

RADIOLOGICAL SURVEY REPORT
OF THE
LAMOITE INC. FACILITY

Prepared by

Fluor Daniel Environmental Services, Inc.
Marlton, New Jersey

February 3, 1994



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I. Introduction

This report presents the results of a radiological survey conducted by Fluor Daniel Environmental Services, Inc. (Fluor Daniel) on October 26-29, 1993, at Buildings B (metal storage building) and C of the Lamotite Inc. (Lamotite) facility located at 2891-2909 East 79th Street, Cleveland, Ohio. The purpose of the Radiological Survey was to provide the basis for preparation of a Radiological Control Procedure to establish requirements for the control of radioactive materials and areas at the Lamotite site (Site).

Radiological surveys were previously conducted by the Department of Energy (DOE) and Nuclear Regulatory Commission (NRC) in 1977 and 1983, respectively. Licensed activities were previously authorized for Horizons, Inc. by Atomic Energy Commission (AEC) Source Material License No. C-3496 and Byproduct Material Licenses No. 27229 and 34-001947-01. According to the NRC Inspection Report No. 99990003/93015, 1993, the Source Material license expired on May 31, 1959; the AEC Byproduct Material license was terminated on February 1, 1957; and the Byproduct Material license 34-001947-01 was terminated on December 9, 1958.

Prior to conducting the radiological survey, results of previous surveys performed by DOE and NRC were reviewed. The NRC survey results were reported in Inspection Report No. 99990003/93015, August 5, 1993, and DOE survey results, obtained by Oak Ridge National Laboratory were reported in DOE/EV-0005/10, "Formally Utilized MED/AEC Sites Remedial Action Program: Radiological Survey of the Former Horizons Inc., Metal Handling Facility, Cleveland, Ohio," dated February 1979 (ORNL Report). The NRC, in their letter to Lamotite, dated August 5, 1993, stated, "The radiation levels found in these areas do not constitute an immediate health and safety problem for your employees and visitors of the building ..."

In order to identify potential radiological hazards to their employees and provide guidelines for safe operations, Lamotite had Fluor Daniel conduct a radiological survey and prepare a Radiological Control Procedure. The radiological survey including direct radiation (measurement taken one (1) centimeter from surface), general area radiation (measurement taken one (1) meter from surface), loose contamination and airborne radiation measurements, was conducted by Messrs. Adkins and Kubacka of Fluor Daniel on October 26 - 29, 1993. The results of the radiological survey and the Radiological Control Procedure are presented in this report.



II. Purpose

The Lamotite site radiological survey was performed to determine radiological controls for the facility. Following completion of the radiological survey and analysis of the results, a Radiological Control Procedure was developed for the Site (Attachment A of this report). This procedure is a guide for radiological controls to be used while performing tasks associated with the plant's day to day operation.

The Radiological Control Procedure provides a brief overview of naturally occurring background radiation present throughout our environment, the difference between general public and nuclear worker exposure limits, location and reason for radiological posting, and guidelines for minimizing the potential spread of radioactive materials and exposure to employees or visitors at the Site.

III. Facility Description and Background History

The Site was formerly used by Horizons to produce granular thorium.

Based on review of the available survey data from NRC Inspection Report No. 99990003/93015 dated August 5, 1993, it was concluded that Fluor Daniel should direct its radiological survey in areas of suspected radioactive contamination where occupancy could lead to either internal or external radiation exposure. Additionally, random radiation measurements were performed in non-suspect areas.

The approximate size of the entire Site is 146,000 ft². Building C (including offices) occupies approximately 24,500 ft² and Building B occupies approximately 5,200 ft². Buildings B and portions of Building C are primarily used as storage areas. The only area which is routinely occupied is the west side of Building C which has been turned into office space of approximately 6,900 ft².

IV. Survey Description

Prior to performing this radiological survey a work plan was developed to establish the initial guidelines for performing the survey. Deviations of the survey from the work plan were minimal, such as instrumentation used, and do not affect the validity of the results contained in this report.



The radiological surveys were conducted in and around the former storage and processing areas utilized by Horizons during thorium processing activities in Buildings B and C. The areas surveyed included ceilings, overhead ledges, walks, roof drain pipes, floors, floor drains, large objects, debris scattered on the floor, dust covering the floor, offices, restrooms, hallways, parking lot, floors of work areas adjoining Buildings B and C and outside the Site buildings.

Air samples were taken inside Building B, specifically, one (1) meter above a floor drain (No. 14), in the employee parking lot, the storage-dock area in the northwest corner of Building C, the office spaces, the maintenance-assembly area (east of Building C), the flammable liquids storage area, the old storage area, and Building C (general area). Breathing zone air samples were taken at the start of the surveys in Buildings B and C.

A thorough radiological survey was performed in Building B and portions of Building C, i.e., in the flammable liquids storage room and the old storage room, using a predetermined 25-ft² grid, to establish personnel radiological controls. A reconnaissance level radiological survey was also performed, using random measurements, i.e., measurements taken at randomly selected non-suspect locations, outside of these areas as an additional precaution.

The radiological surveys were performed using the following equipment:

- Ludlum, Model 19 micro R meter, serial #91555, calibrated on July 15, 1993;
- NE Technology Limited, Electra alpha/beta rate meter, serial #589, calibrated on August 26, 1992 with a dual 100 cm² probe type DP2R/4A, serial #9486; and
- Eberline, Model ESP-1 survey meter with a Model HP-210 pancake probe, serial #1489, calibrated November 10, 1992.

Individual 20-minute background radiation measurements were taken on the Site and in the general Cleveland area and the results are presented in the table below. Note that background radiation levels were not subtracted from the alpha, beta and gamma measurements taken during this survey and reported in Section V.

Instrument	Background Reading
Ludlum micro R meter	8 to 12 μ R/hr.
Electra alpha/beta rate meter	10 to 16.25 dpm/100 cm ² alpha 1143 to 1262 dpm/100 cm ² beta
Eberline w/ pancake probe	320 to 360 dpm gamma

Note: μ R/hr is 1×10^{-6} Roentgen per hour, dpm is disintegrations per minute

Periodic alpha and beta/gamma response checks were performed on both the Electra alpha/beta meter with probe and the Eberline with probe to verify instrument responses. Also, periodic source checks were performed on the Electra alpha/beta meter using an AM-241 source.

Measurement techniques that were used to determine radiation levels during the survey are defined below:

<u>Technique</u>	<u>Description</u>
Direct	Measurement taken approximately one (1) centimeter (cm) from the surface
General Area	Measurement taken approximately one (1) meter (m) from the surface
Swipes	Collection and measurement of loose surface particles over an approximate 100 cm ² surface area using a 1 $\frac{3}{4}$ -inch cloth sampling smear.
Air Sampler	Collection and measurement of airborne particles

Radioactive materials may be in the form of different media. Generally, the following three media categories are used:

<u>Media</u>	<u>Description</u>
Removable	Material that can easily be removed from a surface. Examples may include dirt, dust, loose paint chips, rust, etc. that possess radioactivity.



Fixed	Materials that are embeded onto or in a surface. Examples may include radioactive particles in concrete, sealed under paint, etc.
Airborne	Radioactive particles that are present in the air. Examples may include fine dust particles that are swept up and carried by air currents.

V. Survey Results

Radiation levels, as determined using direct, general area, swipe and/or air sampler survey techniques do not constitute a health and safety problem to Lamotite employees or visitors. This confirms the conclusion of the NRC, based on the previous survey in June, 1993. Also adequate ventilation in Buildings B and C minimizes potential radon buildup.

Attachment B, Radiological Survey Results, shows the grid system (25 ft²-sections) used to take swipes and shows radiation measurement locations where radiation levels were above background. Not all grid areas could be surveyed due to debris and equipment, however, the survey results in these areas of limited access are considered adequate for representation of these areas. Attachment C presents results and locations of air sampling, including gamma analyses from five air samples. Attachment D shows Building B and C areas that were posted as restricted areas.

The criteria used for determining restricted areas was based on the NRC release criteria per "Guidelines for Decontamination of Facilities and Equipment". NRC, August 1987. Based on these guidelines, the following radiation limits for restricted use were used.

- Surface contamination in exceedence of
 - 200 dpm/100 cm² (removable)
 - 1,000 dpm/100 cm² (average, fixed)⁽¹⁾
 - 3,000 dpm/100 cm² (maximum, fixed)

⁽¹⁾ Measurements of average contamination should not be averaged over more than one (1) m².

- Direct radiation measurement one (1) cm from surface in exceedence of
 - natural background plus 200 $\mu\text{R/hr}$ (average)⁽²⁾
 - natural background plus 1,000 $\mu\text{R/hr}$ (maximum)

⁽²⁾ In this case the beta emitter was sufficiently weak so that only the gamma emitter is significant in the dose evaluation. The absorbed dose is due to the gamma radiation.

Areas that were found to have radiation levels, based on survey measurements, above these criteria were posted as restricted areas. These restricted areas, as defined in this report, are identified as either "radioactive materials areas" or "radiation hazard areas" and are defined below.

- Radioactive Materials Area Surveyed areas where radiation measurements exceed the NRC release criteria but which do not exceed 10 CFR 20 limits for radiation exposure to the general public or for employees or visitors.
- Radiation Hazard Area Locations where it is reasonable to believe, based on site history and radiation survey data, that amounts of residual radioactive materials may exist in quantities that could allow employees or visitors to exceed the NRC mandated limits (10 CFR 20) for the general public. These areas, which include floor drains and drain lines, are not easily accessible in the current site configuration, and if left undisturbed do not presently constitute a radiation health risk for an employee or visitor.

Survey results are described in more detail below.

A. Restricted Areas in Buildings B and C

The radiation survey results did not indicate any exposure levels that would result in employees exceeding government mandated limits for the general public (10 CFR 20). This is consistent with the recent survey performed by NRC in August, 1993. However, some areas of the site discussed below have radiation levels above NRC release criteria and some areas indicated the potential for radiation hazards. These areas are posted as either radioactive materials areas or as radiation hazards.

To decrease the possibility of facility workers receiving unnecessary radiation



exposure and to decrease the possibility of the spread of radioactive materials, the following good practice guidelines are recommended in restricted areas identified below:

- No eating, drinking or smoking.
- No sweeping or dusting.
- No dumping, spilling or flooding of liquids in the vicinity of the floor drains.
- No disturbance nor entry of the floor drains.
- No demolition nor removal of portions of the building.
- No grinding, flame cutting, or use of abrasives.
- No removal of equipment, debris or dust.

Deviations from these good practices require the approval of Mr. Rick Puhala and a qualified health physics technician. Specific areas that are identified as restricted areas, based on radiation levels above NRC release criteria and/or background are listed below.

1. Building C - Flammable Liquids Storage Room: The survey of the flammable liquids storage room indicated measurements in exceedence of NRC release criteria for fixed contamination on both the east and south walls. These areas are posted as radioactive materials areas. The remaining floor area of this room is unrestricted for use.

Prior to removal of 55-gallon drums to facilitate surveying, random radiation measurements and swipes of the floor were taken. The Electra alpha/beta ratemeter was used to survey each drum as it was removed. No elevated levels of radiation or contamination were detected.

