.60	5.0	uR/hr [net]
N60 E120	08/01/1998	3420.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]
N60 E130	08/01/1998	3524.0	2782.7	1.0	3.4	0.60	5.0	uR/hr [net]
N60 E140	08/01/1998	3542.0	2782.7	1.0	3.5	0.60	5.0	uR/hr [net]
N60 E150	08/01/1998	3607.0	2782.7	1.0	3.8	0.60	5.0	uR/hr [net]
N60 E160	08/01/1998	3599.0	2782.7	1.0	3.8	0.60	5.0	uR/hr [net]
N60 E170	08/01/1998	3413.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N60 E180	08/01/1998	3510.0	2782.7	1.0	3.4	0.60	5.0	uR/hr [net]
N60 E190	08/01/1998	3565.0	2782.7	1.0	3.6	0.60	5.0	uR/hr [net]
N60 E20	08/01/1998	3410.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N60 E200	08/01/1998	3475.0	2782.7	1.0	3.2	0.60	5.0	uR/hr [net]
N60 E30	08/01/1998	3364.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N60 E40	08/01/1998	3425.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]
N60 E50	08/01/1998	3387.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N60 E60	08/01/1998	3328.0	2782.7	1.0	2.5	0.60	5.0	uR/hr [net]
N60 E70	08/01/1998	3426.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]
N60 E80	08/01/1998	3591.0	2782.7	1.0	3.8	0.60	5.0	uR/hr [net]
N60 E90	08/01/1998	3617.0	2782.7	1.0	3.9	0.60	5.0	uR/hr [net]
N70 E0	08/01/1998	3356.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N70 E10	08/01/1998	3395.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N70 E100	08/01/1998	3410.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N70 E110	08/01/1998	3461.0	2782.7	1.0	3.2	0.60	5.0	uR/hr [net]
N70 E120	08/01/1998	3468.0	2782.7	1.0	3.2	0.60	5.0	uR/hr [net]
N70 E130	08/01/1998	3473.0	2782.7	1.0	3.2	0.60	5.0	uR/hr [net]
N70 E140	08/01/1998	3432.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]
N70 E150	08/01/1998	3442.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N70 E160	08/01/1998	3472.0	2782.7	1.0	3.2	0.60	5.0	uR/hr [net]
N70 E170	08/01/1998	3563.0	2782.7	1.0	3.6	0.60	5.0	uR/hr [net]

TABLE: A1

QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N70 E180	08/01/1998	3492.0	2782.7	1.0	3.3	0.60	5.0	uR/hr [net]
N70 E190	08/01/1998	3483.0	2782.7	1.0	3.3	0.60	5.0	uR/hr [net]
N70 E20	08/01/1998	3530.0	2782.7	1.0	3.5	0.60	5.0	uR/hr [net]
N70 E200	08/01/1998	3444.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N70 E30	08/01/1998	3351.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N70 E40	08/01/1998	3395.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N70 E50	08/01/1998	3472.0	2782.7	1.0	3.2	0.60	5.0	uR/hr [net]
N70 E60	08/01/1998	3419.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]
N70 E70	08/01/1998	3451.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N70 E80	08/01/1998	3522.0	2782.7	1.0	3.4	0.60	5.0	uR/hr [net]
N70 E90	08/01/1998	3395.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N80 E0	08/01/1998	3391.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N80 E10	08/01/1998	3386.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N80 E100	08/01/1998	3346.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N80 E110	08/01/1998	3342.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N80 E120	08/01/1998	3391.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N80 E130	08/01/1998	3458.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N80 E140	08/01/1998	3534.0	2782.7	1.0	3.5	0.60	5.0	uR/hr [net]
N80 E150	08/01/1998	3491.0	2782.7	1.0	3.3	0.60	5.0	uR/hr [net]
N80 E160	08/01/1998	3486.0	2782.7	1.0	3.3	0.60	5.0	uR/hr [net]
N80 E170	08/01/1998	3470.0	2782.7	1.0	3.2	0.60	5.0	uR/hr [net]
N80 E180	08/01/1998	3659.0	2782.7	1.0	4.1	0.60	5.0	uR/hr [net]
N80 E190	08/01/1998	3495.0	2782.7	1.0	3.3	0.60	5.0	uR/hr [net]
N80 E20	08/01/1998	3315.0	2782.7	1.0	2.5	0.60	5.0	uR/hr [net]
N80 E200	08/01/1998	3489.0	2782.7	1.0	3.3	0.60	5.0	uR/hr [net]
N80 E30	08/01/1998	3378.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]
N80 E40	08/01/1998	3526.0	2782.7	1.0	3.5	0.60	5.0	uR/hr [net]
N80 E50	08/01/1998	3434.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]
N80 E60	08/01/1998	3357.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N80 E70	08/01/1998	3458.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N80 E80	08/01/1998	3414.0	2782.7	1.0	2.9	0.60	5.0	uR/hr [net]
N80 E90	08/01/1998	3363.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N90 E0	08/01/1998	3426.0	2782.7	1.0	3.0	0.60	5.0	uR/hr [net]
N90 E10	08/01/1998	3451.0	2782.7	1.0	3.1	0.60	5.0	uR/hr [net]
N90 E100	08/01/1998	3382.0	2782.7	1.0	2.8	0.60	5.0	uR/hr [net]

TABLE: A1

QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N90 E110	08/01/1998	3334.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N90 E120	08/01/1998	3478.0	2782.7	1.0	3.2	0.60	5.0	uR/hr [net]
N90 E130	08/01/1998	3634.0	2782.7	1.0	4.0	0.60	5.0	uR/hr [net]
N90 E140	08/01/1998	3510.0	2782.7	1.0	3.4	0.60	5.0	uR/hr [net]
N90 E150	08/01/1998	3549.0	2782.7	1.0	3.6	0.60	5.0	uR/hr [net]
N90 E160	08/01/1998	3460.0	2782.7	1.0	3.2	0.60	5.0	uR/hr [net]
N90 E170	08/01/1998	3576.0	2782.7	1.0	3.7	0.60	5.0	uR/hr [net]
N90 E180	08/01/1998	3503.0	2782.7	1.0	3.4	0.60	5.0	uR/hr [net]
N90 E190	08/01/1998	3568.0	2782.7	1.0	3.7	0.60	5.0	uR/hr [net]
N90 E20	08/01/1998	3360.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N90 E200	08/01/1998	3493.0	2782.7	1.0	3.3	0.60	5.0	uR/hr [net]
N90 E30	08/01/1998	3285.0	2782.7	1.0	2.3	0.60	5.0	uR/hr [net]
N90 E40	08/01/1998	3324.0	2782.7	1.0	2.5	0.60	5.0	uR/hr [net]
N90 E50	08/01/1998	3360.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
N90 E60	08/01/1998	3342.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N90 E70	08/01/1998	3232.0	2782.7	1.0	2.1	0.60	5.0	uR/hr [net]
N90 E80	08/01/1998	3335.0	2782.7	1.0	2.6	0.60	5.0	uR/hr [net]
N90 E90	08/01/1998	3364.0	2782.7	1.0	2.7	0.60	5.0	uR/hr [net]
GRID R25								
N10 E50	08/02/1998	3181.0	2909.3	1.0	1.3	0.60	5.0	uR/hr [net]
N20 E0	08/02/1998	3756.0	2909.3	1.0	3.9	0.60	5.0	uR/hr [net]
N20 E100	08/02/1998	3470.0	2909.3	1.0	2.6	0.60	5.0	uR/hr [net]
N20 E110	08/02/1998	3436.0	2909.3	1.0	2.4	0.60	5.0	uR/hr [net]
N20 E120	08/02/1998	3361.0	2909.3	1.0	2.1	0.60	5.0	uR/hr [net]
N20 E30	08/02/1998	3456.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net]
N20 E40	08/02/1998	3342.0	2909.3	1.0	2.0	0.60	5.0	uR/hr [net]
N20 E50	08/02/1998	3292.0	2909.3	1.0	1.8	0.60	5.0	uR/hr [net]
N20 E60	08/02/1998	3255.0	2909.3	1.0	1.6	0.60	5.0	uR/hr [net]
N20 E70	08/02/1998	3299.0	2909.3	1.0	1.8	0.60	5.0	uR/hr [net]
N20 E80	08/02/1998	3276.0	2909.3	1.0	1.7	0.60	5.0	uR/hr [net]
N20 E90	08/02/1998	3298.0	2909.3	1.0	1.8	0.60	5.0	uR/hr [net]
N30 E0	08/02/1998	3645.0	2909.3	1.0	3.4	0.60	5.0	uR/hr [net]
N30 E10	08/02/1998	3775.0	2909.3	1.0	4.0	0.60	5.0	uR/hr [net]

