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ANC RECLAMATION PROJECT

WINDBLOWN TAILINGS DELINEATION AND CLEAN UP

MAY 5, 1997

ANC RECLAMATION REPORT

WINDBLOWN TAILINGS DELINEATION AND CLEAN UP

MAY 5, 1997

PREPARED FOR:

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Department of Environmental Quality
Land Quality Division
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PREPARED BY:

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7.A WINDBLOWN TAILINGS DELINEATION AND CLEAN UP

1. INTRODUCTION

Pursuant to Title 10, Code of Federal Regulations, Part 40, and in accordance with correspondence dated January 20, 1989 to ANC from the United States Nuclear Regulatory Commission (NRC), Region IV Uranium Recovery Field Office, License SUA-667 was amended by revising License Condition No. 15. Page three (3) of the Materials License Supplementary Sheet reads the following:

The Licensee shall decommission American Nuclear Corporation's Gas Hills Uranium Mill in accordance with their submittals dated March 31, April 9, 1987 and July 14, 1988. Notwithstanding any statements to the contrary in the documents cited above, the Licensee shall:

B. The Licensee shall utilize the methodology for soil sample collection and radiological analysis for a post decommissioning verification survey in accordance with submittal dated July 14, 1988.

Therefore, in accordance with amended License Condition No. 15 and ANC's submittal dated July 14, 1988, the following methodologies for radiological analysis and soil sample collection for windblown tailings verification and boundary delineation will be performed.

2. WINDBLOWN TAILINGS DELINEATION

A. POTENTIALLY IMPACTED AREAS

Based upon previous preliminary gamma radiation surveys performed on the ANC property, the potentially impacted area has been divided into seven (7) general areas (refer to Drawing 1):

Area 1: North of Tailings Pond 2 including undisturbed areas and some sections which were excavated during Phase II construction.

Area 2: Northeast of Tailings Pond 2 including undisturbed areas and some sections which were excavated during Phase II construction.

Area 3: East and Southeast of Tailings Pond 2 including undisturbed areas.

Area 4: Campsite Draw Diversion.

Area 5: Southwest of Tailings Pond 2 including the old camp site area.

Area 6: North of Tailings Pond 1 including undisturbed areas.

Area 7: Northwest of Tailings Pond 1 including undisturbed areas.

The following four (4) areas have been excluded from consideration as "potentially impacted areas" and no windblown tailings sample collection or radiological analysis will be performed:

Area 8: ***MINE SPOIL AREA***. It would be nearly impossible to determine the existence of windblown tailings contamination within this area because the ambient gamma exposure rate is high. Radium 226 (Ra-226) concentrations attributable to windblown tailings cannot be accurately determined under these conditions even if the area was assessed utilizing 100% soil sampling methods. The ore stockpiles and mine spoils are scheduled to be reclaimed under the AML program. Following reclamation grading and revegetation of this area, the contribution to total risk from possible windblown tailings will be negligible. In addition, the area is upwind of the ANC tailings. No characterization surveys or final status surveys will be performed in this area.

Area 9: ***HOT SPRINGS REA ELECTRIC SUBSTATION***. Approximately 700 volts flow through the substation. Shutting down the substation would eliminate power in all adjacent mine sites, local farms and ranches, and several small communities. In addition, a copper ground wire grid exists less than twelve (12") below the surface within the substation. This copper wire grid serves as the substation grounding system. Gamma surveys performed during Phase II construction with a Ludlum Model 19 meter indicate average readings of approximately 50 MicroR/hr. The obvious safety hazards and risks associated with cleanup of possible windblown tailings within this area far exceed the potential hazards associated with leaving low level contamination in place. No further characterization surveys or final status surveys will be performed in this area.

Area 10: ***CLEAN BORROW EXCAVATION AREA BETWEEN TAILINGS PONDS 1 AND 2***. This area has been designated as the clean borrow area which will be excavated and placed as clean cover over Tailings Pond 2. Proposed reclamation contours require that between ten (10) to twenty (20) feet of this area will be excavated. Any potential windblown tailings will be excavated and removed along with the borrow material. No characterization surveys or final surveys will be performed in this area.