Direct radiation and removable contaminant measurements were taken from the ceiling, ledges, windowsills, walls, and floor. The swipes indicated no removable contamination above background. Direct alpha radiation measurements ranged from 0 to 45.2 dpm/100 cm². During the survey, excessive amounts of dirt/dust were observed on the floor which may have introduced errors in the measurements of low levels of alpha radiation. However, even if this dirt/dust introduced measurement errors, the conclusions in the report are not altered.



Direct gamma measurements along the ceiling were 10 to 15 $\mu\text{R/hr}$ except near the drain pipes from the roof which were 15 to 20 $\mu\text{R/hr}$. General area beta measurements were 1524 to 4142 dpm/100 cm^2 . Direct gamma measurements ranged from 18 to 30 $\mu\text{R/hr}$ and general area gamma measurements were 12 to 20 $\mu\text{R/hr}$. The reason for the higher measured levels near the drain pipes is not known. However, during the previous manufacturing process, radioactive dust particles may have collected on the roof and have been subsequently carried into the drain pipe via rainwater.

Windowsills on the east side of the room were an exception. Direct radiation measurements indicated beta activities of 6667 to 3095 dpm/100 cm^2 and general area beta of 2714 to 6024 dpm/100 cm^2 , the higher measurements coming from cracks in the concrete; and direct gamma measurements of 20 to 30 $\mu\text{R/hr}$ and general area gamma of 20 to 25 $\mu\text{R/hr}$.

Measurements at the junction of the east wall and floor indicated direct beta measurements of 4048 to 6667 dpm/100 cm^2 and general area beta of 2286 to 3095 dpm/100 cm^2 ; and direct gamma measurements of 19 to 30 $\mu\text{R/hr}$ and general area gamma of 20 to 25 $\mu\text{R/hr}$.

The center third of the south wall from the floor to approximately five feet high indicated direct beta measurements of 2857 to 5714 dpm/100 cm^2 and general area beta of 1762 to 2952 dpm/100 cm^2 ; and direct gamma measurements of 30 to 80 $\mu\text{R/hr}$ and general area gamma of 20 to 50 $\mu\text{R/hr}$ with the highest measurements occurring in a two-foot high by five-foot wide oval patch below the center notch. The above locations were posted as radiation materials areas, because the beta level exceeded the NRC release criteria.

2. Building C - Old Storage Room: The survey of the old storage room indicated measurements in exceedence of NRC release criteria for fixed contamination in areas along the north and west walls. The area along the west wall is posted as a radiation hazard area to prevent potential access and entry into the drain pipe because of the potential for radioactive material inside the pipe. Access for normal plant operations is unrestricted, within the area around the drain pipe. The remaining areas in this room are also unrestricted for use.

The same process, as described above, for removal of stored 55-gallon drums was utilized. As before, the swipes indicated no removable contamination. Direct alpha radiation measurements ranged from 0 to



30 dpm/100 cm². Ceiling direct and general area gamma measurements were both 18 to 25 μ R/hr along the roof drain lines. The walls and floor direct beta measurements varied from 1548 to 1905 dpm/100 cm² and general area beta from 1200 to 1429 dpm/100 cm². Direct gamma measurements ranged from 12 to 20 μ R/hr and general area gamma from 10 to 20 μ R/hr, except for a few limited areas. Areas that include the center third of the north wall, which is the opposite side of the common wall shared with the flammable liquids storage room, indicated direct beta measurements of 3335 to 4285 dpm/100 cm² and direct gamma measurements of 30 to 80 μ R/hr and general area gamma of 20 to 50 μ R/hr were concentrated along a horizontal crack near the floor. There were no elevated measurements coming from the wall as was detected in the flammable liquids room.

Additional elevated direct beta measurements of 7143 to 11905 dpm/100 cm² and direct gamma of 30 to 40 μ R/hr measurements were indicated where the three roof drain pipes meet the floor. This area was posted as a radiation hazard due to the potential for removal of radioactive contamination from these pipes.

There was a patch of floor where elevated radiation levels continued southward along the floor starting from the drain pipe in the southwest corner of the room, across the portal to the room, and ending about two feet from the wall. This area is about two feet wide by eight feet long as if the drain pipe turned south under the floor and then down after eight feet. The third area starts at the door in the northeast corner of the room which leads to an outside alcove to which the fans, in the flammable liquids room, exhaust.

Radiation measurements of the ground indicate no detectable alpha, direct beta levels of 1857 to 2619 dpm/100 cm² and general area beta of 1669 to 1908 dpm/100 cm². Measurements indicated direct gamma levels of 25 to 40 μ R/hr and general area gamma of 20 to 28 μ R/hr. The swipes of the fan exhaust vents indicated no removable contamination. Two areas are posted as radioactive materials areas because the beta radiation levels exceed the NRC release criteria.

The other area is posted as a radiation hazard area because it is reasonable to believe that residual radioactive materials exist in the drain pipe that could allow personnel to exceed NRC limits (10 CFR 20) for the general public if disturbed.

3. Building B: The survey of Building B indicated measurements in exceedence of NRC release criteria for fixed contamination and direct



radiation in multiple locations. The entire building is posted as a radioactive materials area. Additionally, three of the floor drains have been posted as radiation hazards. These drains should be avoided because of the potential to spread loose radioactive material trapped in the drain, and to minimize personnel radiation exposure.

A grid radiation and swipe survey was performed which focused on the ceiling, ledges walls, and specific floor and floor drain areas. The swipes indicated no removable contamination on the floor, ceiling, walls, and numerous pieces of stored equipment. Wall and ledge (direct and general area) radiation measurements were only higher where the wall or ledge was adjacent to a floor drain opening, i.e., 8 to 14 $\mu\text{R/hr}$ gamma. Random radiation measurements and swipes were taken on the floor and machinery due to the presence of debris and stored equipment. There was no indication of any removable contamination and radiation measurements at the floor drains that could be accessed indicated elevated levels similar to the NRC survey. No materials were removed from the drains during Fluor Daniel's survey. Radiation hazard tags were placed on the drains with the highest activity to warn personnel of potential radiation hazard from the radioactive materials trapped in the drains. At the building entrances, two chain-link fence gates had been previously installed by Lamotite and the area was posted as radiation materials areas during the radiological survey.

B. Reconnaissance Survey of Other Areas

Other areas were surveyed on a reconnaissance level to verify previous surveys. These surveys showed radiation levels below the NRC release criteria in the following areas.

1. Building C - Office Area: Random radiation measurements throughout the area and swipes, (particularly of the entry ways and foot pathways) indicated no levels of direct radiation or removable contamination in excess of the release criteria.
2. Employee and Visitor Parking Lots and Drives: Random radiation measurements throughout the area and swipes, (particularly of the foot pathways between the buildings and the cars, and on the loading dock driveway) indicated no levels of direct radiation or removable contamination in excess of the release criteria.
3. Exterior Surfaces and Areas Outside of Site Buildings: Random radiation measurements and swipes on grounds and walls indicated no



levels of direct radiation or removable contamination in excess of the release criteria.

4. Assembly Area East of Building C: Random radiation measurements and swipes on floor, equipment, and in the restrooms indicated no levels of direct radiation or removable contamination in excess of the release criteria.
5. Maintenance Area South of Building C: Random radiation measurements and swipes on floor and equipment indicated no levels of direct radiation or removable contamination in excess of the release criteria.
6. Dock, Foil Storage, and Shipment Staging Areas North of Building C: Random measurement and swipes on floor and walls indicate no levels of direct radiation or removable contamination in excess of the release criteria.
7. Building C - Main Storage Area: Grid radiation measurements and swipes of ceilings, ledges, beams, walls, stored items and floor indicated no levels of direct radiation or removable contamination in excess of the release criteria. Some areas of the floor were covered with materials in storage. These areas of the floor were not exposed for survey measurements.

VI. Recommendations

A. Building B - Floor

Based on the NRC and Fluor Daniel survey, the floor drains near the center of Building B exhibit elevated levels of radioactivity. No samples were taken of drain materials, however, it is assumed that radioactive materials may have collected in these drains during prior operations at the Site. In order to isolate these materials from personnel at the surface, and to reduce the potential for migration of these materials further into the drain system, it is recommended that Lamotite cap these drains. A health physics technician must be present during installation to provide radiological control.

B. Use of Building B (Old Metal Storage Building)

If Building B is needed for general operations, then it is suggested that all dirt/dust and debris be removed using a dry vacuum fitted with HEPA filtration. After vacuuming, the collected dirt/dust and debris should be



analyzed to determine if it meets NRC release criteria. If the collected dirt/dust and debris meet the release criteria, then all stored equipment, not associated with prior processing of radioactive materials, may be removed from the building and used elsewhere at the facility. All equipment used previously for the processing of radioactive materials is more likely to have radioactive contamination on internal surfaces and therefore should be surveyed by a qualified health physics technician before use or disposal.

If the building is not needed for general operations, and is not vacuumed, then individual pieces of stored equipment not previously used for processing of radioactive materials should be cleaned, prior to removal, of all dirt/dust using a clean cloth under the guidance of a qualified health physics technician.

C. Facility Status Changes

Any status changes of the Lamotite facility, such as demolition, clean up of potentially contaminated areas, removal of potentially radioactive material, subsurface activity, etc. should be coordinated with NRC. Coordination may range from simple notification to preparation of work plans for NRC review.

VII. Attachments

- Attachment A - RADIOLOGICAL CONTROL PROCEDURE
- Attachment B - RADIOLOGICAL SURVEY RESULTS
- Attachment C - AIR SAMPLING RESULTS
- Attachment D - POSTED AREAS ON SITE



**RADIOLOGICAL CONTROL PROCEDURE
FOR EMPLOYEES WORKING
AT THE LAMOTITE FACILITY**

1. Purpose

A radiological survey was performed in areas formerly used for processing of nuclear materials. The intent of the survey was to determine what radiological controls, if any, were necessary for operations at the Lamotite site (Site). The survey focused on areas inside and adjacent to Buildings B and C and was conducted on October 26-29, 1993.

2. Background

Naturally occurring radionuclides, which are present at the Site, are also present in minute quantities throughout our environment. Concentrations of these radionuclides in normal soils, air, water, food, etc., are referred to as background concentrations or levels. Radiation exposures resulting from this environmental radioactivity are referred to as background exposures. These background exposures are not caused by any human activity and, to a large extent, can be controlled only by changing geographic location. Everyone receives some background exposure daily.

The use of radioactive material for scientific, industrial, or medical purposes may cause radiation exposures above background levels to be received by workers in the nuclear industry and, to a lesser extent, by members of the general public. Scientifically based guidelines have been developed to place an upper limit on exposures above background levels. Limits established for exposure to the general public are much lower than the limits established for workers in the nuclear industry.

Surface contamination at the site is due primarily to deposits of naturally occurring radionuclides including thorium and its daughter products on building surfaces and in floor drains. This contamination is yielding radiation levels slightly above background. The primary type of radioactive levels (emissions) are beta and gamma radiation.

ATTACHMENT A - Continued

The survey results indicated radiation exposure levels are below government mandated limits for the general public (10 CFR 20 - for an employee or visitors) based upon an average number of hours in the posted work areas of less than 2080 hours per year. The purpose of this radiological control procedure is to reduce the potential for spread of naturally occurring radionuclides and to control access to site areas where measurable low levels of radiation were found.