TABLE: A1

QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N30 E100	08/02/1998	3447.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net]
N30 E110	08/02/1998	3449.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net]
N30 E120	08/02/1998	3343.0	2909.3	1.0	2.0	0.60	5.0	uR/hr [net]
N30 E130	08/02/1998	3350.0	2909.3	1.0	2.0	0.60	5.0	uR/hr [net]
N30 E140	08/02/1998	3410.0	2909.3	1.0	2.3	0.60	5.0	uR/hr [net]
N30 E20	08/02/1998	3557.0	2909.3	1.0	3.0	0.60	5.0	uR/hr [net]
N30 E30	08/02/1998	3539.0	2909.3	1.0	2.9	0.60	5.0	uR/hr [net]
N30 E40	08/02/1998	3429.0	2909.3	1.0	2.4	0.60	5.0	uR/hr [net]
N30 E50	08/02/1998	3391.0	2909.3	1.0	2.2	0.60	5.0	uR/hr [net]
N30 E60	08/02/1998	3360.0	2909.3	1.0	2.1	0.60	5.0	uR/hr [net]
N30 E70	08/02/1998	3375.0	2909.3	1.0	2.2	0.60	5.0	uR/hr [net]
N30 E80	08/02/1998	3204.0	2909.3	1.0	1.4	0.60	5.0	uR/hr [net]
N30 E90	08/02/1998	3235.0	2909.3	1.0	1.5	0.60	5.0	uR/hr [net]
N40 E0	08/02/1998	3655.0	2909.3	1.0	3.5	0.60	5.0	uR/hr [net]
N40 E10	08/02/1998	3546.0	2909.3	1.0	3.0	0.60	5.0	uR/hr [net]
N40 E100	08/02/1998	3262.0	2909.3	1.0	1.6	0.60	5.0	uR/hr [net]
N40 E110	08/02/1998	3396.0	2909.3	1.0	2.3	0.60	5.0	uR/hr [net]
N40 E120	08/02/1998	3537.0	2909.3	1.0	2.9	0.60	5.0	uR/hr [net]
N40 E130	08/02/1998	3393.0	2909.3	1.0	2.2	0.60	5.0	uR/hr [net]
N40 E140	08/02/1998	3425.0	2909.3	1.0	2.4	0.60	5.0	uR/hr [net]
N40 E20	08/02/1998	3591.0	2909.3	1.0	3.2	0.60	5.0	uR/hr [net]
N40 E30	08/02/1998	3247.0	2909.3	1.0	1.6	0.60	5.0	uR/hr [net]
N40 E40	08/02/1998	3545.0	2909.3	1.0	3.0	0.60	5.0	uR/hr [net]
N40 E50	08/02/1998	3510.0	2909.3	1.0	2.8	0.60	5.0	uR/hr [net]
N40 E60	08/02/1998	3202.0	2909.3	1.0	1.4	0.60	5.0	uR/hr [net]
N40 E70	08/02/1998	3177.0	2909.3	1.0	1.2	0.60	5.0	uR/hr [net]
N40 E80	08/02/1998	3209.0	2909.3	1.0	1.4	0.60	5.0	uR/hr [ne
N40 E90	08/02/1998	3248.0	2909.3	1.0	1.6	0.60	5.0	uR/hr [ne
N50 E0	08/02/1998	3545.0	2909.3	1.0	3.0	0.60	5.0	uR/hr [ne
N50 E10	08/02/1998	3446.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [ne
N50 E100	08/02/1998	3199.0	2909.3	1.0	1.3	0.60	5.0	uR/hr [ne
N50 E110	08/02/1998	3331.0	2909.3	1.0	2.0	0.60	5.0	uR/hr [ne
N50 E120	08/02/1998	3497.0	2909.3	1.0	2.7	0.60	5.0	uR/hr [ne
N50 E130	08/02/1998	3595.0	2909.3	1.0	3.2	0.60	5.0	uR/hr [ne
N50 E140	08/02/1998	3496.0	2909.3	1.0	2.7	0.60	5.0	uR/hr [ne

TABLE A1

QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

01/11/1999
[GAM_QAN]

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N50 E150	08/02/1998	3565.0	2909.3	1.0	3.0	0.60	5.0	uR/hr [net]
N50 E180	08/02/1998	3536.0	2909.3	1.0	2.9	0.60	5.0	uR/hr [net]
N50 E190	08/02/1998	3610.0	2909.3	1.0	3.3	0.60	5.0	uR/hr [net]
N50 E20	08/02/1998	3434.0	2909.3	1.0	2.4	0.60	5.0	uR/hr [net]
N50 E200	08/02/1998	3580.0	2909.3	1.0	3.1	0.60	5.0	uR/hr [net]
N50 E30	08/02/1998	3448.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net]
N50 E40	08/02/1998	3505.0	2909.3	1.0	2.8	0.60	5.0	uR/hr [net]
N50 E50	08/02/1998	3509.0	2909.3	1.0	2.8	0.60	5.0	uR/hr [net]
N50 E60	08/02/1998	3368.0	2909.3	1.0	2.1	0.60	5.0	uR/hr [net]
N50 E70	08/02/1998	3282.0	2909.3	1.0	1.7	0.60	5.0	uR/hr [net]
N50 E80	08/02/1998	3252.0	2909.3	1.0	1.6	0.60	5.0	uR/hr [net]
N50 E90	08/02/1998	3222.0	2909.3	1.0	1.5	0.60	5.0	uR/hr [net]
N60 E0	08/02/1998	3404.0	2909.3	1.0	2.3	0.60	5.0	uR/hr [net]
N60 E10	08/02/1998	3430.0	2909.3	1.0	2.4	0.60	5.0	uR/hr [net]
N60 E100	08/02/1998	3291.0	2909.3	1.0	1.8	0.60	5.0	uR/hr [net]
N60 E110	08/02/1998	3284.0	2909.3	1.0	1.7	0.60	5.0	uR/hr [net]
N60 E120	08/02/1998	3404.0	2909.3	1.0	2.3	0.60	5.0	uR/hr [net]
N60 E130	08/02/1998	3461.0	2909.3	1.0	2.6	0.60	5.0	uR/hr [net]
N60 E140	08/02/1998	3532.0	2909.3	1.0	2.9	0.60	5.0	uR/hr [net]
N60 E150	08/02/1998	3541.0	2909.3	1.0	2.9	0.60	5.0	uR/hr [net]
N60 E160	08/02/1998	3513.0	2909.3	1.0	2.8	0.60	5.0	uR/hr [net]
N60 E170	08/02/1998	3526.0	2909.3	1.0	2.9	0.60	5.0	uR/hr [net]
N60 E180	08/02/1998	3638.0	2909.3	1.0	3.4	0.60	5.0	uR/hr [net]
N60 E190	08/02/1998	3442.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net]
N60 E20	08/02/1998	3469.0	2909.3	1.0	2.6	0.60	5.0	uR/hr [net]
N60 E200	08/02/1998	3501.0	2909.3	1.0	2.8	0.60	5.0	uR/hr [net]
N60 E30	08/02/1998	3481.0	2909.3	1.0	2.7	0.60	5.0	uR/hr [net]
N60 E50	08/02/1998	3569.0	2909.3	1.0	3.1	0.60	5.0	uR/hr [net]
N60 E60	08/02/1998	3479.0	2909.3	1.0	2.6	0.60	5.0	uR/hr [net]
N60 E70	08/02/1998	3210.0	2909.3	1.0	1.4	0.60	5.0	uR/hr [net]
N60 E80	08/02/1998	3207.0	2909.3	1.0	1.4	0.60	5.0	uR/hr [net]
N60 E90	08/02/1998	3290.0	2909.3	1.0	1.8	0.60	5.0	uR/hr [net]
N70 E0	08/02/1998	3439.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net]
N70 E10	08/02/1998	3319.0	2909.3	1.0	1.9	0.60	5.0	uR/hr [net]
N70 E100	08/02/1998	3171.0	2909.3	1.0	1.2	0.60	5.0	uR/hr [net]

TABLE: A1

QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N70 E110	08/02/1998	3188.0	2909.3	1.0	1.3	0.60	5.0	uR/hr [net]
N70 E120	08/02/1998	3274.0	2909.3	1.0	1.7	0.60	5.0	uR/hr [net]
N70 E130	08/02/1998	3706.0	2909.3	1.0	3.7	0.60	5.0	uR/hr [net]
N70 E140	08/02/1998	3772.0	2909.3	1.0	4.0	0.60	5.0	uR/hr [net]
N70 E150	08/02/1998	3695.0	2909.3	1.0	3.7	0.60	5.0	uR/hr [net]
N70 E160	08/02/1998	3615.0	2909.3	1.0	3.3	0.60	5.0	uR/hr [net]
N70 E170	08/02/1998	3597.0	2909.3	1.0	3.2	0.60	5.0	uR/hr [net]
N70 E180	08/02/1998	3562.0	2909.3	1.0	3.0	0.60	5.0	uR/hr [net]
N70 E190	08/02/1998	3550.0	2909.3	1.0	3.0	0.60	5.0	uR/hr [net]
N70 E20	08/02/1998	3532.0	2909.3	1.0	2.9	0.60	5.0	uR/hr [net]
N70 E200	08/02/1998	3620.0	2909.3	1.0	3.3	0.60	5.0	uR/hr [net]
N70 E30	08/02/1998	3359.0	2909.3	1.0	2.1	0.60	5.0	uR/hr [net]
N70 E40	08/02/1998	3353.0	2909.3	1.0	2.1	0.60	5.0	uR/hr [net]
N70 E50	08/02/1998	3539.0	2909.3	1.0	2.9	0.60	5.0	uR/hr [net]
N70 E60	08/02/1998	3368.0	2909.3	1.0	2.1	0.60	5.0	uR/hr [net]
N70 E70	08/02/1998	3253.0	2909.3	1.0	1.6	0.60	5.0	uR/hr [net]
N70 E80	08/02/1998	3190.0	2909.3	1.0	1.3	0.60	5.0	uR/hr [net]
N70 E90	08/02/1998	3188.0	2909.3	1.0	1.3	0.60	5.0	uR/hr [net]
N80 E0	08/02/1998	3400.0	2909.3	1.0	2.3	0.60	5.0	uR/hr [net]
N80 E10	08/02/1998	3406.0	2909.3	1.0	2.3	0.60	5.0	uR/hr [net]
N80 E100	08/02/1998	3171.0	2909.3	1.0	1.2	0.60	5.0	uR/hr [net]
N80 E110	08/02/1998	3104.0	2909.3	1.0	0.9	0.60	5.0	uR/hr [net]
N80 E120	08/02/1998	3073.0	2909.3	1.0	0.8	0.60	5.0	uR/hr [net]
N80 E130	08/02/1998	3447.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net]
N80 E140	08/02/1998	3635.0	2909.3	1.0	3.4	0.60	5.0	uR/hr [net]
N80 E150	08/02/1998	3717.0	2909.3	1.0	3.8	0.60	5.0	uR/hr [net
N80 E160	08/02/1998	3610.0	2909.3	1.0	3.3	0.60	5.0	uR/hr [net
N80 E170	08/02/1998	3450.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net
N80 E180	08/02/1998	3462.0	2909.3	1.0	2.6	0.60	5.0	uR/hr [net
N80 E190	08/02/1998	3445.0	2909.3	1.0	2.5	0.60	5.0	uR/hr [net
N80 E20	08/02/1998	3472.0	2909.3	1.0	2.6	0.60	5.0	uR/hr [net
N80 E200	08/02/1998	3639.0	2909.3	1.0	3.4	0.60	5.0	uR/hr [net
N80 E30	08/02/1998	3358.0	2909.3	1.0	2.1	0.60	5.0	uR/hr [net
N80 E40	08/02/1998	3390.0	2909.3	1.0	2.2	0.60	5.0	uR/hr [net
N80 E50	08/02/1998	3305.0	2909.3	1.0	1.8	0.60	5.0	uR/hr [net

