
Formerly Utilized Sites Remedial
Action Program (FUSRAP)

Maywood Chemical Company Superfund Site

ADMINISTRATIVE RECORD

Document Number

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Results of Radon and Gamma Radiation Measurements at 19 Commercial and Governmental Properties of the Maywood Site

Maywood, New Jersey

August 1994



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CONTENTS

	Page
FIGURES	v
TABLES	ix
ACRONYMS	xi
UNITS OF MEASURE	xii
EXECUTIVE SUMMARYxiii
1.0 INTRODUCTION	1
2.0 SITE DESCRIPTION AND HISTORY	11
3.0 SAMPLING APPROACH AND RATIONALE	13
3.1 RADON AND THORON CHARACTERISTICS	13
3.2 DATA REQUIREMENTS AND SAMPLING METHODOLOGY FOR COMMERCIAL AND GOVERNMENTAL PROPERTIES	14
3.3 ANALYTICAL METHODS	15
3.2.1 Radon (Radon-222)	15
3.2.2 Thoron (Rn-220)	16
4.0 ANALYTICAL RESULTS AND DATA INTERPRETATION	18
4.1 COMMERCIAL PROPERTIES	19
4.1.1 National Community Bank - 160/174 Essex Street	19
4.1.2 National Community Bank - 113 Essex Street	20
4.1.3 Hunter Douglas	21
4.1.4 Meta-Lite, Inc.	22
4.1.5 Mark Correctional, Inc	23
4.1.6 PC Warehouse	24
4.1.7 Gulf Station	25
4.1.8 Stepan Company	26
4.1.9 Sunoco Station	28
4.1.10 Uniform Fashions (formerly Federal Express)	29
4.1.11 Flint Ink	30
4.1.12 Bergen Cable	32
4.1.13 Airco Medical and Specialty Products	33
4.1.14 Heather Hill (former Appleton Electric)	34
4.1.15 DeSaussure	36
4.1.16 Joseph Muscarelle Associates	38
4.1.17 Sears Repair Center	39
4.1.18 Sears Distribution Center	40
4.1.19 Myron Manufacturing	42

FIGURES

Figure	Title	Page
1-1	Locations of the Properties Included in the Radon/Gamma Exposure Survey at the Maywood Site	5
4-1	PIC Measurement Locations and Areas of Contamination at National Community Bank 160 and 174 Essex Street	51
4-2	Locations of Radon Canisters at National Community Bank 160 and 174 Essex Street	52
4-3	PIC Measurement Locations and Areas of Contamination at National Community Bank 113 Essex Street	53
4-4	Locations of Radon Canisters in the Basement at National Community Bank 113 Essex Street	54
4-5	Locations of Radon Canisters in the First Floor at National Community Bank 113 Essex Street	55
4-6	PIC Measurement Locations and Areas of Contamination at the Former Hunter Douglas Property 85-99 Route 17 North	56
4-7	Locations of Radon Canisters at Meta-Lite 85-99 Route 17 North	57
4-8	Locations of Radon Canisters at Mark Correctional 85-99 Route 17 North	58
4-9	Locations of Radon Canisters at PC Warehouse 85-99 Route 17 North	59
4-10	PIC Measurement Locations and Areas of Contamination at the Gulf Station Property 239 Route 17 North	60
4-11	Locations of Radon Canister at the Gulf Station Property 239 Route 17 North	61
4-12	PIC Measurement Locations and Areas of Contamination at the Stepan Property 100 West Hunter Avenue	62
4-13	Locations of Radon Canisters at Stepan Property Buildings 78, 86, and 20 100 West Hunter Avenue	63
4-14	Locations of Radon Canisters at Stepan Property Buildings 67, 52, 4, and 1 100 West Hunter Avenue	64

FIGURES

(continued)

Figure	Title	Page
4-29	Locations of Radon Canisters at the Bergen Cable Property 170 Gregg Street	79
4-30	PIC Measurement Locations and Areas of Contamination at Airco Medical and Specialty Products 80 Hancock Street	80
4-31	Locations of Radon Canisters at Airco Medical and Specialty Products 80 Hancock Street	81
4-32	PIC Measurement Locations and Areas of Contamination at the Former Appleton Electric Property 100 Hancock Street	82
4-33	Locations of Radon Canisters at the Former Appleton Electric Property 100 Hancock Street	83
4-34	PIC Measurement Locations and Areas of Contamination at the DeSaussure Property 23 West Howcroft Avenue	84
4-35	Locations of Radon Canisters at the DeSaussure Property 23 West Howcroft Avenue	85
4-36	PIC Measurement Locations and Areas of Contamination at the Joseph Muscarelle Property Essex Street and Route 17	86
4-37	Locations of Radon Canisters at the Joseph Muscarelle Property Essex Street and Route 17 (Basement)	87
4-38	Locations of Radon Canisters at the Joseph Muscarelle Property Essex Street and Route 17 (First Floor)	88
4-39	PIC Measurement Locations and Areas of Contamination at Sears Repair Center Property 200 State Route 17 South	89
4-40	Locations of Radon Canisters at Sears Repair Center Property 200 State Route 17 South	90
4-41	PIC Measurement Locations and Areas of Contamination at the Sears Distribution Center Property 149-151 Maywood Avenue	91
4-42	Locations of Radon Canisters at the Sears Distributions Center Property (Ground Floor) 149-151 Maywood Avenue	93