3. Definitions

Based on the radiological survey, certain areas were posted as restricted areas. These restricted areas include radioactive materials areas and radiation hazard areas. These areas are defined below as they apply to this report.

- **Radioactive Materials Area** Surveyed areas where radiation measurements exceed the NRC release criteria but which do not exceed 10 CFR 20 limits for radiation exposure to the general public or for employees or visitors.

- **Radiation Hazard Area** Locations where it is reasonable to believe, based on site history and radiation survey data, that amounts of residual radioactive materials exist in quantities that could allow employees or visitors to exceed the NRC mandated limits (10 CFR 20) for the general public. These areas, consisting of floor drains and drain lines, are not easily accessible in the current site configuration, and if left undisturbed do not constitute a radiation health risk for an employee or visitor.

4. Guidelines

A. Building B

This building is posted as a radioactive materials area. This posting is due primarily to the emission of measurable radiation in the floor drains, which are posted as radiological hazards. This also prevents uncontrolled and/or inadvertent removal of radioactive materials from these drains and spread to other areas. The floor drain areas should be avoided. The following rules apply while in Building B, unless approved by Mr. Rick Puhala and under the direction of a qualified health physics technician.



ATTACHMENT A - Continued

- No eating, drinking or smoking.
- No sweeping, mopping or dusting.
- No dumping of liquids in the floor drains or disturbance of the drains.
- No climbing.
- No demolition or removal of portions of the building.
- No grinding, flame cutting, or use of abrasives on building surfaces.
- No moving or removal of equipment or debris.

B. Building C

Posted radioactive materials areas of Building C, including portions of the flammable liquids storage room and the old storage room, are safe for passage. The following rules apply for these posted areas unless approved by Mr. Rick Puhala and under the direction of a qualified health physics technician:

- No sweeping or dusting in posted areas.
- No dumping of liquids in the drains or disturbance of the drains.
- No demolition or removal of portions of the building.
- No grinding, flame cutting, or use of abrasives.

C. Other Areas

The following guidelines should be followed in non-posted areas:

- No subsurface activity inside of Buildings B or C.
- No entry or excavation of any drain lines.
- No digging and/or removal of concrete or asphalt paving or excavation anywhere within the site boundaries.

The posted areas in Buildings B and C are identified in the figures on the following pages.



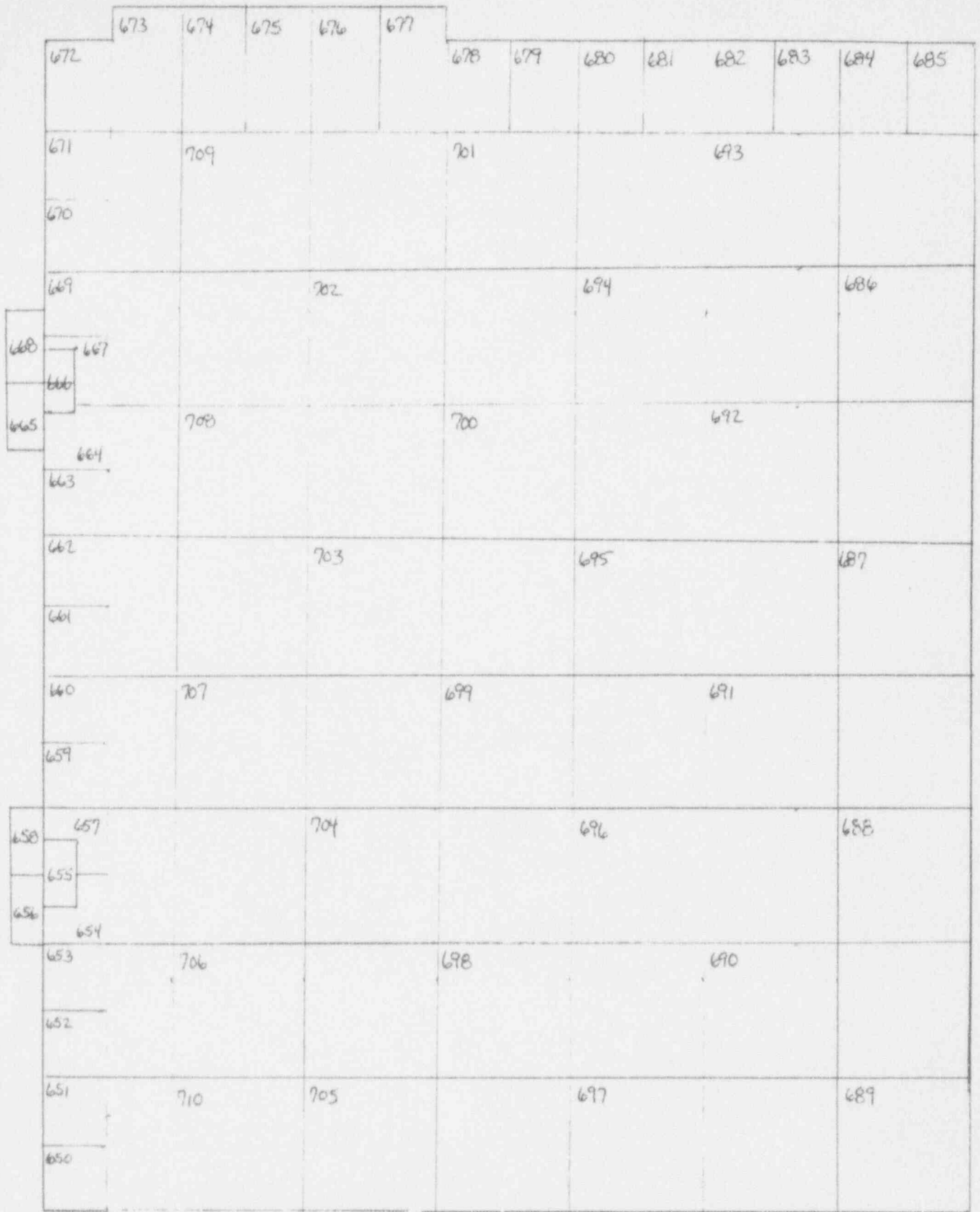
RADIOLOGICAL SURVEY RESULTS

Direct and general area radiation, and contamination measurements were taken in specific grid areas of Building B (the old metal storage building) and specific areas of Building C. The location and results of these measurements are presented on figures and in tables on the following pages. The total number of documented measurements are summarized below:

<u>Type</u>	<u>Number</u>
Swipes	846
Direct Radiation	648

BUILDING B

BUILDING C



BUILDING C, FLAMMABLE LIQUIDS STORAGE ROOM FLOOR

SURVEYED BY: DAVID KUBACKA

VERIFIED BY: RANDALL J. ADKINS

SURVEY DATE: 10-28-93

LOCATION: BUILDING C, FLAMMABLE STORAGE ROOM FLOOR

SURVEYED BY: DAVID KUBACKA
 VERIFIED BY: RANDALL J. ADKINS
 SURVEY DATE: 10/28/93

<u>GRID#</u>	<u>ALPHA (1CM) DPM/100CM²</u>	<u>BETA (1CM) DPM/100CM²</u>	<u>BETA (1M) DPM/100CM²</u>	<u>GAMMA(1CM) uR/HR</u>	<u>GAMMA (1M) uR/HR</u>
650	16	2,438	1,633	18	22
651	0	2,800	1,562	20	19
652	0	2,914	1,519	22	18
653	0	3,005	1,585	27	18
654	0	3,962	2,913	20	20
655	0	3,281	1,371	24	20
656	31	23,124	5,024	27	21
657	0	4,376	1,280	30	25
658	16	27,676	5,024	27	21
659	0	3,123	1,690	30	25
660	0	2,738	1,743	30	25
661	0	2,643	1,657	27	25
662	0	2,810	1,610	30	25
663	0	2,962	1,581	30	25
664	0	3,695	2,817	25	20
665	16	19,967	5,514	25	25
666	0	4,228	1,323	22	22
667	0	3,929	3,180	25	25
668	31	26,138	6,248	30	25
669	0	3,643	2,754	30	28
670	0	2,967	1,538	30	28
671	0	2,867	1,160	30	28
672	0	2,785	1,686	30	25
673	31	2,000	1,751	25	20
674	0	1,752	1,555	20	20
675	0	2,062	1,598	20	20
676	0	2,976	1,914	35	30
677	0	5,771	5,662	45	30
678	0	4,376	4,500	60	33
679	0	3,390	4,075	80	50
680	0	3,771	4,338	80	50
681	0	5,662	4,181	70	45
682	0	4,124	3,967	50	35
683	0	3,071	2,438	30	30
684	0	1,686	1,419	25	23
685	0	1,486	1,310	20	20
686	0	1,528	1,280	17	12
687	0	1,648	1,314	12	11
688	0	1,619	1,390	11	11
689	0	1,543	1,252	10	10
690	0	1,500	1,414	11	10
691	0	1,614	1,381	12	10

692 0 1,552 1,280 16 12

LOCATION: BUILDING C, FLAMMABLE STORAGE ROOM FLOOR

SURVEYED BY: DAVID KUBACKA

VERIFIED BY: RANDALL J. ADKINS

SURVEY DATE: 10/28/93

<u>GRID#</u>	<u>ALPHA (1CM)</u> <u>DPM/100CM²</u>	<u>BETA (1CM)</u> <u>DPM/100CM²</u>	<u>BETA (1M)</u> <u>DPM/100CM²</u>	<u>GAMMA(1CM)</u> <u>uR/HR</u>	<u>GAMMA (1M)</u> <u>uR/HR</u>
693	0	1,805	1,302	20	13
694	0	1,590	1,374	19	13
695	0	1,667	1,272	15	11
696	31	1,690	1,252	10	10
697	0	1,533	1,205	10	10
698	0	1,600	1,325	14	11
699	0	1,633	1,381	18	11
700	0	1,595	1,363	20	12
701	0	1,843	1,320	22	15
702	0	1,562	1,314	20	15
703	0	1,595	1,254	20	15
704	0	1,557	1,236	20	15
705	0	1,671	1,314	18	13
706	0	1,814	1,280	19	14
707	0	1,786	1,280	20	17
708	0	1,757	1,214	25	20
709	0	1,824	1,372	25	20
710	0	1,476	1,302	17	12

	749	748	747	746	745	744	743	742	741	740	739	738	737	736
	750			779				780					781	
		778				783				782				
	751			784				785					786	
		777				788							787	
	752					776				775				
	753													
763	754	771			772			773					774	
762	755													
761	756		770			769				768				
760	757													
759	758	764			765			766						767