TABLE: A1

QUANTITATIVE GAMMA MEASUREMENT
SUMMARY OF RESULTS
BUILDING 64 GROUNDS

		COUNT DATA			RESULT DATA			
		Counts		Time				
		Gross	Bkgd	(Min)	Result	MDA	Limit	Result Units
N80 E60	08/02/1998	3415.0	2909.3	1.0	2.4	0.60	5.0	uR/hr [net]
N80 E70	08/02/1998	3218.0	2909.3	1.0	1.4	0.60	5.0	uR/hr [net]
N80 E80	08/02/1998	3170.0	2909.3	1.0	1.2	0.60	5.0	uR/hr [net]
N80 E90	08/02/1998	3201.0	2909.3	1.0	1.4	0.60	5.0	uR/hr [net]
GRID R26								
N0 E0	08/05/1998	3355.0	2807.0	1.0	2.5	0.60	5.0	uR/hr [net]
N50 E10	08/05/1998	3650.0	2807.0	1.0	3.9	0.60	5.0	uR/hr [net]
N80 E50	08/05/1998	3406.0	2807.0	1.0	2.8	0.60	5.0	uR/hr [net]

APPENDIX B

SURFACE SOIL SAMPLE RESULTS

BOEING

The Boeing Company
Rocketdyne Propulsion & Power

6633 Canoga Ave.
P.O. Box 7922
Canoga Park, CA 91309-7922

Date: September 24, 1998

No.: SHEA-16228 (Revision)

To: Philip Rutherford
D/641, 055, T487
(818)586-6140

From: John Shao
D/641, 055, T487
(818)586-8024

Subject: Soil Sampling Results for Building 064 area at SSFL (Revision)

This report summarizes the findings from a radiation survey performed on samples from SSFL's Building 64 area following extensive excavation. The soil sampling method and the analytical techniques used are also described.

In the past, in order to ascertain the levels of radioactivity in soil, a relatively large series of soil samples was taken and then counted on a GeLi gamma spectroscopy system. This resulted in a significant investment of project schedule time for sample analysis. A technique using a screening process for preliminary sample selection was needed in order to reduce schedule impact. The screening process and the results of analysis are described below.

Screening Process Using Portable 3x3 NaI and MCA

All together, a total of 137 soil samples were screened from the Building 64 area. Each soil sample was placed in a plastic bag, uniquely numbered, and subsequently placed in a "B"-box in numerical order. The samples were then removed from the "B"-box and measured in a one-minute count using a 3"x3" NaI probe attached to a multi-channel analyzer (MCA). During the one-minute survey, each sample was placed in a half cylindrical lead pig with the NaI probe pointing down at the sample. All the samples were cooled to room temperature before the radiation survey.

The screening results from the NaI probe are presented in Table 1 and Drawing 064-01. The gamma measurements range from 8274 to 10857 counts/minute with the mean value at 9668 counts/minute. To better understand the results of the survey, further statistical analysis was performed. A cumulative probability chart was plotted using Cumplot Version 2.20[1] (see Cumulative Probability Plot). This chart shows that the gamma exposure results have nearly ideal normal distribution. Only minimal variance from normal distribution was detected at the lower extreme of the cumulative probability. Since the soil gamma exposure measurements suggested that the soil radioactive content was normally distributed, the highest, lowest, and mid-range samples were selected for analysis. Each sample was transferred to a marinelli, weighed, and analyzed in the lab using a high Ge(Li) gamma spectrometer. The highest, mid-range, and lowest samples were found to contain 2.69, 0.11, and 0.41 pCi/g of Cs-137 respectively (the location of the highest counts/minute sample is one of the areas excavated). Two additional samples were then selected (at the "1/4" point and the "3/4" point of the distribution). Both "1/4" point and the"3/4" point samples had 0.03 pCi/g of Cs-137. Table 2 summarizes the results from the gamma spectroscopy analysis.

Locations with High Ambient Gamma Measurements

Prior to soil sampling, the ambient gamma survey was performed every 10 ft^2 in the Building 64 area. Statistical analysis of the survey results revealed four locations with high ambient gamma measurements (>5.0 μR/hr) that deviated slightly from normal distribution. Soil samples were subsequently taken from these locations and were screened with a 3"x3" NaI probe. The results of the NaI screening are shown in Table 1 (samples 064-98-0199 thru 064-98-0202). Since each screening result is less than the mean value of all the samples screened, it can be concluded that all four samples are less then the cleanup level of 9.20 pCi/g. The high ambient gamma measurements at these locations are likely due to the nearby large boulder(s).

Excavation and Post-Excavation Sample Analysis

During the NaI screening process, samples from four locations (R24-37.5-190, R24-112.5-137.5, Q24-162.5-12.5, and Q24-159.5-12.5) revealed a Cs-137 peak on the portable multi-channel analyzer. These samples were therefore analyzed on the laboratory Ge(Li) gamma spectrometer and found to contain Cs-137 concentrations that ranged from 2.57 to 6.34 pCi/g (see Table 3).

A solid asphalt sample taken at R24-37.5-190 revealed a Cs-137 concentration of 13.68 pCi/g, which is higher than the release limit. To determine whether the radiological contamination was also in the soil, the asphalt from bag #064-98-0186 was separated from the soil by a sieve with 0.0331-inch mesh. After analyzing the two separated samples, the Cs-137 contamination was found to be in both the soil (7.36 pCi/g) and in the asphalt (3.93 pCi/g). The asphalt and soil from this location were removed. Subsequent sampling at R24-37.5-190 indicated only 0.53 pCi/g activity.

Areas surrounding the other three locations were also excavated and resampled. Table 3 summarizes the Cs-137 concentrations before and after excavation at all four locations. The highest post-excavation Cs-137 activity at Q24-162.5-12.5 and the neighboring Q24-159.5-12.5 is 1.30 pCi/g, or 14% of the cleanup standard of 9.2 pCi/g.

Background Determination

A soil sample representing the background at SSFL was taken approximately 150 feet west of Building 020, in an area unaffected by Building 20 operations. Using the same sodium iodine detector and the same method, ten measurements were taken. The mean background soil measurement was 8927 counts/minute, and the experimental standard deviation was 77 counts/minute (see Table 4). The gamma spectroscopy result confirms the background sample has less than the minimum detectable activity of Cs-137 (see Table 2).

Summary

In summary, four of the 137 samples screened have Cs-137 concentration higher than fall out concentration. Immediate areas surrounding these four samples were excavated and removed. Analysis of samples taken after the excavation indicates cesium-137 activity well below the release limit of 9.2 pCi/g. The remaining 133 samples can be concluded to be below the release limit based on: 1) the screening results are normally distributed, 2) all five representative samples are less than the release limit of Cs-137, and 3) the efficiency demonstrated by the 3"x3" NaI probe. The greater efficiency provided by the 3"x3"

NaI probe and the multi-channel analyzer is an improvement to the screening technique over the 1"x1" NaI detector. The results presented in this report suggest that the screening process technique used has a great potential for reducing the time and costs of field sample analysis.

If you have any questions regarding this report, please call me at (818) 586-8024.