Area 11: ***NORTH OF GAS HILLS ROAD.*** For many years the Gas Hills Road was utilized as a major haul road by numerous mining companies to transport uranium, ore bearing materials, etc. Because of the difficulty involved with determining specific

mine company liabilities associated with possible contamination, no characterization surveys of final surveys will be performed in this area.

B. MEASUREMENT TECHNIQUES

1. GAMMA-RADIATION MEASUREMENTS

Gama-radiation measurements will be made utilizing portable Ludlum Model 19 Scintillometers, hereafter referred to as MicroR meters, which use Sodium Iodine (NaI) detectors to measure gamma-radiation exposure rates. These MicroR meters have proven to be capable of detecting surface or near-surface deposits of residual radioactivity which exceed present EPA standards (Young, Jackson, and Thomas 1983).

The MicroR meters will be held at the one (1) meter elevation. The one (1) meter measurement will respond to near-surface windblown tailings material at a greater horizontal distance than at a lower elevation because the distance the gamma-rays have to penetrate through soil will be greater for lower detector elevations.

Gamma-radiation measurements will be made in dry weather, not during periods of snow or rainfall or when the soil is abnormally wet. These conditions will decrease the rate of radon gas escape from the soil thereby lowering the concentrations of radon daughters, which are the major gamma-ray emitters in the Ra 226 decay chain.

The MicroR meters have been and will be calibrated on a semiannually basis by Energy Laboratories, Inc. located in Casper, Wyoming. In addition, the MicroR meters will be cross-calibrated at least once a day with a source of known decay rate located on-site.

2. SOIL ANALYSIS

Soil samples will be analyzed for U 238 , Ra 226, Th 230 and Th 234 by utilizing wet chemical digestion and spectrometer procedures. Due to the relatively high cost and long turn around time for wet chemistry, five percent (5%) of all soil samples obtained will be analyzed by wet chemical digestion.

The remaining samples will be analyzed directly in the laboratory, without wet chemical digestion, by utilizing Sodium-Iodine (NaI) multi-channel gamma-ray spectrometers. The NaI detectors are much larger and therefore more efficient than germanium diodes. In addition, samples can be analyzed much more rapidly using NaI detectors than is possible with germanium diodes.

Samples will be sealed in airtight containers at Energy Laboratories, Inc. to permit Rn 222 gas to approach equilibrium with Ra 226. In order to distinguish between tailings and natural material, the concentration of U 238 will be measured. The U 238 will be measured by counting the low-energy gamma rays emitted by its short lived daughter, Th 234. In windblown tailings, the activity of Th 234 should be much lower than those of the long lived radionuclides, Th 230 and Ra 226, which are left in the tailings after the uranium has been extracted. In unprocessed tailings material the activity of the radionuclides should be similar.