BUILDING C, OLD STORAGE ROOM FLOOR



SURVEYED BY: DAVID KUBACKA

VERIFIED BY: RANDALL J. ADKINS

SURVEY DATE: 10-28-93

LOCATION: BUILDING C, OLD STORAGE ROOM FLOOR

SURVEYED BY: DAVID KUBACKA
 VERIFIED BY: RANDALL J. ADKINS
 SURVEY DATE: 10/28/93

<u>GRID#</u>	<u>ALPHA (1CM)</u> <u>DPM/100CM²</u>	<u>BETA (1CM)</u> <u>DPM/100CM²</u>	<u>BETA (1M)</u> <u>DPM/100CM²</u>	<u>GAMMA(1CM)</u> <u>uR/HR</u>	<u>GAMMA (1M)</u> <u>uR/HR</u>
736	0	1,852	1,310	20	15
737	0	1,962	1,345	20	15
738	0	2,062	1,272	20	15
739	0	2,643	1,402	25	20
740	0	2,914	1,390	35	25
741	0	3,214	1,513	60	35
742	0	3,438	1,545	60	35
743	31	4,228	1,602	80	50
744	0	3,633	1,498	70	35
745	0	2,742	1,404	50	30
746	0	2,652	1,383	35	25
747	0	2,212	1,298	30	20
748	0	1,990	1,252	25	20
749	0	1,892	1,287	25	20
750	0	1,833	1,302	20	20
751	0	1,845	1,213	20	20
752	0	10,048	2,914	25	20
753	16	11,795	2,815	40	25
754	0	8,681	1,912	35	25
755	0	7,714	1,723	30	20
756	0	7,214	1,550	30	18
757	0	2,857	1,314	20	15
758	0	2,148	1,298	10	10
759	0	2,021	1,302	10	8
760	0	2,113	1,345	12	10
761	0	2,378	1,332	15	10
762	0	4,852	1,298	15	10
763	0	5,022	1,345	20	12
764	0	2,012	1,251	10	10
765	0	1,812	1,232	10	10
766	0	1,845	1,302	10	10
767	0	2,223	1,287	25	20
768	0	1,532	1,312	10	11
769	0	1,498	1,302	10	15
770	0	1,550	1,245	10	15
771	0	2,245	1,312	25	15
772	0	1,423	1,345	10	15
773	0	1,512	1,298	10	10
774	0	1,445	1,202	10	10
775	0	1,390	1,262	10	10
776	0	1,425	1,202	10	10
777	0	1,402	1,312	10	20

778 0 1,334 1,345 15 15

LOCATION: BUILDING C, OLD STORAGE ROOM FLOOR

SURVEYED BY: DAVID KUBACKA
VERIFIED BY: RANDALL J. ADKINS
SURVEY DATE: 10/28/93

GRID#	ALPHA (1CM) DPM/100CM ²	BETA (1CM) DPM/100CM ²	BETA (1M) DPM/100CM ²	GAMMA(1CM) uR/HR	GAMMA (1M) uR/HR
779	0	1,390	1,298	15	20
780	0	1,345	1,248	15	20
781	0	1,402	1,232	10	10
782	0	1,425	1,272	10	10
783	0	1,310	1,202	10	15
784	0	1,390	1,219	10	15
785	0	1,445	1,233	10	10
786	0	1,323	1,302	10	10
787	0	1,402	1,288	10	10
788	0	1,314	1,219	10	15

		804				805						806	
803	802	801	800	798	799	797	796	795	794	793	792	791	790
													789

BUILDING C, OLD STORAGE ROOM NORTH WALL

SURVEYED BY: DAVID KUBACKA

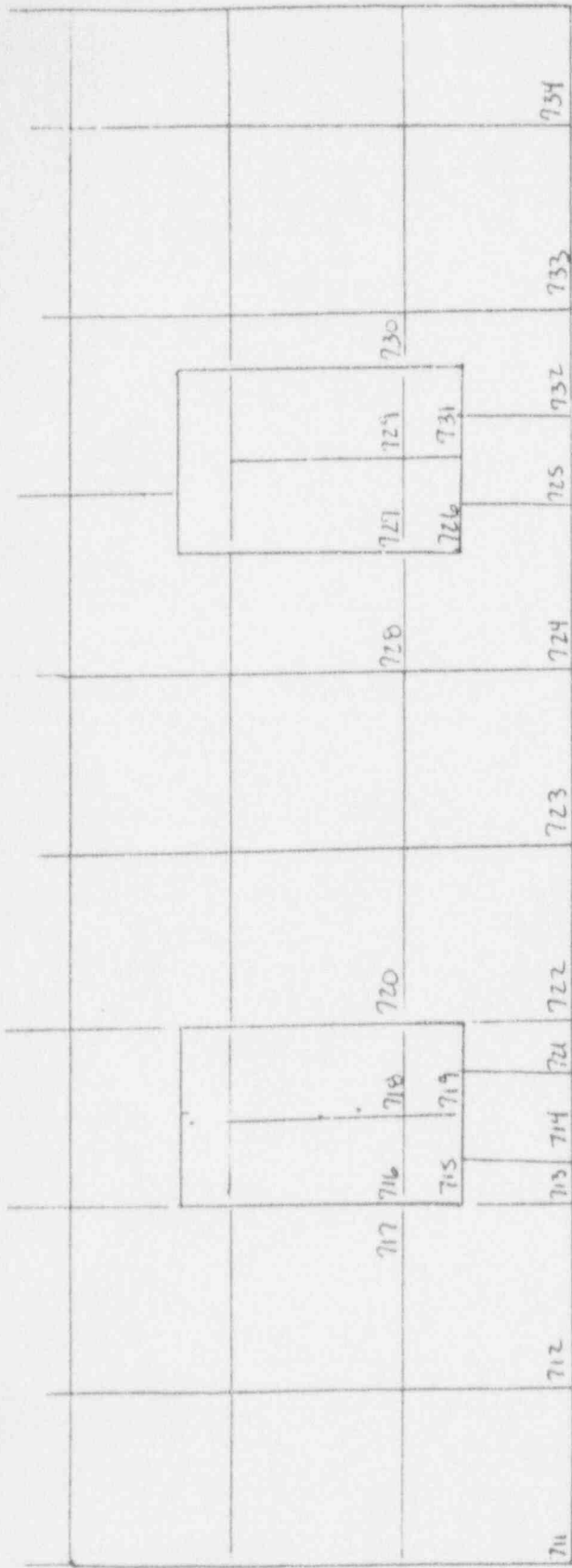
VERIFIED BY: RANDALL J. ADKINS

SURVEY DATE: 10-28-93

LOCATION: BUILDING C, OLD STORAGE ROOM, NORTH WALL

SURVEYED BY: DAVID KUBACKA
VERIFIED BY: RANDALL J. ADKINS
SURVEY DATE: 10/28/93

<u>GRID#</u>	<u>ALPHA (1CM)</u> <u>DPM/100CM²</u>	<u>BETA (1CM)</u> <u>DPM/100CM²</u>	<u>BETA (1M)</u> <u>DPM/100CM²</u>	<u>GAMMA (1CM)</u> <u>uR/HR</u>	<u>GAMMA (1M)</u> <u>uR/HR</u>
789	0	1,852	1,340	20	15
790	0	1,415	1,233	20	10
791	0	1,962	1,345	20	15
792	0	2,062	1,272	20	15
793	0	2,643	1,402	25	20
794	0	4,914	1,390	40	25
795	0	5,214	1,513	55	30
796	0	5,438	1,545	65	35
797	0	6,228	1,602	80	50
798	0	5,622	1,498	75	35
799	0	4,742	1,404	55	30
800	0	4,152	1,383	35	25
801	0	2,212	1,298	30	20
802	0	1,990	1,252	25	30
803	0	1,892	1,287	25	20
804	0	1,402	1,214	25	15
805	0	1,454	1,254	30	20
806	0	1,338	1,233	20	10



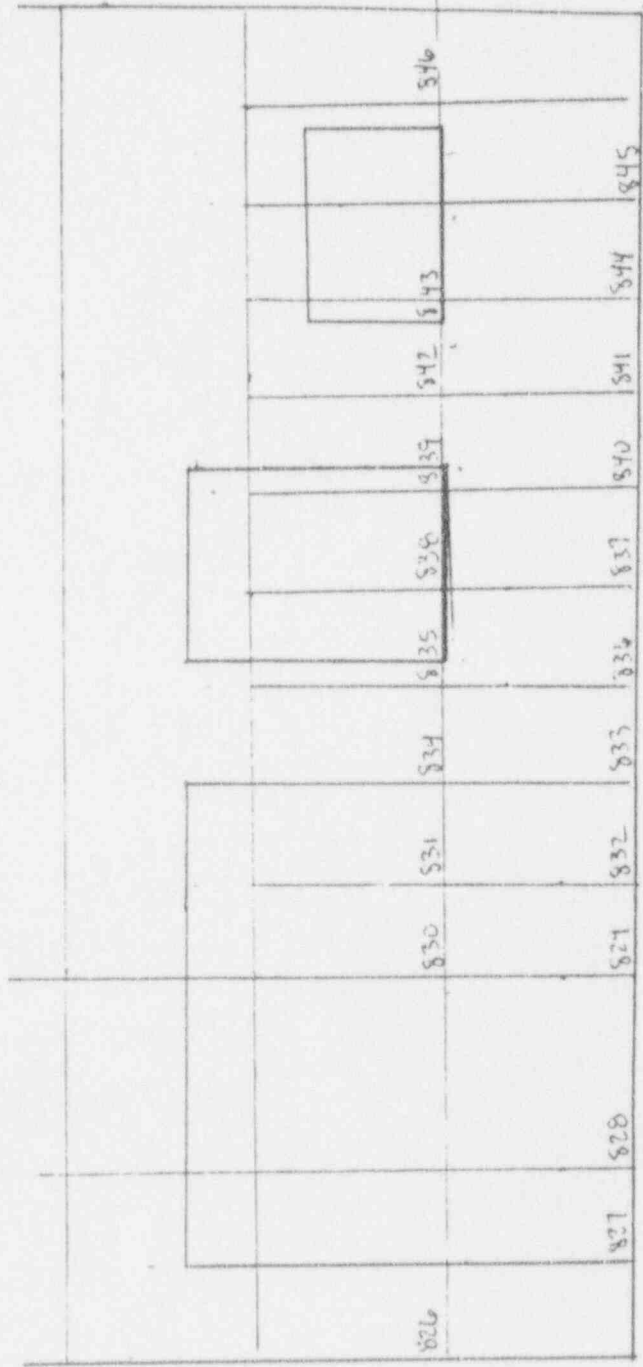
EAST WALL

BUILDING C, FLAMMABLE LIQUIDS STORAGE ROOM EAST AND SOUTH WALLS

SURVEYED BY: DAVID KOBACKA

VERIFIED BY: RANDALL J. ADKINS

SURVEY DATE: 10-18-93



SOUTH WALL

LOCATION: BUILDING C, FLAMMABLE STORAGE ROOM, EAST WALL

SURVEYED BY: DAVID KUBACKA
VERIFIED BY: RANDALL J. ADKINS
SURVEY DATE: 10/28/93

GRID#	ALPHA (1CM) DPM/100CM ²	BETA (1CM) DPM/100CM ²	BETA (1M) DPM/100CM ²	GAMMA(1CM) uR/HR	GAMMA (1M) uR/HR
711	0	2,612	1,751	19	17
712	0	2,950	1,690	25	18
713	0	3,962	1,810	20	20
714	0	3,281	1,720	25	20
715	31	23,124	1,914	30	20
716	0	6,238	3,524	28	20
717	0	3,817	1,894	25	18
718	0	7,142	4,139	28	18
719	31	27,676	2,009	27	20
720	0	3,912	1,925	25	18
721	0	4,376	1,823	30	20
722	0	2,931	1,719	30	20
723	0	2,733	1,670	28	22
724	0	3,372	1,640	27	20
725	0	2,813	1,823	25	20
726	16	19,967	2,154	25	20
727	0	6,028	4,212	25	20
728	0	4,113	1,872	22	17
729	0	6,733	4,113	28	20
730	0	4,212	1,924	25	20
731	16	26,138	1,872	30	22
732	0	3,634	1,751	30	22
733	0	2,917	1,710	30	20
734	0	2,785	1,690	30	20