John Shao

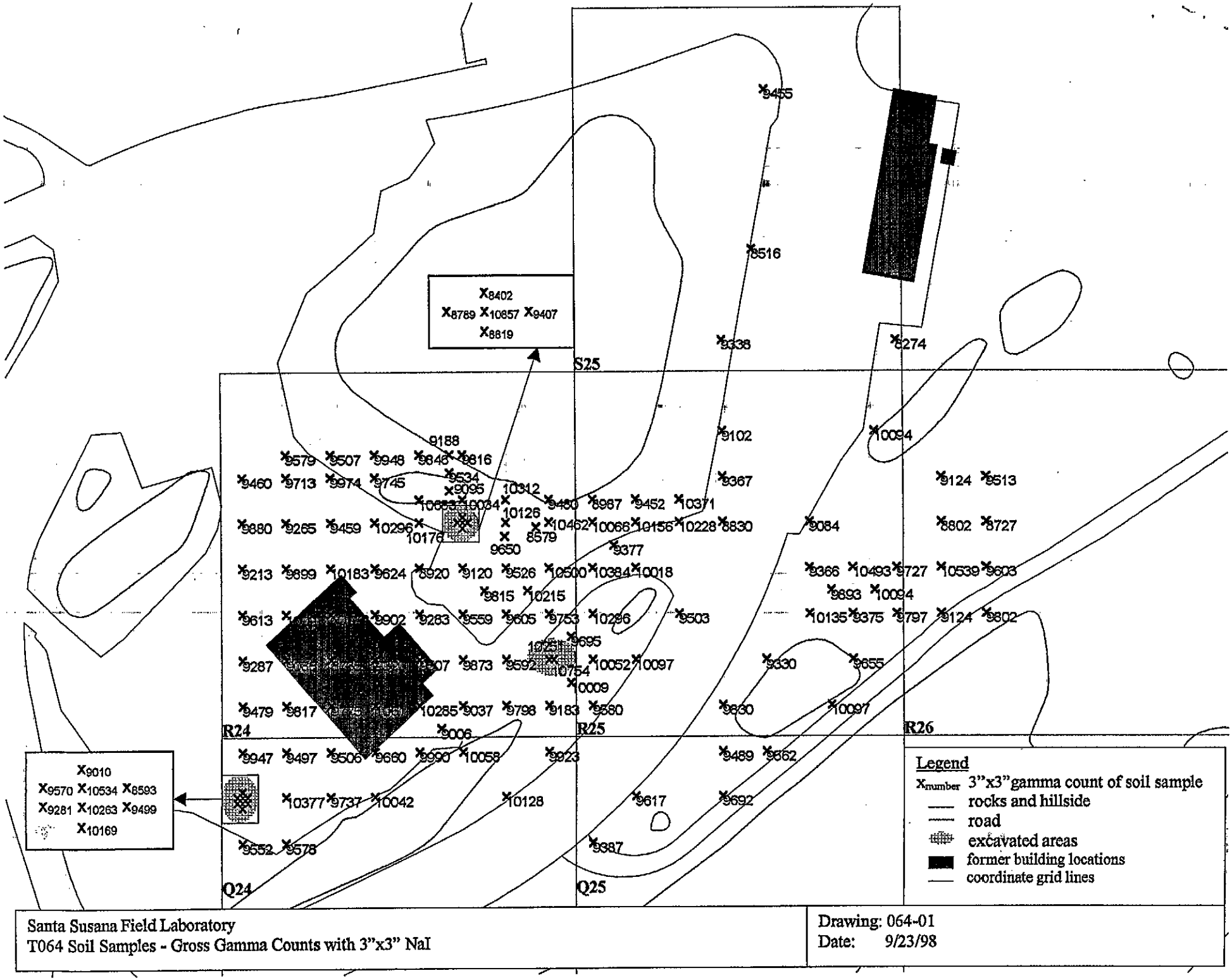
Radiation Safety

cc: Philip Horton

James Barnes

Building 64 File

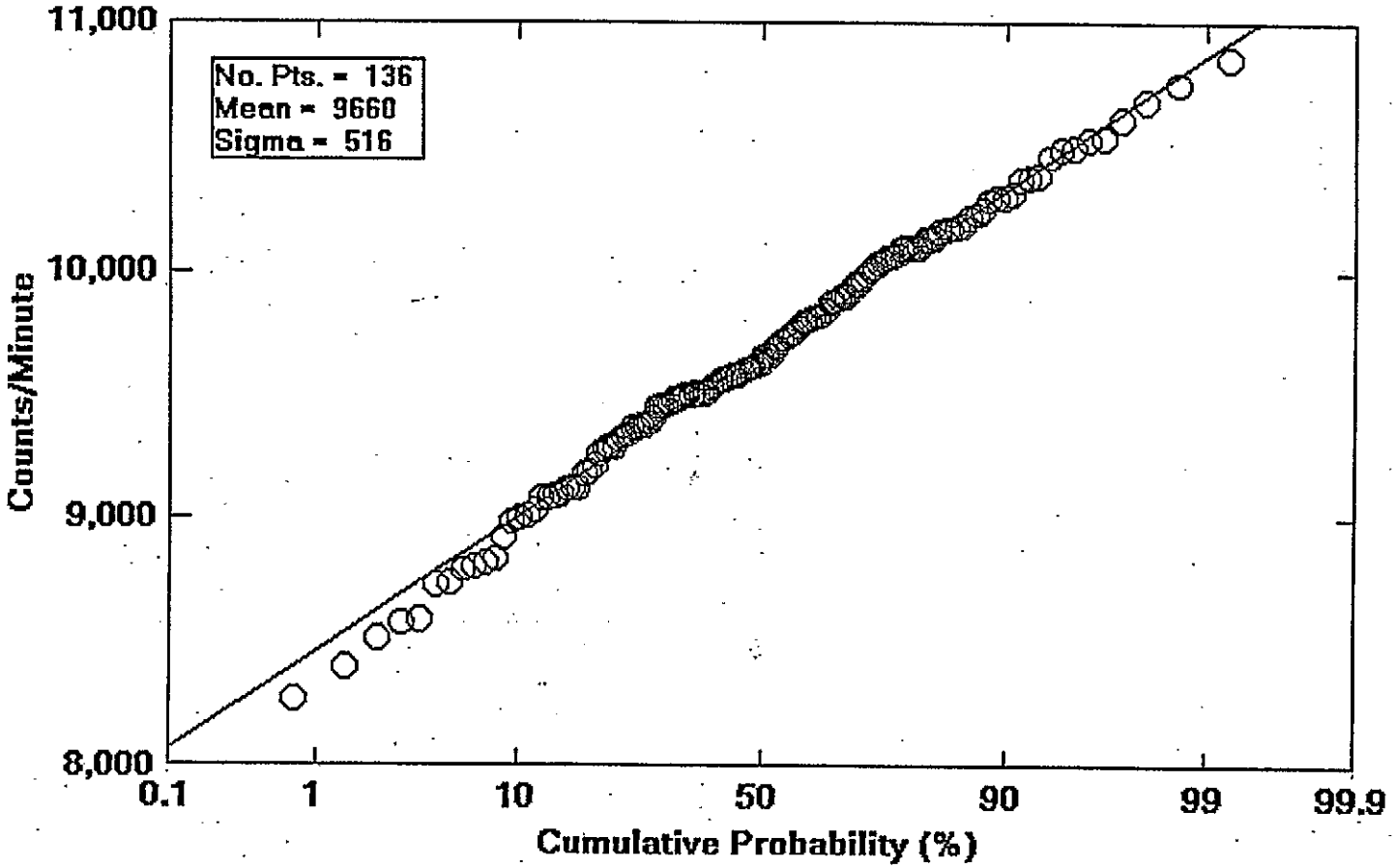
[1] Proprietary Software. Boeing



Santa Susana Field Laboratory
T064 Soil Samples - Gross Gamma Counts with 3"x3" NaI

Drawing: 064-01
Date: 9/23/98

Screening Results (Bldg 64 Soil Samples)



U:\DIR00005.CHK\RADIAT~1\BLDG64.CSV

09-21-98

TABLE 1. Gamma Exposure Measurements of Soil Samples from Building 064.

Bag #	Counts/Minute	Grid Number	Feet North	Feet East	Sample Depth (ft)
064-98-0053	9006	R24	0	125	<0.5
064-98-0054	9479	R24	12.5	12.5	<0.5
064-98-0055	9817	R24	12.5	37.5	<0.5
064-98-0056	9775	R24	12.5	62.5	<0.5
064-98-0057	10611	R24	12.5	87.5	<0.5
064-98-0058	10285	R24	12.5	112.5	<0.5
064-98-0059	9037	R24	12.5	137.5	<0.5
064-98-0060	9798	R24	12.5	162.5	<0.5
064-98-0061	9183	R24	12.5	187.5	<0.5
064-98-0062	9287	R24	37.5	12.5	<0.5
064-98-0063	9086	R24	37.5	37.5	<0.5
064-98-0064	8735	R24	37.5	62.5	<0.5
064-98-0065	9320	R24	37.5	87.5	<0.5
064-98-0066	9507	R24	37.5	112.5	<0.5
064-98-0067	9873	R24	37.5	137.5	<0.5
064-98-0068	9592	R24	37.5	162.5	<0.5
064-98-0069	10251	R24	37.5	187.5	<0.5
064-98-0070	9613	R24	62.5	12.5	<0.5
064-98-0071	10091	R24	62.5	37.5	<0.5
064-98-0072	10172	R24	62.5	62.5	<0.5
064-98-0073	9902	R24	62.5	87.5	<0.5
064-98-0074	9283	R24	62.5	112.5	<0.5
064-98-0075	9559	R24	62.5	137.5	<0.5
064-98-0076	9605	R24	62.5	162.5	<0.5
064-98-0077	9753	R24	62.5	187.5	<0.5
064-98-0078	9815	R24	75	150	<0.5
064-98-0079	10215	R24	75	175	<0.5
064-98-0080	9213	R24	87.5	12.5	<0.5
064-98-0081	9899	R24	87.5	37.5	<0.5
064-98-0082	10183	R24	87.5	62.5	<0.5
064-98-0083	9624	R24	87.5	87.5	<0.5
064-98-0084	8920	R24	87.5	112.5	<0.5
064-98-0085	9120	R24	87.5	137.5	<0.5
064-98-0086	9526	R24	87.5	162.5	<0.5
064-98-0087	10500	R24	87.5	187.5	<0.5
064-98-0088	9880	R24	112.5	12.5	<0.5
064-98-0089	**9265**	**R24**	**112.5**	**37.5**	**<0.5**
064-98-0090	9459	R24	112.5	62.5	<0.5
064-98-0091	10296	R24	112.5	87.5	<0.5
064-98-0092	10176	R24	112.5	112.5	<0.5
064-98-0093 *	**10857**	**R24**	**112.5**	**137.5**	**<0.5**
064-98-0094	10126	R24	112.5	162.5	<0.5
064-98-0095	10462	R24	112.5	187.5	<0.5
064-98-0096	10683	R24	125	112.5	<0.5
064-98-0097	10034	R24	125	137.5	<0.5
064-98-0098	10312	R24	125	162.5	<0.5
064-98-0099	9480	R24	125	187.5	<0.5
064-98-0100	9460	R24	137.5	12.5	<0.5
064-98-0101	9713	R24	137.5	37.5	<0.5
064-98-0102	9974	R24	137.5	62.5	<0.5
064-98-0103	9745	R24	137.5	87.5	<0.5
064-98-0104	9579	R24	150	37.5	<0.5
064-98-0105	9507	R24	150	62.5	<0.5
064-98-0106	9948	R24	150	87.5	<0.5
064-98-0107	9846	R24	150	112.5	<0.5