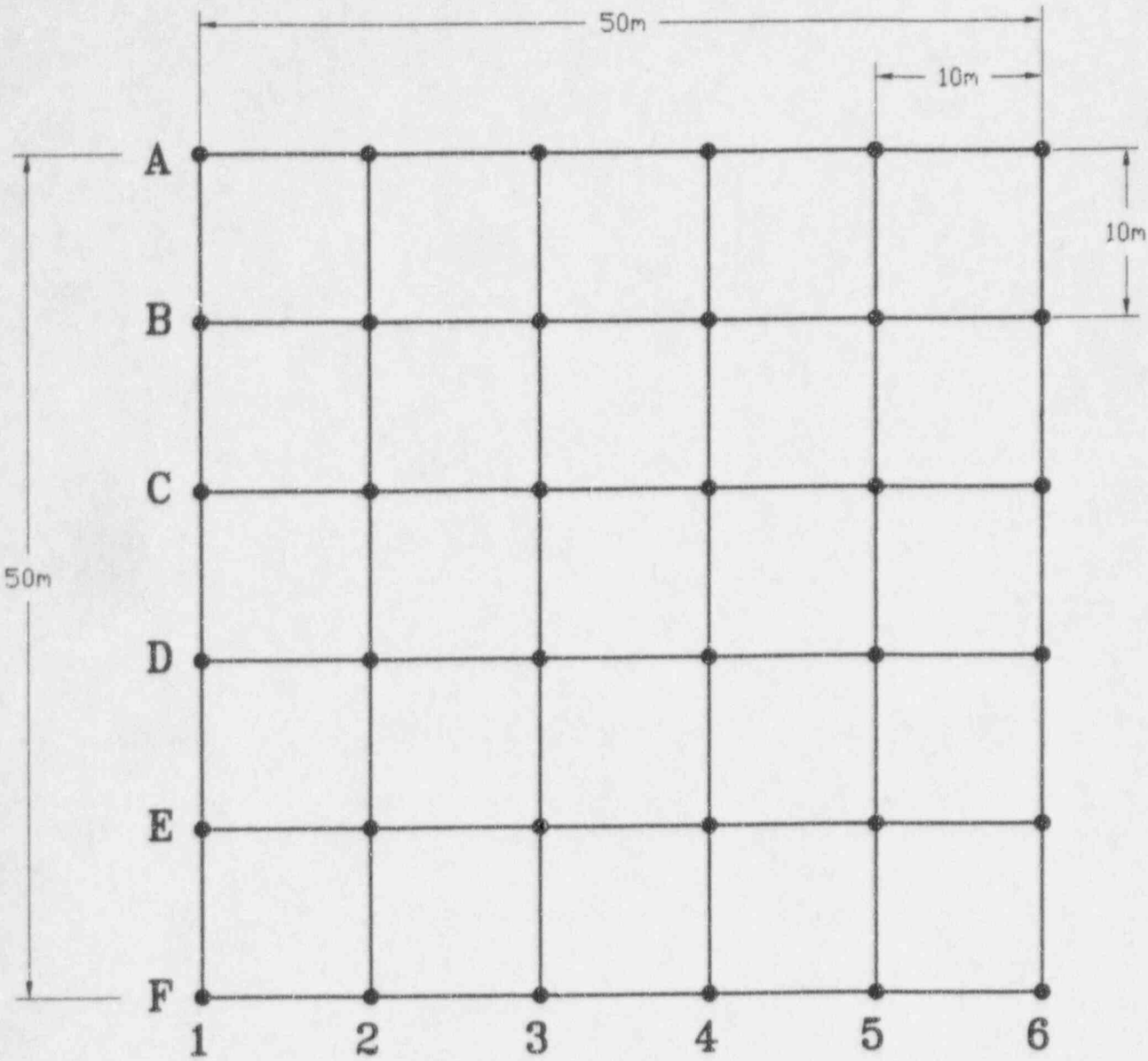
C. DETAILED GAMMA RADIATION SURVEYS AND SOIL SAMPLE COLLECTION (CLASS II)

The methodology for soil sample collection and radiological survey will be structured utilizing, as a guideline, NUREG/CR - 4118 publication "Monitoring Methods for Determining Compliance With Decommissioning Cleanup Criteria at Uranium Recovery Sites."

1. GAMMA RADIATION SURVEYS

The "potentially impacted areas" will be divided into 50 meter by 50 meter grids. Each corner node of every grid shall be located by survey utilizing a GPS Trimble Real Time Kinematic survey system. Gamma radiation measurements will be performed by traversing each grid in two (2) distinct, perpendicular patterns which ultimately subdivide each 50 meter grid into twenty five (25) 10 meter grids (refer to Figure 7A.1). One pattern will traverse the grid parallel to the easting coordinate at 10 meter centers and the other pattern will traverse the grid parallel to the northing coordinate at 10 meter centers. In addition, gamma measurements will be performed at each 50 meter grid corner node. Gamma measurements will be taken unshielded at one (1) meter above the surface. There will be thirty six (36) gamma readings per 50 meter grid. GPS survey will be performed within each 50 meter grid at all gamma survey locations. Each GPS survey point will be entered into the system data collector and identified by a description including the date, grid number, and MicroR per hour reading.