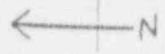
LOCATION: BUILDING C, FLAMMABLE STORAGE ROOM, SOUTH WALL

SURVEYED BY: DAVID KUBACKA

VERIFIED BY: RANDALL J. ADKINS

SURVEY DATE: 10/28/93

<u>GRID#</u>	<u>ALPHA (1CM)</u> <u>DPM/100CM²</u>	<u>BETA (1CM)</u> <u>DPM/100CM²</u>	<u>BETA (1M)</u> <u>DPM/100CM²</u>	<u>GAMMA (1CM)</u> <u>uR/HR</u>	<u>GAMMA (1M)</u> <u>uR/HR</u>
826	0	2,213	1,562	25	25
827	0	2,000	1,751	25	22
828	0	1,912	1,598	20	20
829	0	2,976	1,712	35	30
830	0	2,952	1,425	30	30
831	0	3,257	2,019	35	30
832	0	5,771	2,255	45	30
833	0	4,376	2,643	60	33
834	0	5,505	2,513	45	30
835	0	5,372	2,419	50	35
836	0	3,390	2,398	80	50
837	0	3,771	2,187	80	50
838	0	5,117	2,317	50	35
839	0	5,006	2,223	45	30
840	0	5,662	2,445	70	45
841	16	4,124	2,113	50	35
842	0	4,767	2,212	35	28
843	0	3,757	1,951	30	25
844	0	3,071	1,662	30	20
845	0	1,686	1,513	25	20
846	0	1,573	1,398	20	20



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BUILDING C, MAIN STORAGE AREA (NORTHEAST)

SURVEYED BY: DAVID KUBACKA

VERIFIED BY: N/A

SURVEY DATE: 10-28-93

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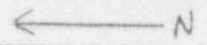
"

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BUILDING C, MAIN STORAGE AREA (SOUTH EAST)

SURVEYED BY: DAVID KUBACKA

VERIFIED BY: N/A

SURVEY DATE: 10-28-93

RAGE STORAGE

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STORAGE

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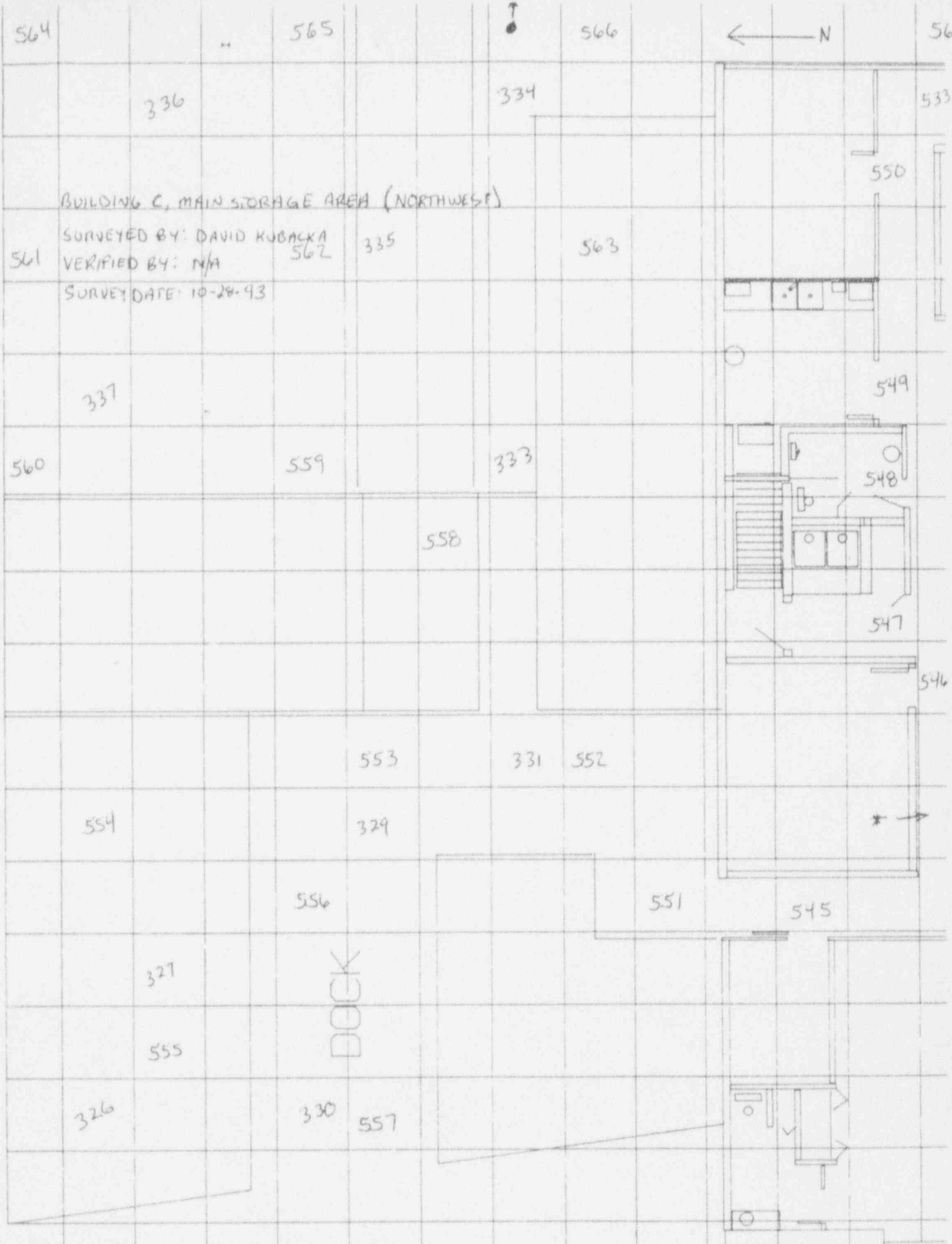
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BUILDING C, MAIN STORAGE AREA (OFFICES) (SOUTH WEST)

533 SURVEYED BY: DAVID KADALKA

VERIFIED BY: N/A

SURVEY DATE: 10-28-93

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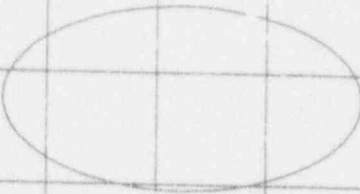
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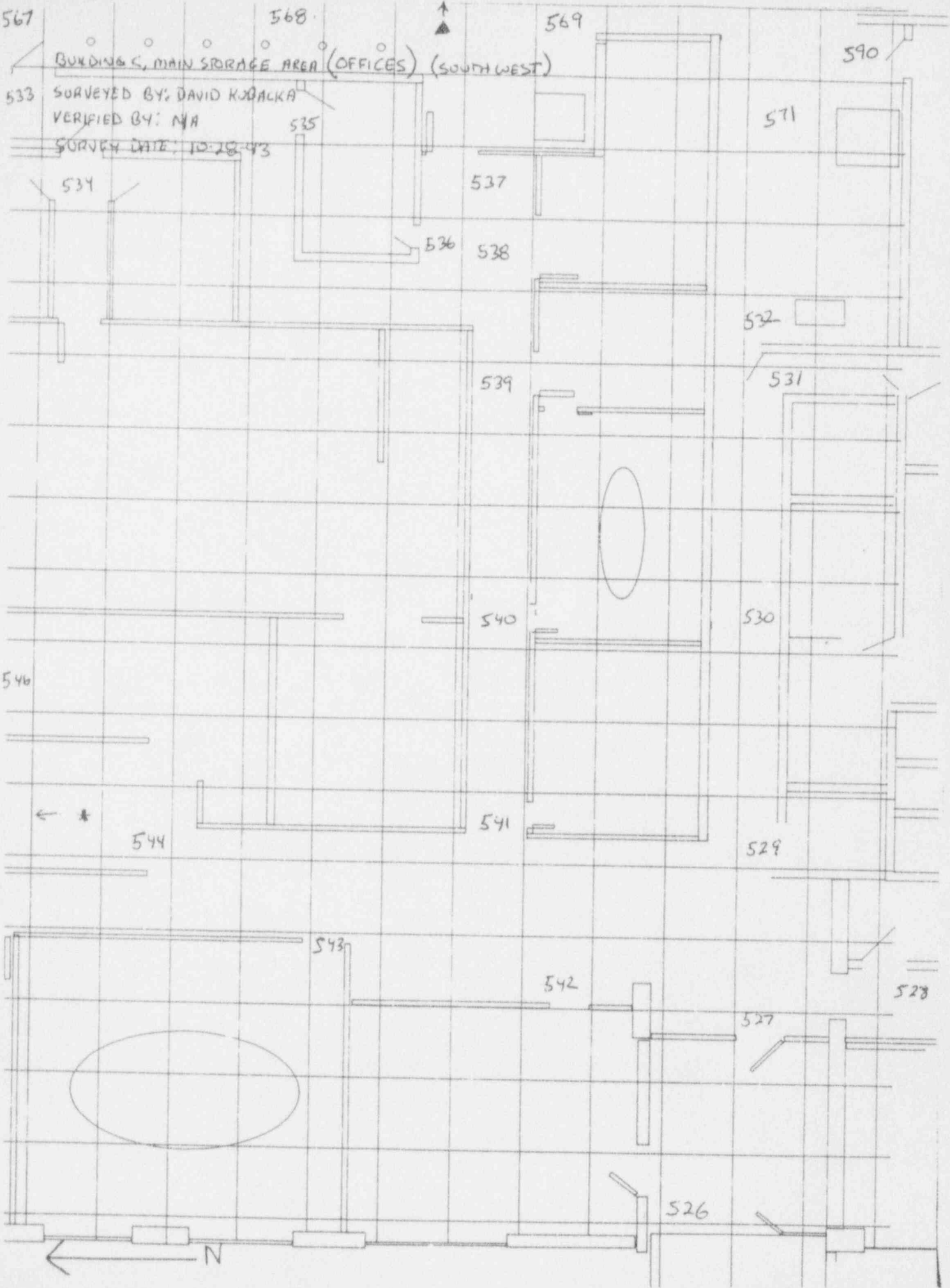
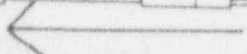
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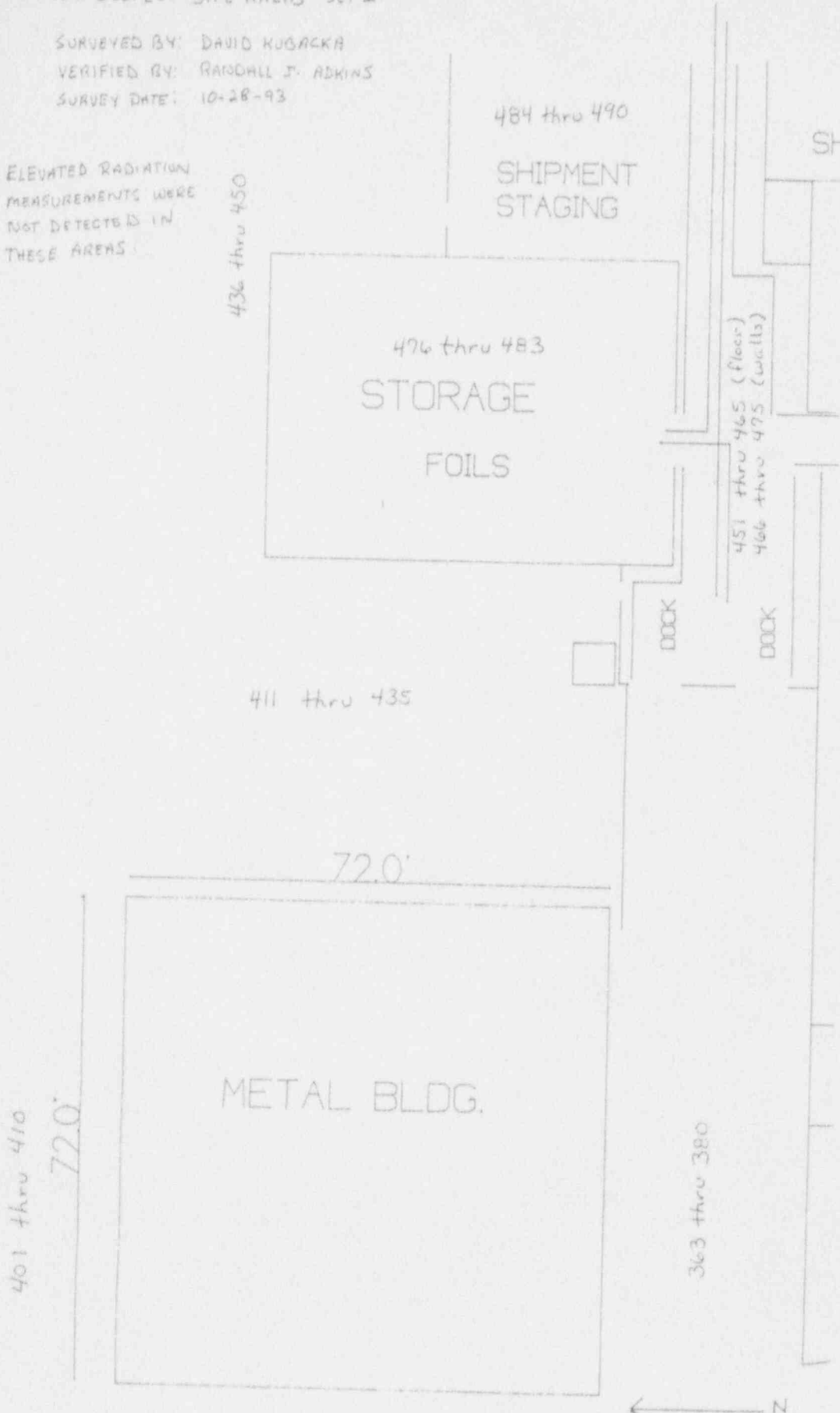