Bag #	Counts/Minute	Grid Number	Feet North	Feet East	Sample Depth (ft)
064-98-0108	9816	R24	150	137.5	<0.5
064-98-0109	9947	Q24	187.5	12.5	<0.5
064-98-0110	9497	Q24	187.5	37.5	<0.5
064-98-0111	9506	Q24	187.5	62.5	<0.5
064-98-0112	9660	Q24	187.5	87.5	<0.5
064-98-0113	9990	Q24	187.5	112.5	<0.5
064-98-0114	10058	Q24	187.5	137.5	<0.5
064-98-0115	9923	Q24	187.5	187.5	<0.5
064-98-0116 *	**10534**	**Q24**	**162.5**	**12.5**	**<0.5**
064-98-0117	10377	Q24	162.5	37.5	<0.5
064-98-0118	9737	Q24	162.5	62.5	<0.5
064-98-0119	10042	Q24	162.5	87.5	<0.5
064-98-0120	10128	Q24	162.5	162.5	<0.5
064-98-0121	9552	Q24	137.5	12.5	<0.5
064-98-0122	9578	Q24	137.5	37.5	<0.5
064-98-0123	10009	R25	25	0	<0.5
064-98-0124	9695	R25	50	0	<0.5
064-98-0125	9580	R25	12.5	12.5	<0.5
064-98-0126	10052	R25	37.5	12.5	<0.5
064-98-0127	**10296**	**R25**	**62.5**	**12.5**	**<0.5**
064-98-0128	10384	R25	87.5	12.5	<0.5
064-98-0129	10066	R25	112.5	12.5	<0.5
064-98-0130	8987	R25	125	12.5	<0.5
064-98-0131	9377	R25	100	25	<0.5
064-98-0132	10097	R25	37.5	37.5	<0.5
064-98-0133	10018	R25	87.5	37.5	<0.5
064-98-0134	10156	R25	112.5	37.5	<0.5
064-98-0135	9452	R25	125	37.5	<0.5
064-98-0136	9503	R25	62.5	62.5	<0.5
064-98-0137	10228	R25	112.5	62.5	<0.5
064-98-0138	10371	R25	125	62.5	<0.5
064-98-0139	8830	R25	112.5	87.5	<0.5
064-98-0140	9367	R25	137.5	87.5	<0.5
064-98-0141	9102	R25	162.5	87.5	<0.5
064-98-0142	9330	R25	37.5	112.5	<0.5
064-98-0143	9692	Q25	162.5	87.5	<0.5
~~064-98-0144~~	not sampled				
064-98-0145	9655	R25	37.5	162.5	<0.5
064-98-0146	10135	R25	62.5	137.5	<0.5
064-98-0147	9375	R25	62.5	162.5	<0.5
064-98-0148	9797	R25	62.5	187.5	<0.5
064-98-0149	9893	R25	75	150	<0.5
064-98-0150	10094	R25	75	175	<0.5
064-98-0151	9366	R25	87.5	137.5	<0.5
064-98-0152	10493	R25	87.5	162.5	<0.5
064-98-0153	**9727**	**R25**	**87.5**	**187.5**	**<0.5**
064-98-0154	9124	R26	62.5	12.5	<0.5
064-98-0155	9802	R26	62.5	37.5	<0.5
064-98-0156	10539	R26	87.5	12.5	<0.5
064-98-0157	9603	R26	87.5	37.5	<0.5
~~064-98-0158~~	not sampled				
064-98-0159	8802	R26	112.5	12.5	<0.5
064-98-0160	8727	R26	112.5	37.5	<0.5
~~064-98-0161~~	not sampled				
064-98-0162	9124	R26	137.5	12.5	<0.5
064-98-0163	9513	R26	137.5	37.5	<0.5

Bag #	Counts/Minute	Grid Number	Feet North	Feet East	Sample Depth (ft)
~~064-98-0164~~	not sampled				
064-98-0165	9489	Q25	187.5	87.5	<0.5
064-98-0166	9830	R25	12.5	87.5	<0.5
064-98-0167	9617	Q25	162.5	37.5	<0.5
064-98-0168	10097	R25	12.5	150	<0.5
064-98-0169	9562	Q25	187.5	112.5	<0.5
064-98-0170	9387	Q25	137.5	12.5	<0.5
064-98-0171	9084	R25	112.5	137.5	<0.5
064-98-0172	10094	R25	162.5	175	<0.5
064-98-0173	**8274**	**S25**	**12.5**	**187.5**	**<0.5**
064-98-0174	9338	S25	12.5	87.5	<0.5
064-98-0175	8516	S25	62.5	105	<0.5
064-98-0176	9455	S25	150	112.5	<0.5
~~064-98-0177~~	not sampled				
~~064-98-0178~~	not sampled				
~~064-98-0179~~	not sampled				
~~064-98-0180~~	not sampled				
~~064-98-0181~~	not sampled				
~~064-98-0182~~	not sampled				
~~064-98-0183~~	not sampled				
~~064-98-0184~~	not sampled				
~~064-98-0185~~	not sampled				
064-98-0186 *	**10754**	**R24**	**37.5**	**190**	**<0.5**
064-98-0187	9650	R24	105	162	<0.5
064-98-0188	9010	Q24	165.5	12.5	<0.5
064-98-0189 *	**10263**	**Q24**	**159.5**	**12.5**	**<0.5**
064-98-0190	9570	Q24	162.5	9.5	<0.5
064-98-0191	8593	Q24	162.5	15.5	<0.5
064-98-0192	8402	R24	115.5	137.5	<0.5
064-98-0193	8819	R24	109.5	137.5	<0.5
064-98-0194	8789	R24	112.5	134.5	<0.5
064-98-0195	9407	R24	112.5	140.5	<0.5
064-98-0196	10169	Q24	156.5	12.5	<0.5
064-98-0197	9281	Q24	159.5	9.5	<0.5
064-98-0198	9499	Q24	159.5	15.5	<0.5
064-98-0199	9095	R24	130	130	<0.5
064-98-0200	9534	R24	140	130	<0.5
064-98-0201	9188	R24	150	130	<0.5
064-98-0202	8579	R24	110	180	<0.5
maximum	10857				
minimum	8274				
mean	9668				
exp. stand. dev.	516				

* Samples that showed a Cs-137 peak when surveyed by a 3" x 3" NaI probe attached to a multi-channel analyzer.
Note: Samples selected for gamma spectroscopy analysis are in boldprint.

Table 2. Gamma Spectroscopy Results of Representative Samples.

Sample Name	Counts/Minute	Cs-137 (pCi/g) **	Sample Obervation	Bag #	Sample #
lowest	8274	0.41	contains few small asphalt pieces	064-98-0173	ENV980206
"1/4" point	9265	0.03	grey color sand	064-98-0089	ENV980207
mid-range	9727	0.11	sandy clay	064-98-0153	ENV980211
"3/4" point	10296	0.03	sandy clay	064-98-0127	ENV980210
highest *	10857	2.69	sandy clay	064-98-0093	ENV980208
background	8927	<MDA	sandy clay	N/A	ENV980213

* Sample that showed a Cs-137 peak when surveyed by a 3" x 3" NaI probe attached to a multi-channel analyzer.

** The minimum detectable activity (MDA) of Cs-137 is 0.02 pCi/g.

Table 3. Gamma Spectroscopy Results of Excavated Locations.

Sample Location	Before Excavation		After Excavation	
	Cs-137 (pCi/g)	Sample Number	Cs-137 (pCi/g)	Sample Number
R24-37.5-190	6.34	ENV980196 (Bag#064-98-0186)*	0.53	ENV980215 **
R24-112.5-137.5	2.69	ENV980208 (Bag#064-98-0093)*	0.43	ENV980227 **
Q24-162.5-12.5	2.57	ENV980209 (Bag#064-98-0116)*	1.30	ENV980236 ** : composite sample of Q24-162.5-12.5 & Q24-159.5-12.5
Q24-159.5-12.5	4.31	ENV980223 (Bag#064-98-0189)*	1.30	ENV980236 ** : composite sample of Q24-162.5-12.5 & Q24-159.5-12.5
R24-37.5-190 : Asphalt sample	13.68	ENV-98-0193 **	N/A	N/A
R24-37.5-190 : Particles from ENV980196 smaller than 0.0331 inch	7.36	ENV980220 **	N/A	N/A
R24-37.5-190 : Particles from ENV980196 larger than 0.0331 inch	3.93	ENV980219 **	N/A	N/A

* Samples that showed a Cs-137 peak when surveyed by a 3" x 3" NaI probe attached to a multi-channel analyzer.

** Samples analyzed directly by gamma spectroscopy without being surveyed by a NaI probe first.

TABLE 4. Gamma Exposure Measurements of Background Soil Sample.

Measurement #	Counts/Minute
1	8987
2	8939
3	8911
4	8933
5	8817
6	8882
7	9002
8	9043
9	8800
10	8951
Mean	8927
Experimental Standard Deviation (68% Confidence Limit)	77

APPENDIX C

SUBSURFACE CORE SAMPLE RESULTS

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BOEING

The Boeing Company
Rocketdyne Propulsion & Power

6633 Canoga Ave.
P.O. Box 7922
Canoga Park, CA
91309-7922

Date: May 11, 1998

No.: SHEA-015099

To: Phil Rutherford
Manager, Radiation Safety
055-641, T487 x66140

From: Farley Dahl
SHEA Project Engineer
055-641, T100 x65788

Subject: Building 064 Sideyard and 'G' Street Core Drilling Sample Analyses

The Building 064 Sideyard and 'G' Street core drilling soil sampling was performed to verify the quality of the current cleanup activities, assess the depth to bedrock and sample underneath 'G' street. Core drilling was performed at 14 locations (see Figure 1). Location A was at the foundation of the previously demolished building. Location B was at the original 1963 contaminated zone and has been heavily excavated several times. Locations C and H are east and down slope of the building site and west of "G" street. Locations D, E, F and G are in the sideyard proper to assess the excavated sanitary leach field. Locations I, J and K were drilled through the 'G' street road where the building 064 driveway connects. Locations L, M and N are located east of 'G' street across from the building 064 sideyard where contamination has been removed. All locations together adequately cover the affected areas.

Fifty-two soil samples were taken at approximately 1.5 feet intervals until bedrock was encountered. Table 1 provides the sample numbers, locations, dates and depths of the samples. The samples were analyzed for gamma emitting radionuclides using a thin beryllium window High Purity Geranium (HPGe) Canberra gamma spectroscopy system. Results of the sample analyses for detected radionuclides are found in Table 2, which are all typical environmental background levels. The comparison with Site-wide Limits for Soil from N001SRR140127 are located in Table 3 where detected values and counting system MDA's for the analyses are listed. Figure 2 summarizes the natural K-40 in the soil as a comparison for the normal distribution of samples and homogeneity of the site soil. Additionally, Figure 3 plots the sample results for the primary isotope of interest Cs-137.