A gamma radiation isoconcentration map will be generated from information obtained during the surveys. The isoconcentration map will be color coded to assist with designation of windblown tailings for removal during future construction. Gamma radiation survey readings between 0 and 45 MicroR per hour will be designated as blue. Readings greater than 45 MicroR per hour will be designated as red.



• = GAMMA SURVEY LOCATION
TOTAL = 36 LOCATIONS

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FIGURE 7A.1

"POTENTIALLY IMPACTED AREAS"
GAMMA SURVEY GRIDS

Date: May 1997

Project: 2-1926

File: 9001\ANC.DWG

2. GAMMA SURVEYS IN REGIONS ADJACENT TO SPOIL PILES

Areas which are adjacent to or close to the existing spoil/ore piles (Area 8) may have high ambient gamma radiation exposure rates because of "shine" from the piles. At these locations, it may not be possible to use unmodified MicroR meters to measure increases in the gamma exposure rates due to windblown tailings. In these cases, it will be necessary to shield the MicroR meters on all sides with lead to conduct the survey. The lead case will have a removable lead shield on the bottom of the detector. Exposure rates will be measured with and without the shield in place. The difference between the readings, which is called the delta value, gives a measure of the exposure rate due to radioactive materials beneath the detector.

3. SOIL SAMPLE COLLECTION

The boundaries of areas which have concentrations of Ra 226 which exceed the established criteria of 9.27 pCi/gm Ra 226, conservatively corresponding to a 45 MicroR per hour gamma reading in the top 15 cm of soil, will be determined by laboratory measurement of Ra 226 in soil samples. The soil samples will be collected at locations indicating maximum gamma radiation and along the boundaries of areas showing elevated exposure rates. The surface samples will be collected to a depth of approximately 15 cm with a model SP-135 Oakfield Soil Sampler and submitted to Energy Laboratories, Inc. for analysis.

3. EARTHWORK

A. GENERAL

Excavation for Windblown Tailing Materials (WTM) will be in accordance with this section of the report. Excavation of the WTM will consist of removal and disposal of all soils with exposure rates which exceed the established criteria of 9.27 pCi/gm Ra 226 and are shown as the color red on the isoconcentration map.

The Engineer will have a qualified ground control person on the project during excavation of all WTM. No material will be excavated or disposed of within the designated embankment area at Tailings Pond No. 1 prior to monitoring by the Engineer's ground control person. All work related to Earthwork by the Contractor will be in accordance to the Plans and Specifications which will be prepared specifically for this task.

The Engineer's ground control person will be trained in the following subjects:

1. Principles and practices of radiation protection.
2. Radioactivity measurement standardization and monitoring techniques.

3. Ludlum Model 19 Scintillometer operation including instrument theory, operating procedures, maintenance, field application, and gauge calibration.

B. PROCEDURES FOR EXCAVATION AND DISPOSAL OF WTM

WTM removal and disposal shall be handled in accordance with the following procedures.

1. All WTM delineated for excavation and disposal, per the procedures as discussed in Section 2.3 of this report, will be identified in the field with pin flags.

2. Excavation of these materials will be completed in a very selective manner in order to excavate only the radioactive soils with minimal disturbance to the surrounding and/or underlying suitable soils.

3. Excavation of radioactive soils will not extend below the pre-mining or undisturbed soil surface unless so directed by the Engineer's ground control person.