OTHER AREAS

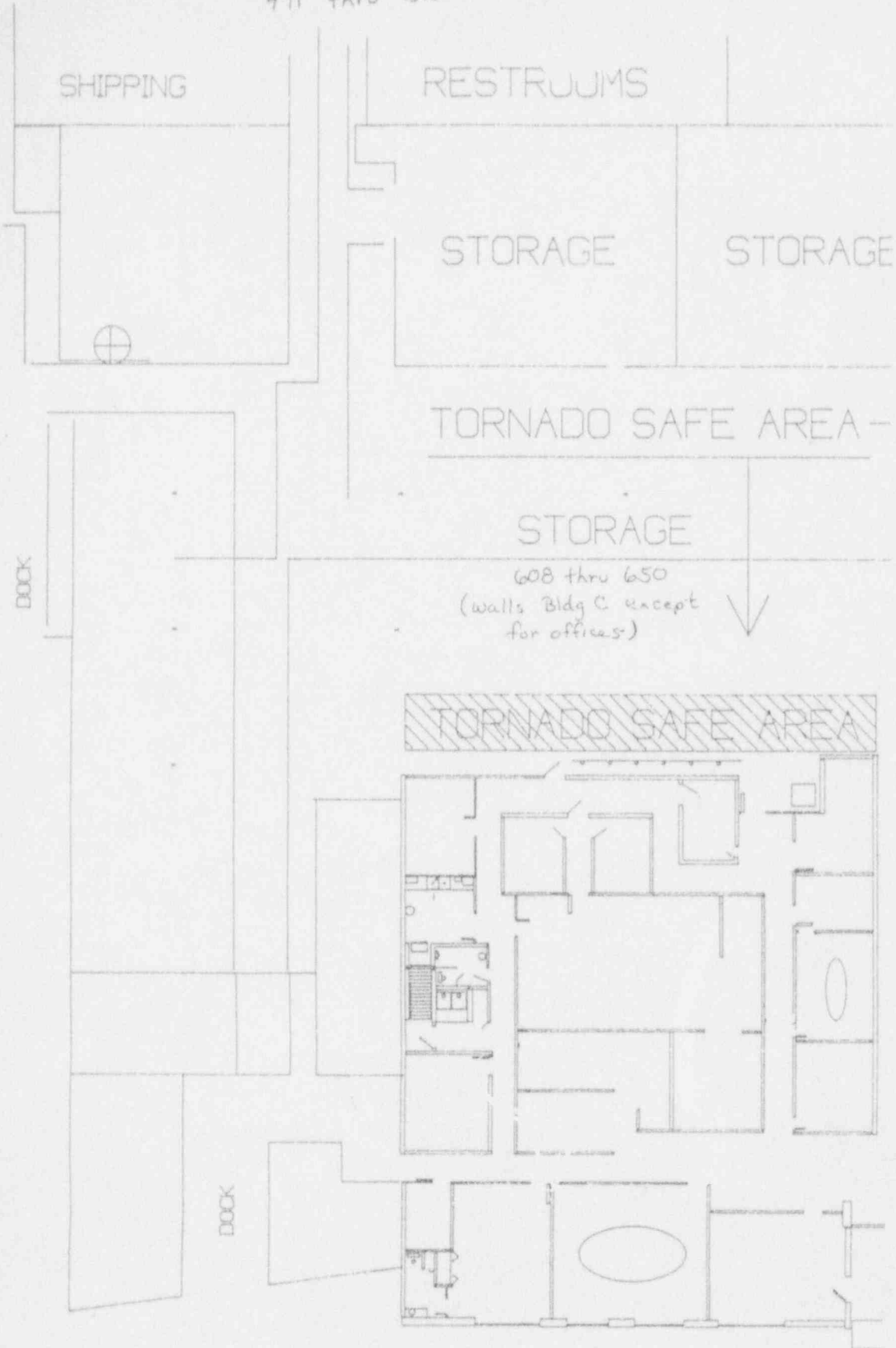
NON-SUSPECT SITE AREAS SET 1

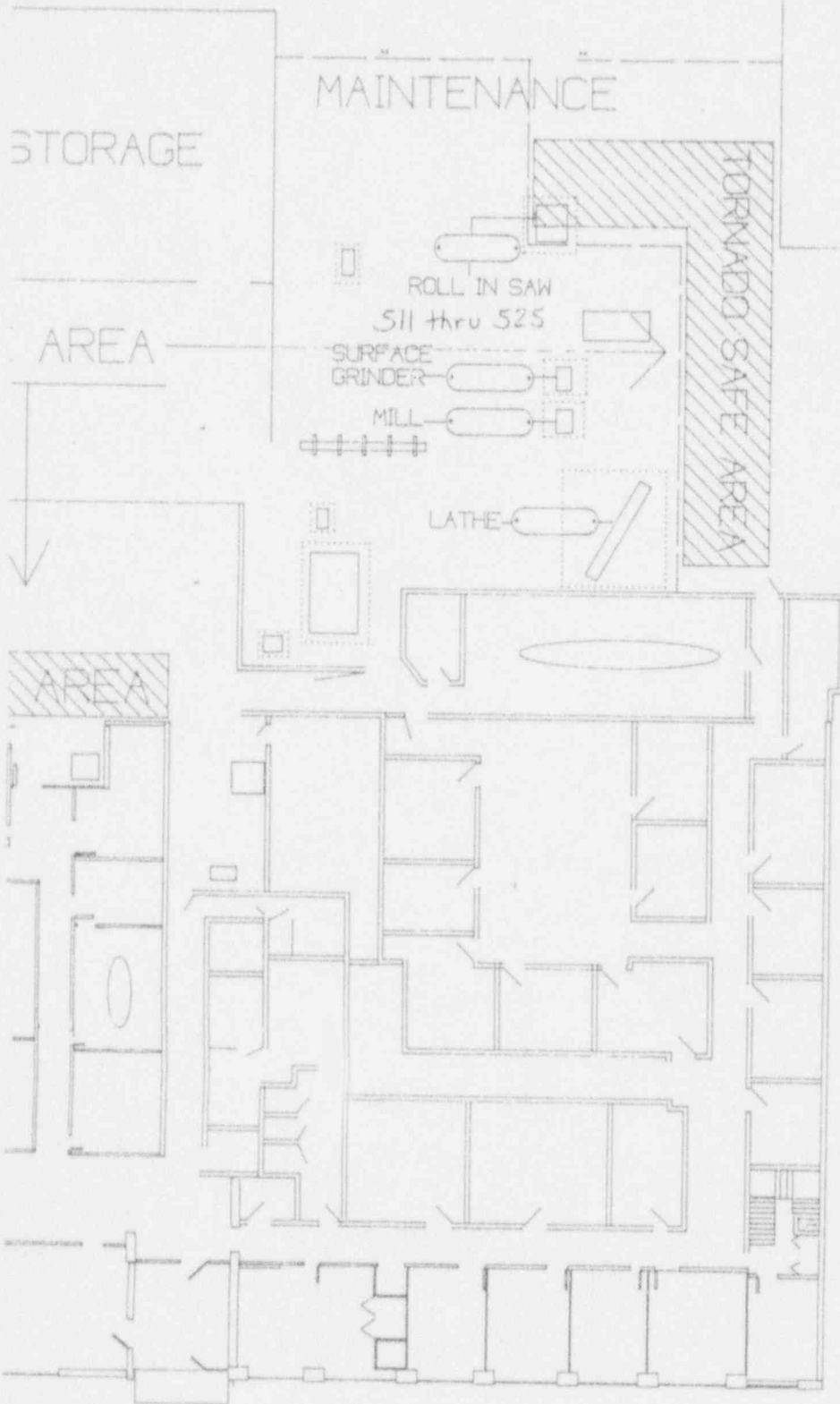
SURVEYED BY: DAVID KUGACKA
VERIFIED BY: RANDALL J. ADKINS
SURVEY DATE: 10-28-93

ELEVATED RADIATION
MEASUREMENTS WERE
NOT DETECTED IN
THESE AREAS:



491 thru 510







AIR SAMPLING RESULTS

Laboratory analysis results are presented in Table C.1, attached. All analysis sample values were below 10 CFR 20 Appendix B occupational values for inhalation.