All samples underneath 'G' street lack the normal fallout levels of Cs-137 as expected and no excavation of the street for further sampling or remediation is required. Also, the samples fully support the quality of the current cleanup activities down to the bedrock and no further remediation of the exposed affected areas is required. In conclusion, the Building 064 Sideyard and 'G' Street core drilling soil sampling shows that the area has been remediated and is ready for the final survey and soil sampling, final survey report, third party verification phase and release.

Farley C. Dahl

Farley C. Dahl, PE

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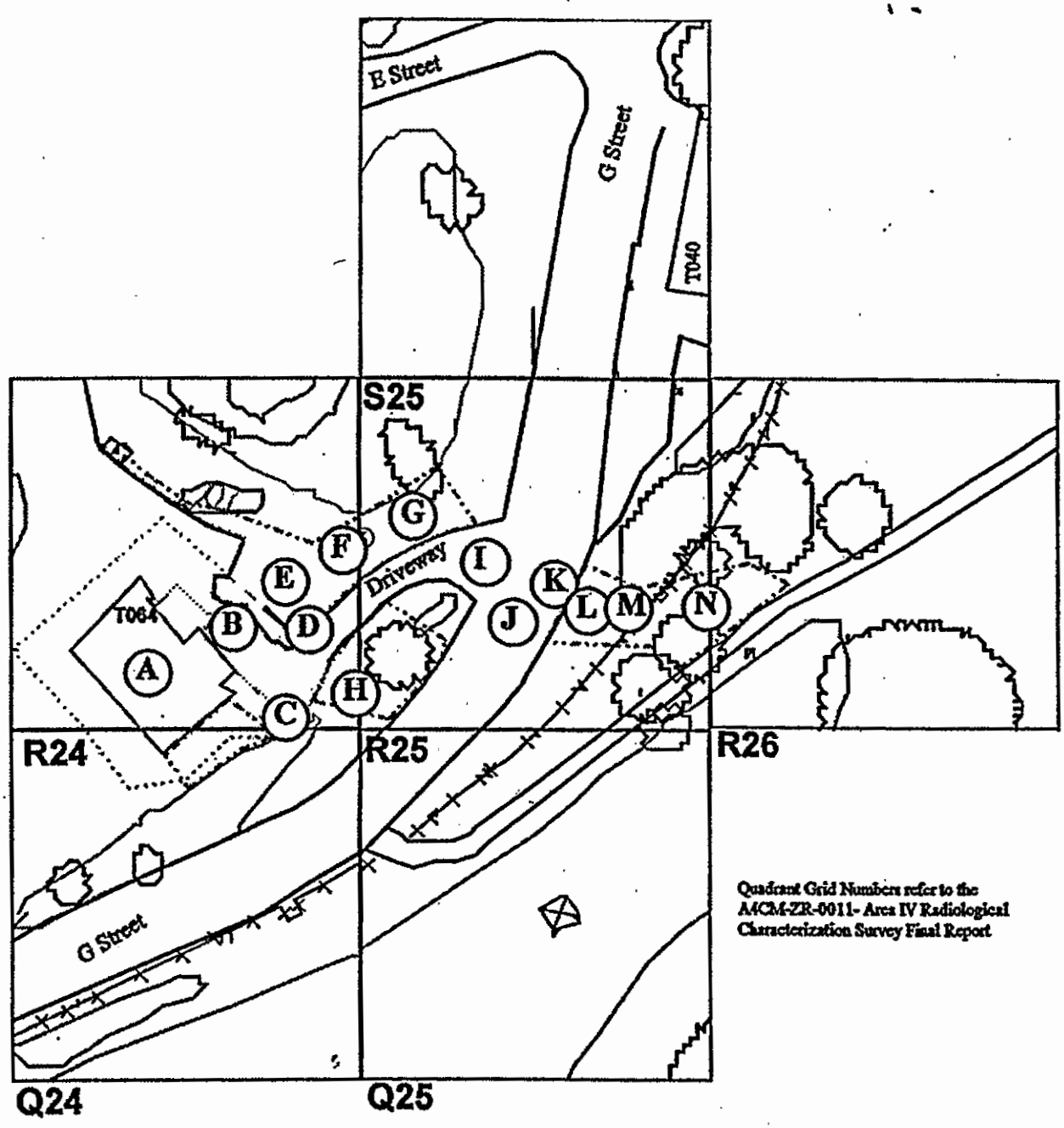
T064 SIDEYARD AND "G" STREET AREA DEEP SAMPLE LOCATIONS



Circled letters = approximate sample location designations

3-24-98

Figure 1. Map of the Building 064 Sideyard and 'G' Street Core - Drilling Sample Locations

Table 1. - Building 064 Sideyard and 'G' Street Core Samples Data Sheet

Sample Number	Sample Date	Location Designator	Depth Range Feet	Grid Number	Feet North	Feet East	Sampled By	Sample Description
064-98-0001	23-Mar-98	A	0 to 0.5	R24	28	91	E. R. McGinnis	Soil
064-98-0002	23-Mar-98	E	0 to 1.5	R24	74	154	E. R. McGinnis	Soil
064-98-0003	23-Mar-98	E	1.5 to 2.3	R24	74	154	E. R. McGinnis	Soil
064-98-0004	23-Mar-98	F	0 to 1.5	R24	92	170	E. R. McGinnis	Soil
064-98-0005	23-Mar-98	F	1.5 to 1.8	R24	92	170	E. R. McGinnis	Soil
064-98-0006	23-Mar-98	G	0 to 1.1	R25	104	19	E. R. McGinnis	Soil
064-98-0007	23-Mar-98	H	0 to 1.8	R24	33	197	E. R. McGinnis	Soil
064-98-0008	23-Mar-98	H	1.8 to 3.1	R24	33	197	E. R. McGinnis	Soil
064-98-0009	23-Mar-98	H	3.1 to 4.7	R24	33	197	E. R. McGinnis	Soil
064-98-0010	23-Mar-98	H	4.7 to 6.4	R24	33	197	E. R. McGinnis	Soil
064-98-0011	23-Mar-98	H	6.4 to 6.8	R24	33	197	E. R. McGinnis	Soil
064-98-0012	23-Mar-98	M	0 to 1.4	R25	71	162	E. R. McGinnis	Soil
064-98-0013	23-Mar-98	M	1.4 to 2.9	R25	71	162	E. R. McGinnis	Soil
064-98-0014	23-Mar-98	M	2.9 to 4.5	R25	71	162	E. R. McGinnis	Soil
064-98-0015	23-Mar-98	M	4.5 to 6	R25	71	162	E. R. McGinnis	Soil
064-98-0016	23-Mar-98	M	6 to 8.3	R25	71	162	E. R. McGinnis	Soil
064-98-0017	23-Mar-98	M	8.3 to 9.5	R25	71	162	E. R. McGinnis	Soil
064-98-0018	23-Mar-98	M	9.5 to 10	R25	71	162	E. R. McGinnis	Soil
064-98-0019	23-Mar-98	L	0 to 1.5	R25	77	139	E. R. McGinnis	Soil
064-98-0020	23-Mar-98	L	1.5 to 3	R25	77	139	E. R. McGinnis	Soil
064-98-0021	23-Mar-98	L	3 to 4.6	R25	77	139	E. R. McGinnis	Soil
064-98-0022	23-Mar-98	L	4.6 to 6.3	R25	77	139	E. R. McGinnis	Soil
064-98-0023	23-Mar-98	L	6.3 to 7.7	R25	77	139	E. R. McGinnis	Soil
064-98-0024	23-Mar-98	L	7.7 to 8.5	R25	77	139	E. R. McGinnis	Soil
064-98-0025	23-Mar-98	K	0 to 1.5	R25	93	126	E. R. McGinnis	Soil
064-98-0026	23-Mar-98	K	1.5 to 3	R25	93	126	E. R. McGinnis	Soil
064-98-0027	23-Mar-98	K	3 to 4.5	R25	93	126	E. R. McGinnis	Soil
064-98-0028	23-Mar-98	K	4.5 to 6	R25	93	126	E. R. McGinnis	Soil
064-98-0029	23-Mar-98	K	6 to 7.5	R25	93	126	E. R. McGinnis	Soil
064-98-0030	23-Mar-98	K	7.5 to 9	R25	93	126	E. R. McGinnis	Soil
064-98-0031	23-Mar-98	K	9 to 10.5	R25	93	126	E. R. McGinnis	Soil
064-98-0032	23-Mar-98	K	10.5 to 12	R25	93	126	E. R. McGinnis	Soil
064-98-0033	23-Mar-98	K	12 to 13.5	R25	93	126	E. R. McGinnis	Soil
064-98-0034	23-Mar-98	K	13.5 to 15	R25	93	126	E. R. McGinnis	Soil
064-98-0035	23-Mar-98	J	0 to 1.5	R25	82	102	E. R. McGinnis	Soil
064-98-0036	23-Mar-98	J	1.5 to 3	R25	82	102	E. R. McGinnis	Soil
064-98-0037	23-Mar-98	J	3 to 4.5	R25	82	102	E. R. McGinnis	Soil
064-98-0038	23-Mar-98	J	4.5 to 6	R25	82	102	E. R. McGinnis	Soil
064-98-0039	23-Mar-98	J	6 to 7.5	R25	82	102	E. R. McGinnis	Soil
064-98-0040	23-Mar-98	J	7.5 to 9	R25	82	102	E. R. McGinnis	Soil
064-98-0041	23-Mar-98	J	9 to 10.5	R25	82	102	E. R. McGinnis	Soil
064-98-0042	23-Mar-98	I	0 to 1.5	R25	101	89	E. R. McGinnis	Soil
064-98-0043	24-Mar-98	C	0 to 1.5	R24	2	142	E. R. McGinnis	Soil
064-98-0044	24-Mar-98	C	1.5 to 2.2	R24	2	142	E. R. McGinnis	Soil
064-98-0045	24-Mar-98	D	0 to 1.5	R24	49	164	E. R. McGinnis	Soil
064-98-0046	24-Mar-98	D	3 to 4.5 *	R24	49	164	E. R. McGinnis	Soil
064-98-0047	24-Mar-98	D	4.5 to 6	R24	49	164	E. R. McGinnis	Soil
064-98-0048	24-Mar-98	D	6 to 7.5	R24	49	164	E. R. McGinnis	Soil
064-98-0049	24-Mar-98	B	0 to 1.5	R24	59	127	E. R. McGinnis	Soil
064-98-0050	24-Mar-98	B	1.5 to 3	R24	59	127	E. R. McGinnis	Soil
064-98-0051	24-Mar-98	N	0 to 1.5	R25	76	194	E. R. McGinnis	Soil
064-98-0052	24-Mar-98	N	1.5 to 3	R25	76	194	E. R. McGinnis	Soil