4. Equipment utilized to excavate and dispose of the WTM will consist ***only of scrapers*** with support equipment including push dozers and motor graders. The volume of excavated WTM will be limited to not more than 90% of the scraper capacity to prevent spillage along the on-site haul roads. The Engineer's ground control person will perform gamma radiation measurements continuously within the excavated area by traversing each area in perpendicular patterns at ten (10) meter centers to ensure that soils with elevated exposure rates have, in fact, been removed. Any soils with elevated gamma readings will again be identified with pin flags and removed. This process will be repeated until all WTM have been successfully excavated. The Contractor's excavating equipment will not be allowed to leave the area until it has been completely surveyed.

5. Excavated WTM will be selectively disposed of at the designated encapsulation area on Tailings Pond No. 1 as directed by the Engineer. Compaction of WTM within the disposal area will not be required, however, each scraper load will be placed in horizontal layers not exceeding twelve (12) inches and will be smoothed by the motor grader. Compaction shall be obtained by splitting the scraper tracks of previously placed loads during the grading activities. Accurate construction of the WTM placement area will be required to plus or minus 0.3 inches of the lines and grades shown on the construction plans and as staked in the field by the Engineer. WTM will be placed in such a manner as to facilitate capping with a minimum thickness of one (1) foot interim cover soils. Placement of the interim cover is necessary to isolate the WTM from natural dispersive forces including wind and water erosion.

6. Excavation and disposal of WTM will only be conducted during daylight hours.

4. FINAL VERIFICATION SURVEY (CLASS I)

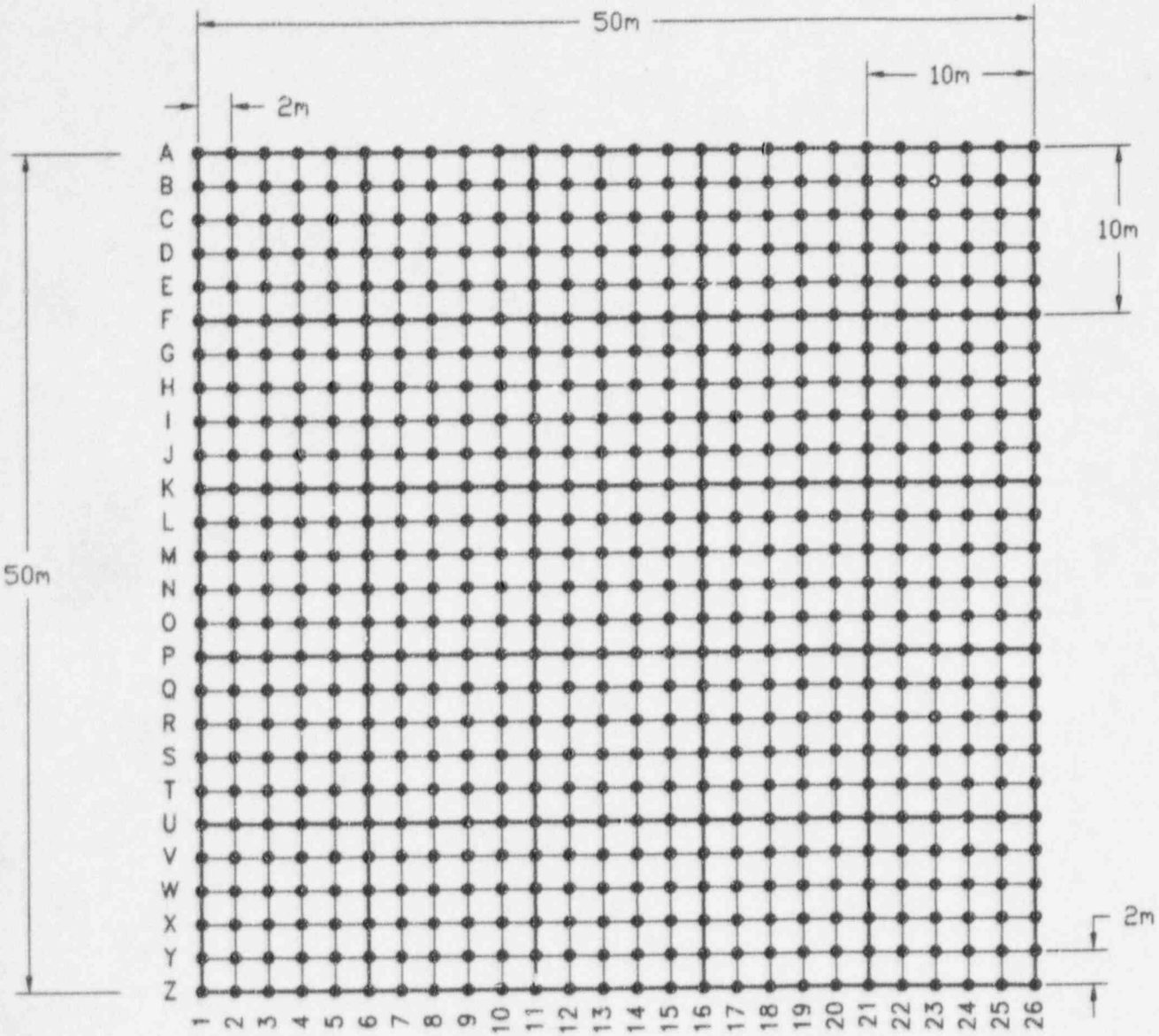
The methodology for soil sample collection and radiological survey and analysis for the Final Verification Survey will be structured utilizing the guidelines as presented in Section 2.3 of this report. Final Verification Surveys ***will only*** be performed in those areas where WTM were previously identified and excavated. For "Potentially Impacted Areas" which did not exhibit gamma readings greater than 45 MicroR per hour, the Class II survey will serve as the Final Verification Survey.