Air sample locations are shown on Figures C.1-C.3 on the following pages. The locations are listed below:

<u>ID #</u>	<u>Sample Location Description</u>
1	Building B - general area (one (1) m above drain 14)
2	Outside
3	Building C - nw corner
4	Building C - general area
5	Building C - flammable liquid storage room
6	Building C - office area
7	Building C - old storage room
8	Building C - maintenance assembly area

ATLAN-TECH, INC.

Radiochemistry Lab

635 Hembree Parkway, Roswell, GA 30076 (404) 442-1067

PO: 23607000-9-001
DO: 5902-1

SAMPLE ANALYSIS REPORT

Page 1 of 1 Rev. 0 11/10/93
Status: Final

FLUOR DANIEL SAMPLE ID	ATLAN-TECH SAMPLE ID #	SAMPLE COLLECT START DATE	SAMPLE COLLECT STOP DATE	TOTAL AIR (L)	RADIONUCLIDE	ACTIVITY PER LITER (Bq)	COMMENTS
Building B	930347	10/26/93 11:00	10/26/93 20:00	1.08E-04	Ra-226 Pb-214 Bi-214	< 5.470E-05 < 3.680E+00 < 5.010E+00	All less than MDA
Office	930348	10/27/93 19:00	10/28/93 07:00	1.44E-04	Ra-226 Pb-214 Bi-214	< 9.150E-05 < 1.760E+00 < 2.340E+00	All less than MDA
Building C General Area	930349	10/28/93 19:30	10/29/93 08:00	1.50E-04	Ra-226 Pb-214 Bi-214	< 3.680E-05 < 3.940E+00 < 5.450E+00	All less than MDA
Flammables Storage Area	930350	10/27/93 11:00	10/27/93 18:30	9.00E+03	Ra-226 Pb-214 Bi-214	< 6.570E-05 < 3.680E+00 < 5.010E+00	All less than MDA
Old Storage Room	930351	10/28/93 13:00	10/28/93 19:00	7.20E-03	Ra-226 Pb-214 Bi-214	< 7.660E-05 < 3.940E+00 < 5.450E+00	All less than MDA

Reviewed By: *Beth Stuchman*

Approved By: *H. H. Rao*

TABLE C.1

P.02

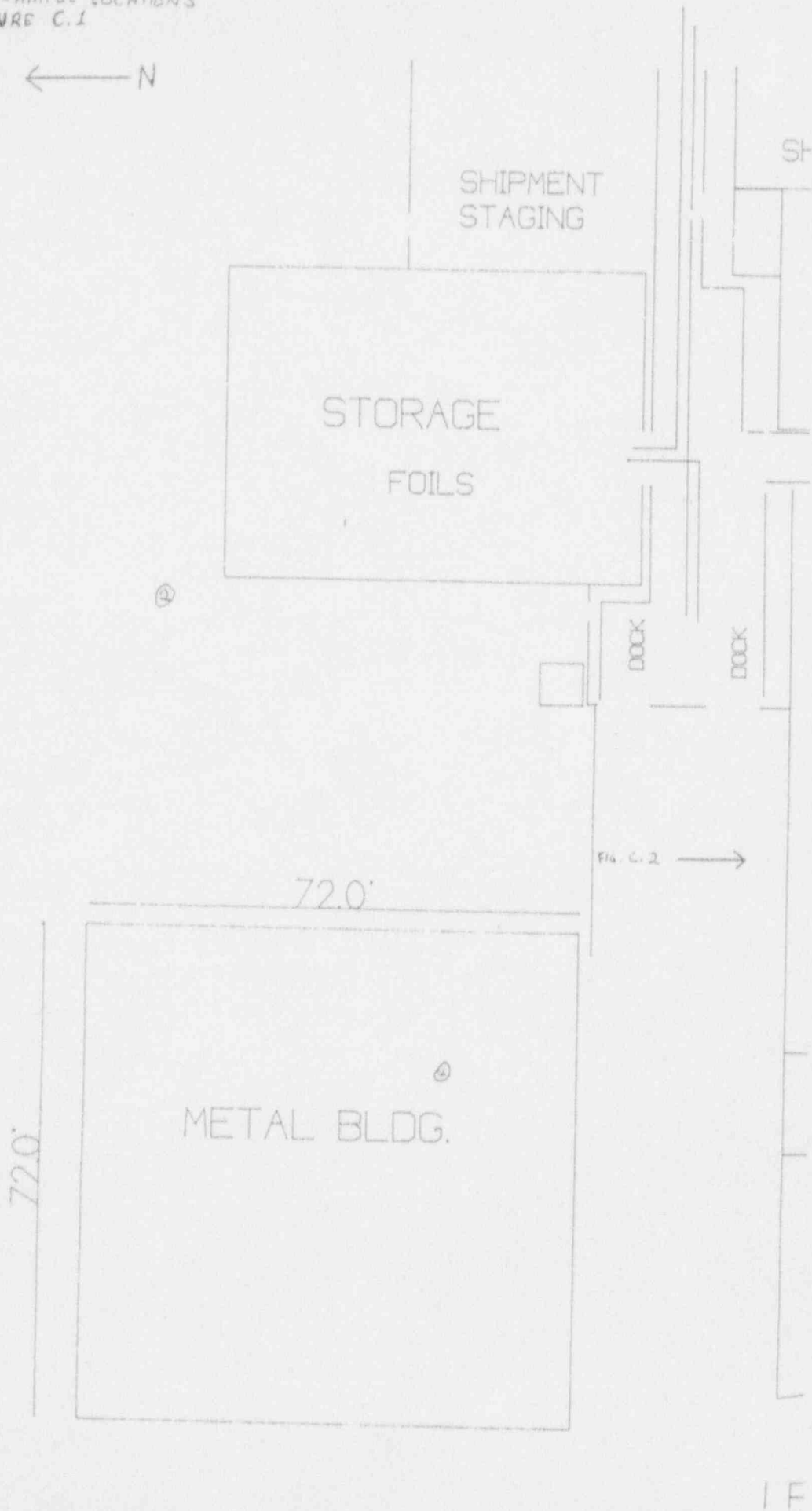
ATLAN-TECH, INC. Roswell, GA 30076 (404) 442-8445