** Location D, 1.5 to 3 feet, no sample retained.*

TABLE 2 - BUILDING 064 SIDEYARD AND 'G' STREET SOIL DRILLING SAMPLES RESULTS

NOTE: BOLD VALUES INDICATE DETECTED AND NON-BOLD VALUES INDICATE MDA FOR THAT SAMPLE

Sample #	Date	MAP LOC#	Sample wt.(grams)	K-40 pCi/g	Cs-137 pCi/g	Tl-208 pCi/g	Pb-212 pCi/g	Bi-212 pCi/g	Ra-224 pCi/g	Ac-228 pCi/g	Pb-210 pCi/g	Pb-214 pCi/g	Bi-214 pCi/g	Ra-226 pCi/g	Th-234 pCi/g	Pa-234m pCi/g	U-235 pCi/g
064-98-0001	3/23/98	A	713	18.22	0.02	0.36	0.56	< 0.14	1.03	0.93	0.95	0.67	0.69	1.63	0.68	< 2.67	0.10
064-98-0002	3/23/98	E	742	16.73	0.09	0.32	0.72	< 0.11	0.93	0.96	0.77	0.62	0.70	1.49	0.99	< 2.51	0.09
064-98-0003	3/23/98	E	741	18.26	0.05	0.36	0.67	1.06	1.30	0.96	0.83	0.69	0.67	1.63	0.92	< 2.74	0.10
064-98-0004	3/23/98	F	641	17.79	0.06	0.30	0.66	0.86	0.99	0.94	0.91	0.71	0.78	1.44	0.79	< 3.01	0.09
064-98-0005	3/23/98	F	851	17.84	< 0.03	0.36	0.52	< 0.14	1.34	1.02	< 0.74	0.60	0.64	1.39	0.81	< 2.50	0.08
064-98-0006	3/23/98	G	674	17.78	0.02	0.43	0.75	0.74	1.39	1.05	1.01	0.79	0.83	< 0.41	1.04	2.37	0.10
064-98-0007	3/23/98	H	716	18.76	0.04	0.36	0.52	1.00	1.05	1.05	0.76	0.75	0.77	2.08	1.14	< 2.79	0.13
064-98-0008	3/23/98	H	654	19.59	< 0.02	0.35	0.75	< 0.14	1.23	1.05	0.95	0.66	0.87	1.61	0.74	< 2.84	0.10
064-98-0009	3/23/98	H	679	17.62	< 0.02	0.34	0.58	0.99	1.40	1.01	0.96	0.81	0.77	1.96	0.72	< 2.73	0.11
064-98-0010	3/23/98	H	736	16.99	< 0.02	0.37	0.76	0.79	1.29	0.95	1.07	0.80	0.76	1.50	0.86	< 2.43	0.09
064-98-0011	3/23/98	H	662	18.10	< 0.02	0.36	0.61	1.85	1.40	0.97	< 0.76	0.77	0.82	1.74	0.73	< 2.66	0.11
064-98-0012	3/23/98	M	663	18.36	0.12	0.36	0.66	< 0.14	1.20	0.90	0.94	0.67	0.66	1.64	0.83	< 2.63	0.10
064-98-0013	3/23/98	M	720	16.75	< 0.02	0.37	0.73	< 0.13	1.10	0.99	< 0.73	0.64	0.84	1.52	0.82	< 2.71	0.12
064-98-0014	3/23/98	M	694	15.85	< 0.02	0.42	0.62	1.14	1.35	1.14	1.17	0.83	0.81	1.83	1.05	< 2.70	0.11
064-98-0015	3/23/98	M	706	14.56	< 0.02	0.34	0.76	0.78	1.18	0.99	1.27	0.69	0.76	1.49	0.97	< 2.56	0.09
064-98-0016	3/23/98	M	936	14.60	< 0.02	0.30	0.48	0.74	0.99	0.86	0.88	0.57	0.61	1.44	0.77	2.13	0.09
064-98-0017	3/23/98	M	1166	13.39	< 0.02	0.25	0.52	0.52	0.77	0.72	0.75	0.62	0.62	< 0.27	0.74	< 1.73	0.07
064-98-0018	3/23/98	M	1151	13.37	< 0.02	0.28	0.41	< 0.09	0.93	0.80	0.56	0.71	0.73	1.34	0.45	< 1.86	0.08
064-98-0019	3/23/98	L	773	16.80	0.03	0.37	0.71	1.02	1.19	1.02	0.78	0.72	0.94	1.61	0.86	< 2.41	0.10
064-98-0020	3/23/98	L	760	15.78	< 0.02	0.40	0.72	0.77	1.22	1.13	0.75	0.79	0.91	1.66	0.93	< 2.62	0.11
064-98-0021	3/23/98	L	843	15.66	< 0.02	0.37	0.52	2.06	1.29	1.09	< 0.66	0.71	0.82	1.64	0.63	< 2.43	0.11
064-98-0022	3/23/98	L	853	15.27	< 0.02	0.37	0.66	< 0.13	1.20	1.07	0.88	0.81	0.85	1.91	0.88	< 2.39	0.12
064-98-0023	3/23/98	L	793	14.42	< 0.02	0.37	0.51	< 0.11	1.19	1.03	0.75	0.66	0.71	1.42	0.61	1.68	0.09
064-98-0024	3/23/98	L	823	14.37	< 0.02	0.33	0.48	< 0.11	1.08	0.93	0.98	0.66	0.68	1.21	0.68	< 2.37	0.07
064-98-0025	3/23/98	K	1042	16.00	0.01	0.34	0.50	0.73	0.95	0.89	0.82	0.61	0.66	1.36	0.75	1.78	0.08
064-98-0026	3/23/98	K	896	16.28	< 0.02	0.33	0.60	0.80	1.17	0.97	0.61	0.59	0.81	1.58	0.71	< 2.23	0.10
064-98-0027	3/23/98	K	960	17.17	< 0.02	0.31	0.45	0.62	1.18	0.96	< 0.62	0.74	0.78	1.43	0.90	< 2.21	0.09
064-98-0028	3/23/98	K	861	17.31	< 0.02	0.34	0.55	< 0.12	0.97	0.91	0.81	0.68	0.86	1.48	0.73	< 2.27	0.09
064-98-0029	3/23/98	K	764	17.84	< 0.02	0.40	0.74	0.80	1.08	1.13	< 0.73	0.89	0.99	< 0.36	1.26	< 2.39	0.12
064-98-0030	3/23/98	K	752	17.52	< 0.02	0.39	0.62	0.76	1.44	1.13	1.41	0.62	0.91	1.81	1.10	<2.70	0.11
064-98-0031	3/23/98	K	781	16.85	< 0.02	0.40	0.70	< 0.13	1.36	1.13	0.92	0.67	0.91	1.71	0.83	2.22	0.10
064-98-0032	3/23/98	K	716	15.52	< 0.02	0.44	0.66	0.83	1.14	1.16	1.06	0.80	0.89	1.81	0.84	2.57	0.11
064-98-0033	3/23/98	K	811	15.32	< 0.02	0.36	0.79	1.05	1.15	1.12	0.99	0.72	0.80	1.79	1.08	< 2.57	0.11
064-98-0034	3/23/98	K	818	15.62	< 0.02	0.36	0.51	0.94	1.23	1.06	0.86	0.77	0.84	1.78	0.97	2.58	0.11
064-98-0035	3/23/98	J	816	16.89	< 0.02	0.42	0.53	0.86	1.37	1.09	< 0.72	0.75	0.83	1.53	0.81	< 2.47	0.09
064-98-0036	3/23/98	J	753	16.18	< 0.02	0.36	0.71	< 0.13	1.28	0.96	0.99	0.66	0.81	1.50	0.97	< 2.65	0.09
064-98-0037	3/23/98	J	737	16.37	< 0.02	0.40	0.74	< 0.13	1.29	1.02	1.15	0.90	0.97	1.69	1.08	< 2.70	0.10
064-98-0038	3/23/98	J	836	15.57	< 0.02	0.36	0.73	1.13	1.34	1.10	0.78	0.87	0.90	1.58	1.06	< 2.48	0.10
064-98-0039	3/23/98	J	785	16.68	< 0.02	0.42	0.74	< 0.13	1.24	1.19	< 0.75	0.81	0.86	1.72	0.82	< 2.64	0.10
064-98-0040	3/23/98	J	714	16.81	< 0.02	0.41	0.87	< 0.15	1.18	1.13	0.82	0.69	0.89	1.66	1.05	< 2.65	0.11
064-98-0041	3/23/98	J	797	16.11	< 0.02	0.44	0.47	1.14	1.15	1.13	0.84	0.80	0.87	1.62	1.06	< 2.49	0.10
064-98-0042	3/23/98	I	849	16.81	< 0.02	0.37	< 0.13	0.77	1.07	0.96	0.89	0.57	0.83	1.70	0.90	< 2.42	0.10
064-98-0043	3/24/98	C	866	16.96	0.13	0.35	0.44	< 0.12	1.20	1.01	< 0.64	0.56	0.67	1.26	0.60	< 2.15	0.08
064-98-0044	3/24/98	C	789	16.90	0.11	0.40	0.76	< 0.14	1.16	1.11	0.73	0.63	0.67	1.55	0.80	1.93	0.09
064-98-0045	3/24/98	D	654	17.86	< 0.02	0.33	0.67	1.00	1.16	0.97	1.01	0.77	0.86	1.51	1.14	< 2.92	0.09
064-98-0046	3/24/98	D	618	17.21	< 0.02	0.32	0.67	< 0.13	1.01	0.85	< 0.68	0.62	0.90	< 0.36	0.84	< 2.31	0.10
064-98-0047	3/24/98	D	784	19.02	< 0.02	0.33	0.67	0.86	1.13	1.01	0.87	0.81	0.85	1.47	0.94	< 2.60	0.09
064-98-0048	3/24/98	D	875	17.83	0.02	0.35	0.69	< 0.10	0.92	0.94	< 0.67	0.84	0.86	1.81	1.00	2.15	0.11
064-98-0049	3/24/98	B	843	17.38	0.02	0.31	0.42	< 0.11	1.01	0.83	0.73	0.73	0.71	1.44	0.58	< 2.31	0.09
064-98-0050	3/24/98	B	851	17.99	< 0.02	0.35	0.50	0.60	1.04	0.91	0.86	0.26	0.84	1.46	0.84	< 2.46	0.09
064-98-0051	3/24/98	N	828	16.50	0.02	0.35	0.84	0.72	1.10	0.91	0.70	0.83	0.87	1.82	1.20	< 2.43	0.11
064-98-0052	3/24/98	N	865	15.21	< 0.02	0.31	0.55	1.59	0.95	0.85	0.86	0.61	0.69	1.37	0.72	< 1.99	0.06
		Number of detects		52	14	52	51	31	52	52	41	52	52	48	52	9	52
		Detect[1]	Maximum	19.59	0.13	0.44	0.92	2.06	1.44	1.19	1.41	0.90	0.99	2.06	1.26	2.58	0.13
			Average	16.79	0.06	0.36	0.64	0.94	1.16	1.00	2.18	0.73	0.80	1.62	0.86	2.16	0.10
			Minimum	13.37	0.02	0.25	0.41	0.52	0.77	0.72	0.56	0.26	0.61	1.21	0.45	1.68	0.07