A. GAMMA RADIATION SURVEYS AND SOIL SAMPLE COLLECTION

Following excavation and removal of all suspected WTM, the excavated area will be divided into 50 meter by 50 meter grids utilizing the previously established grid corner node locations by the GPS Trimble Real Time Kinematic survey system. Surface gamma surveys will be performed within the grid coordinate system with a further breakdown to twenty five (25) - 10 meter by 10 meter squares. Gamma readings will be taken unshielded at a one (1) meter elevation from the surface, recorded and averaged over each 10 meter by 10 meter sub grid. The gamma radiation measurements will be performed by traversing each grid in two (2) distinct, perpendicular patterns which ultimately subdivide each 10 meter grid into twenty five (25) - 2 meter grids (refer to Figure 7A.2.). There will be thirty six (36) gamma readings per 10 meter by 10 meter grid. GPS survey will be performed within each 10 meter grid at all gamma survey locations. Each survey point will be entered into the system data collector and identified by description including the date, grid number and MicroR per hour reading.

Areas determined to contain WTM will be excavated in accordance with Section 3.0 and the above noted procedure will be repeated until all WTM have been removed and disposed of on Tailings Pond No. 1.

Soil samples will be taken at two (2) - 10 meter by 10 meter grids located within each 50 meter by 50 meter grid. Each soil sample will be a composite of five (5) sample locations within the 10 meter by 10 meter sub grid at a depth of 0 - 15 centimeters (refer to Figure 7A.3). The sample locations will be established utilizing the two 10 meter by 10 meter girds with the greatest averaged gamma readings. This methodology of soil sample location will eliminate any bias. GPS survey will be performed at each sample location. The coordinates of the sample location will be entered into the system data collector and identified for future reference, if required.