11/10/93

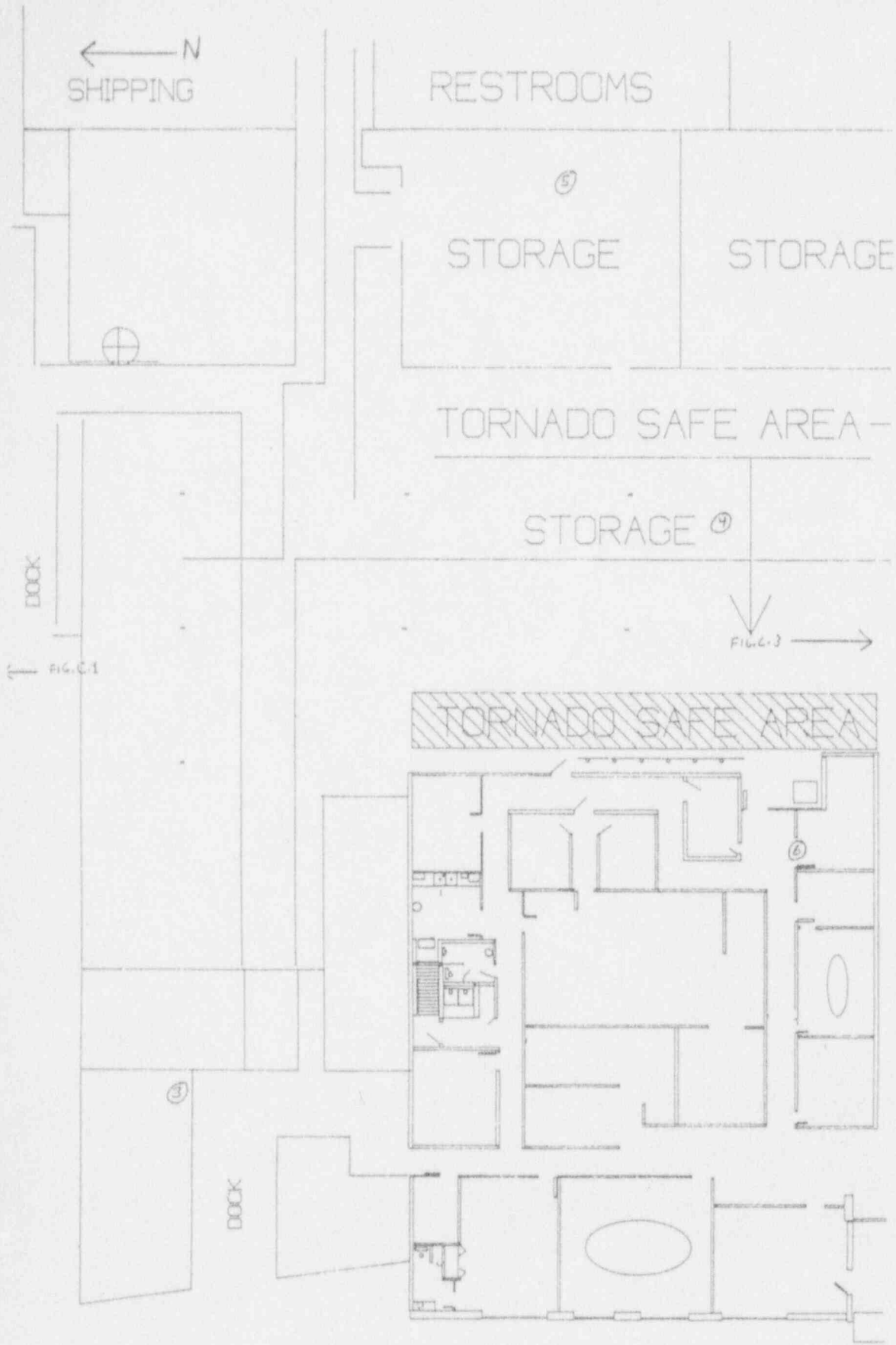
11/10/93

11/10/93

AIR SAMPLE LOCATIONS
FIGURE C.1

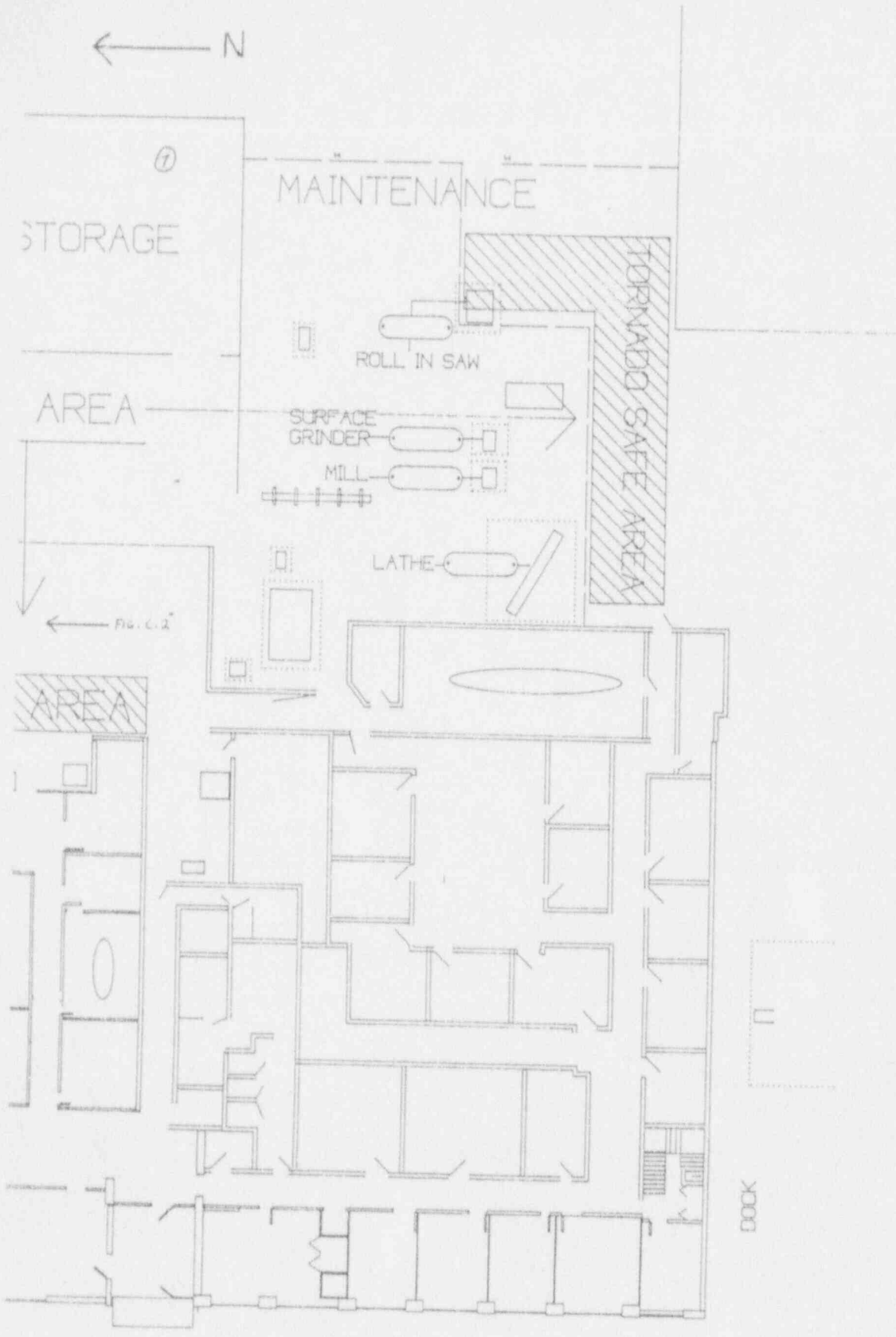


AIR SAMPLE LOCATIONS
FIGURE C.2



1 FOOT ON PAPER = 200 FEET

AIRSAMPLE LOCATIONS
FIGURE C.3



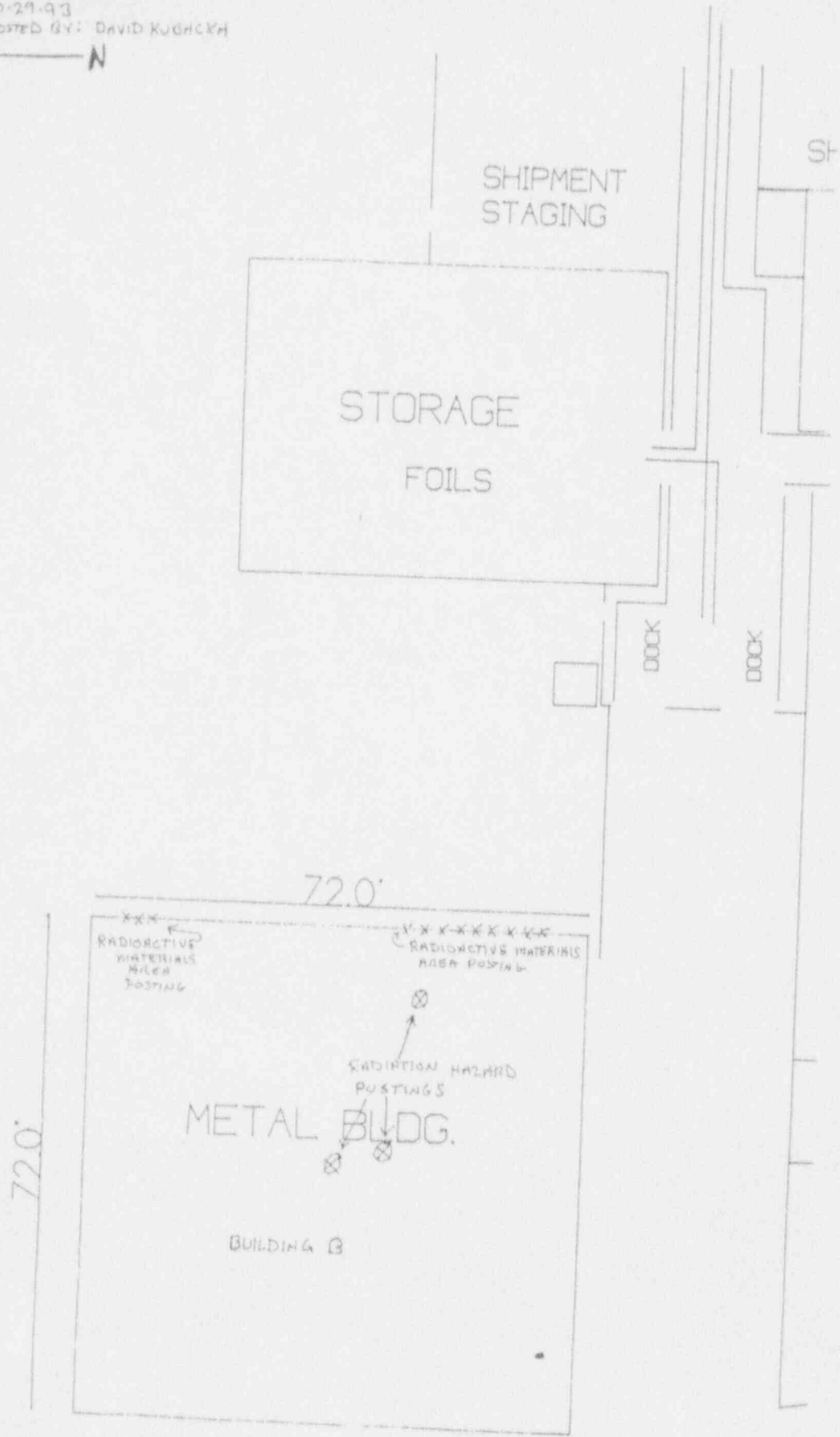
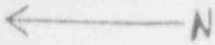


POSTED AREAS ON SITE

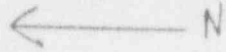
Figures D.1 and D.2 show areas at the Site which were posted and where access and activities (as described in Attachment A) are to be restricted.

Posted areas are indicated in the attachments as lines of "X's". A single "X" represents drains with elevated radioactive emissions. All of building B and limited portions of building C are posted as radioactive materials areas. Three (3) floor drains in building B and one (1) vertical drain in building C are posted as radiation hazards.

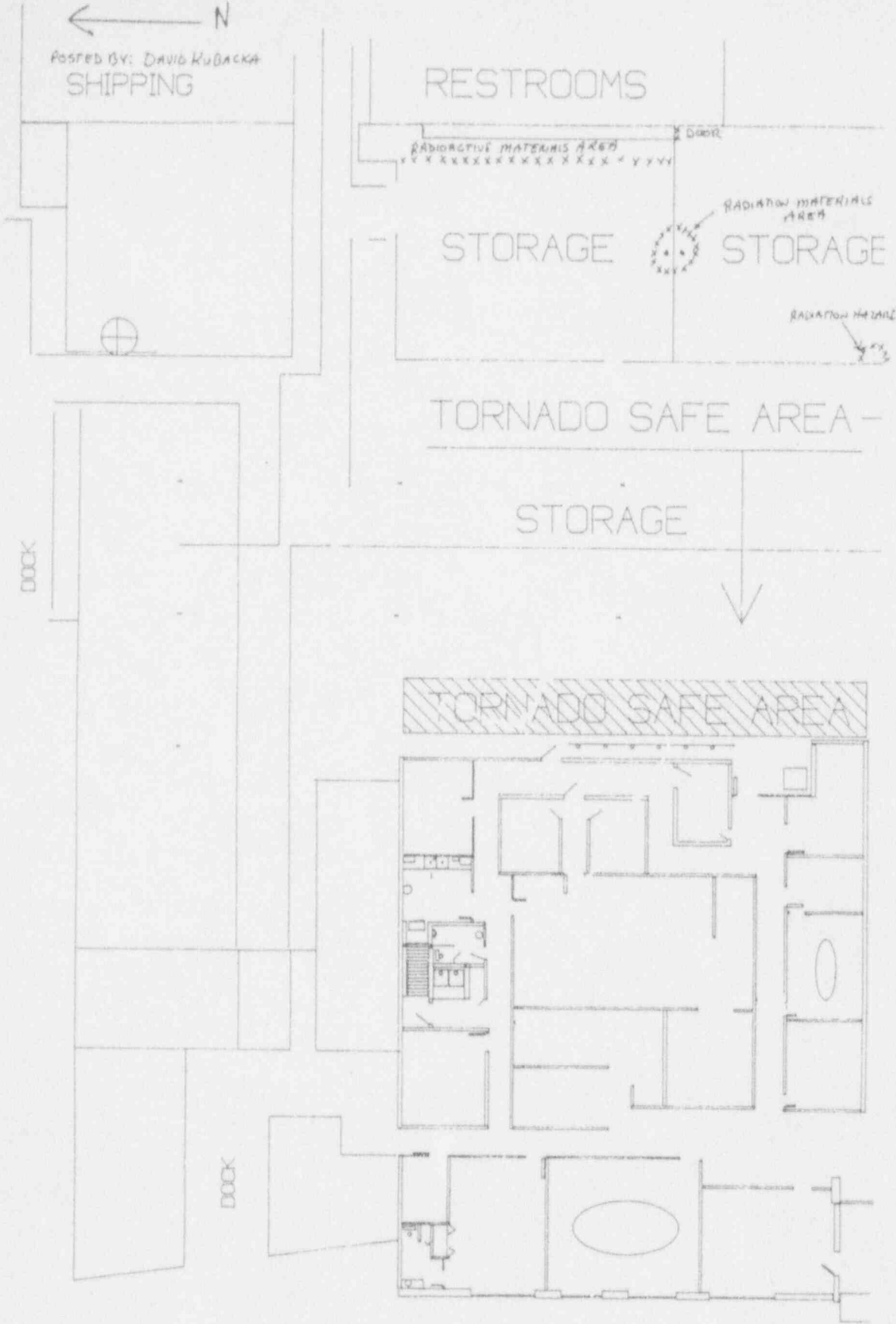
POSTED AREAS
FIGURE D.1
10-29-93
POSTED BY: DAVID KUGHCKH



POSTED AREAS
FIGURE D.2
10-29-93



POSTED BY: DAVID KUBACKA
SHIPPING



1 FOOT ON PAPER = 200 FEET

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DOCUMENT
PAGE PULLED**

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