[1]Note: MDA's are not included in the summary calculations

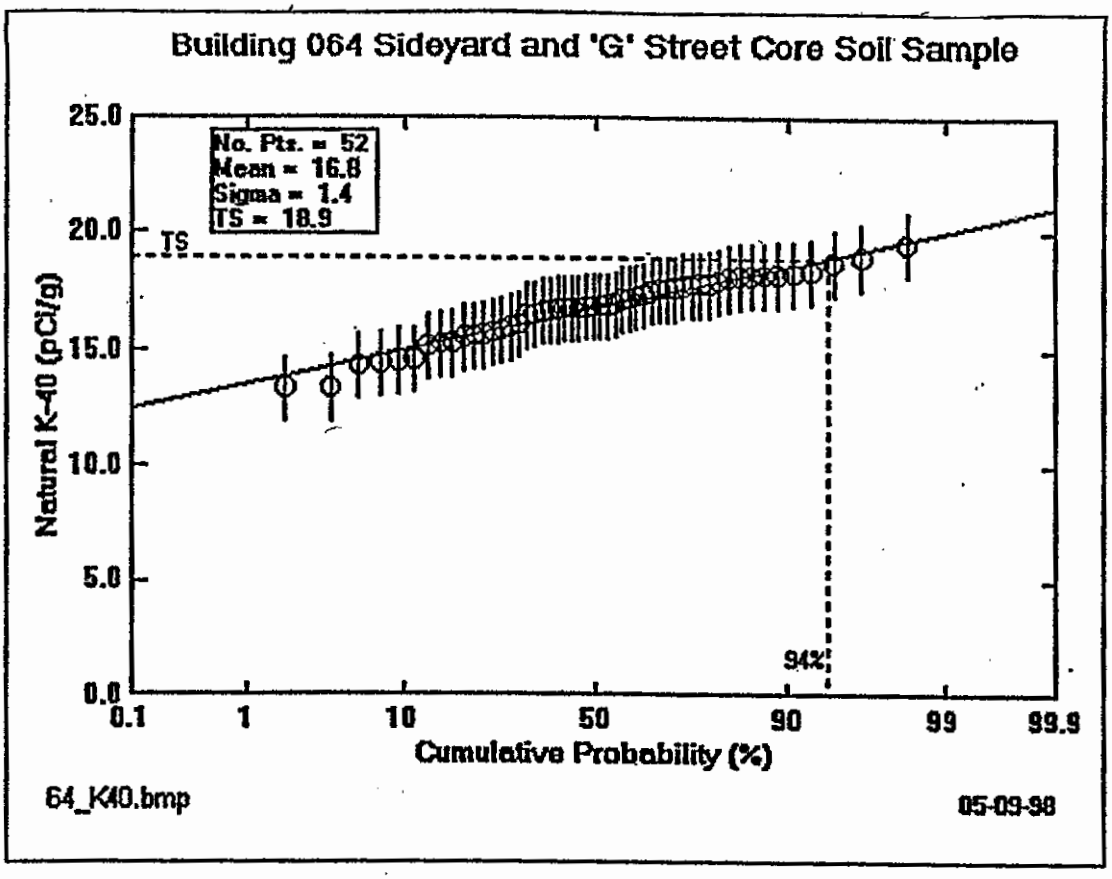


Figure 2. K-40 Cumulative Distribution Plot

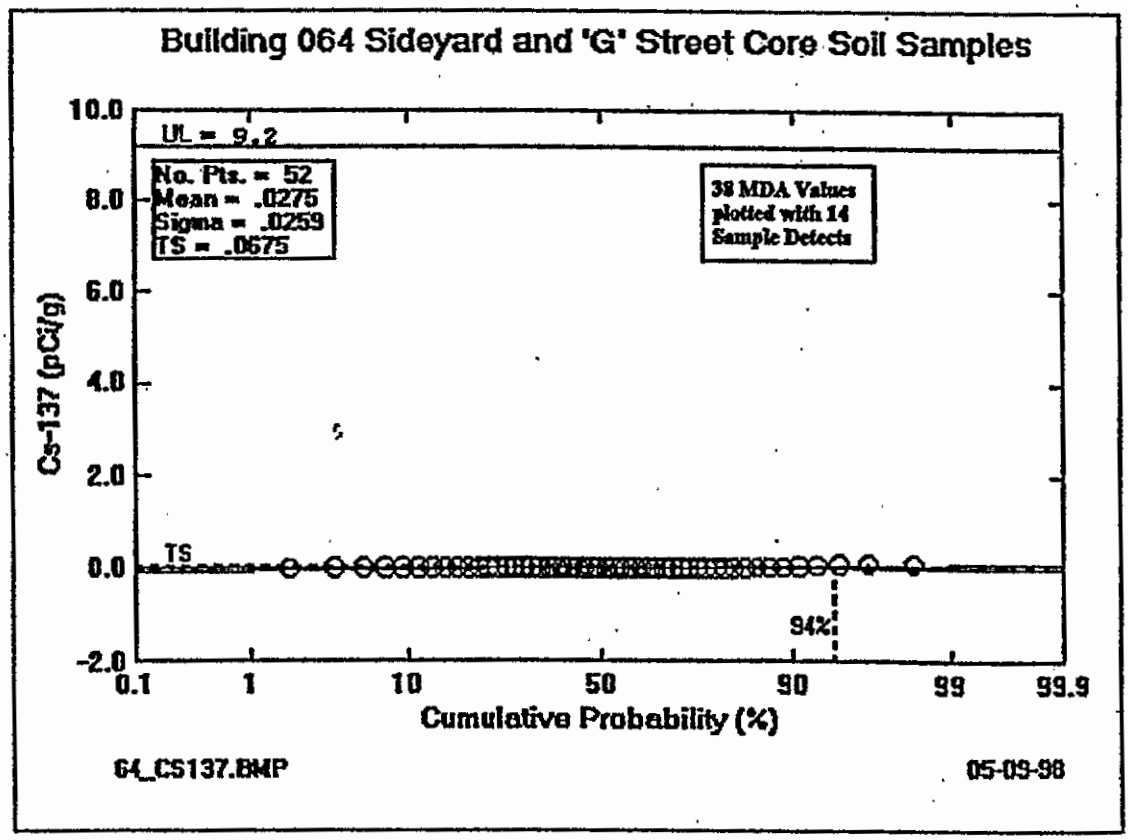


Figure 3. Cs-137 Cumulative Distribution Plot

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TABLE 3
SITE-WIDE LIMITS FOR SOIL VERSUS OBSERVED CONCENTRATION (REFERENCE N001SRR140127) [a]

Radionuclide	Soil Guideline	Observed Concentration
Am-241	5.44	< 0.06
Co-60	1.94	< 0.02
Cs-134	3.33	< 0.02
Cs-137	9.20	0.02 – 0.13
Eu-152	4.51	< 0.04
Eu-154	4.11	< 0.03
K-40	27.6	13.4 – 19.6
Na-22	2.31	< 0.02
Ra-226	5[d], 15[d]	1.2 – 2.8
Th-228	5[d], 15[d]	< 3.7
Th-232	5[d], 15[d]	< 10.3
U-234	30[c]	< 16.5
U-235	30[c]	0.07 – 0.13
U-238	35[c]	1.68 – 3.01

[a] Reference taken from Boeing/Rocketdyne 96ETEC-DRF-0374, Enclosure A, June 28, 1996
[c] Generally more conservative NRC limits for uranium isotopes are proposed
[d] DOE Order 5400.5 limits are proposed (5 pCi/g averaged over first 15 cm of soil depth and 15 pCi/g averaged over 15 cm layers below the top 15 cm)