• = GAMMA SURVEY LOCATION
TOTAL = 676 LOCATIONS

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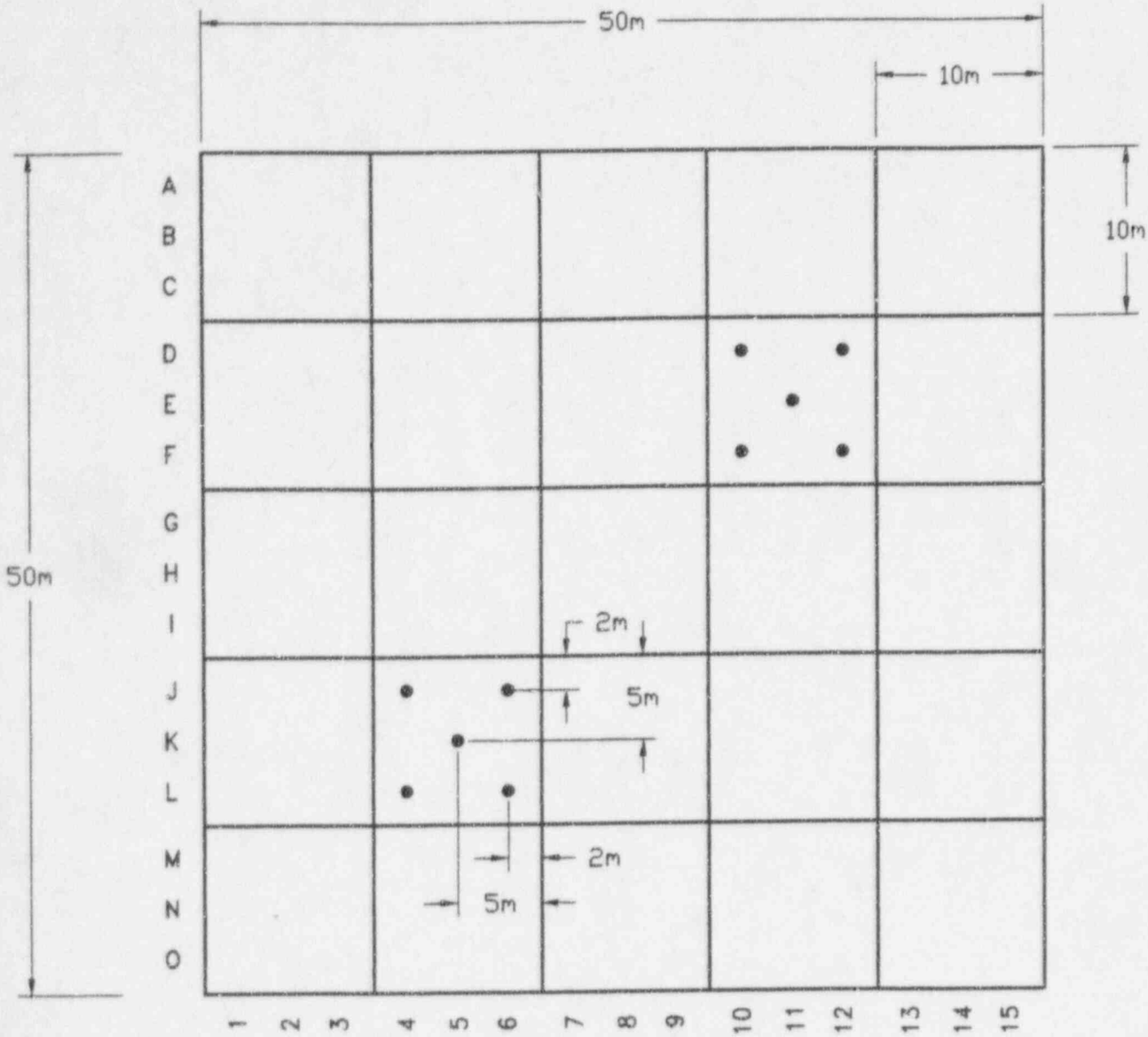
FIGURE 7A.2

"EXCAVATED CLASS I AREAS"
GAMMA SURVEY GRIDS

Date: May 1997

Project: 2-1926

File: 9001\ANC.DWG



• = GAMMA SURVEY LOCATION
TOTAL = 5 LOCATIONS PER
10 METER GRID

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FIGURE 7A.3

"SOIL SAMPLE COLLECTION"
FINAL VERIFICATION SURVEY

Date: May 1997

Project: 2-1926

File: 9001\ANC.DWG

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