TABLES

Table	Title	Page
1-1	Commercial and Government Properties	6
1-2	Commercial and Government Properties not Included in Sampling Effort	7
4-1	Concentrations of Radon at the National Community Bank Property, 174 Essex Street, Lodi	111
4-2	Concentrations of Radon and Thoron at the National Community Bank, 113 Essex Street, Maywood	112
4-3	Concentrations of Radon at Meta-Lite Property, 85-99 Route 17 North, Maywood	113
4-4	Concentrations of Radon at the Mark Correctional Property, 85-99 Route 17, Maywood	114
4-5	Concentrations of Radon at the PC Warehouse Property, 85-99 Route 17 North, Maywood	115
4-6	Concentrations of Radon and Thoron at the Gulf Station Property, 239 Route 17 North, Maywood	116
4-7	Concentrations of Radon and Thoron at the Stepan Company Property, 100 West Hunter Avenue, Maywood	117
4-8	Concentrations of Radon and Thoron at the Sunoco Station Property, 167 Route 17 North, Maywood	121
4-9	Concentrations of Radon at the Uniform Fashions Property (former Federal Express), 137 Route 17 North, Maywood	122
4-10	Concentrations of Radon and Thoron at the Flint Ink Property, 80 Industrial Road, Lodi	123
4-11	Concentrations of Radon at Bergen Cable, 170 Gregg Street, Lodi	124
4-12	Concentrations of Radon and Thoron at the Airco Property, 80 Hancock Street, Lodi	125
4-13	Concentrations of Radon and Thoron at the Heather Hill Property (formerly Appleton Electric), 100 Hancock Street, Lodi	126

ACRONYMS

AEC	Atomic Energy Commission
ALARA	as low as reasonably achievable
BNI	Bechtel National, Inc
CF	conversion failure
DCG	derived concentration guide
DOE	Department of Energy
EPA	Environmental Protection Agency
FUSRAP	Formerly Utilized Sites Remedial Action Program
LSA	low specific activity
MISS	Maywood Interim Storage Site
NJDEP	New Jersey Department of Environmental Protection
PIC	pressurized ionization chamber
RI/FS	remedial investigation/feasibility study

EXECUTIVE SUMMARY

In March 1994, radon and gamma exposure rate measurements were taken at 19 commercial and governmental properties where buildings are present at the Maywood site. The sampling was conducted because some of the remedial action alternatives being considered by the Department of Energy (DOE) for the Maywood site could allow contaminated soil to remain in place beneath the buildings until some future time when the soils would be easily accessible because of construction activities or changes in the use of the properties. The data collected from these sampling activities will be used to evaluate the dose and risk to current and future occupants of the properties included in this investigation.

Interior and exterior gamma exposure rate measurements were collected at each of the 19 properties included in the investigation. The highest measurements, both interior and exterior, were located on the Stepan Company property in areas that are not occupied full-time by Stepan employees. Both types of measurements were recorded at locations immediately adjacent to the site of the former thorium processing buildings, in an area where radioactively contaminated soils are known to be present. The area is covered by grass, and controls (such as posting of the area as radioactively contaminated and demarcation with rope) have been instituted to limit access to that area.

Data for radon (radon-222) indicate that radon concentrations at the 19 properties do not exceed the DOE guideline of 3.0 pCi/L above background, or the Environmental Protection Agency and State of New Jersey action level of 4.0 pCi/L including background. Background for the Maywood area is approximately 1.0 pCi/L. The highest concentration of radon (3.4 pCi/L, including background) was measured inside Building 3 at the Stepan Company property. Building 3 was constructed above a known burial area containing thorium process wastes and residues and is not occupied full-time.

Ten percent of the radon canisters deployed on properties where contamination is known to be present beneath the building(s) were analyzed for thoron (radon-220). DOE applies the same guideline for thoron as for radon, which is 3.0 pCi/L above background. None of the thoron measurements exceeded this guideline.

1.0 INTRODUCTION

In 1974, the Atomic Energy Commission (AEC), a predecessor agency to the Department of Energy (DOE), instituted the Formerly Utilized Sites Remedial Action Program (FUSRAP), a program now managed by DOE. The objective of FUSRAP is to identify and clean up or otherwise control sites where residual radioactive contamination (exceeding DOE guidelines) remains from activities carried out under contract to the Manhattan Engineer District and AEC. In addition to these sites, Congress authorized DOE to undertake remedial actions at four other sites where commercial operations had resulted in radioactive contamination of the environment. One of these four sites is located in Maywood, New Jersey.

Operations at the Maywood Chemical Works resulted in contamination of numerous properties in Maywood, Rochelle Park, and Lodi, including the property previously owned by Maywood Chemical Works (now owned by the Stepan Company); the DOE-owned property referred to as the Maywood Interim Storage Site (MISS); and residential, commercial, and governmental vicinity properties (Figure 1-1). These properties have been grouped into four operable units to better organize and segment the remedial investigation/feasibility study (RI/FS).

- Stepan Company property
- MISS property
- Residential properties
- Commercial and governmental properties

This report discusses radon and gamma radiation exposure measurements taken at 19 of the Maywood site commercial and governmental properties where buildings are located and presents the results of the measurements. The commercial properties included in these investigations are listed in Table 1-1. Some commercial and governmental properties included in the Maywood site were not included in these investigations because no buildings are located on the properties (see Table 1-2). Some of the remedial action alternatives for the Maywood site being considered by DOE could allow contaminated soil to remain inaccessible under the buildings on the 19 properties, the sampling data will be used to

FIGURE FOR SECTION 1.0

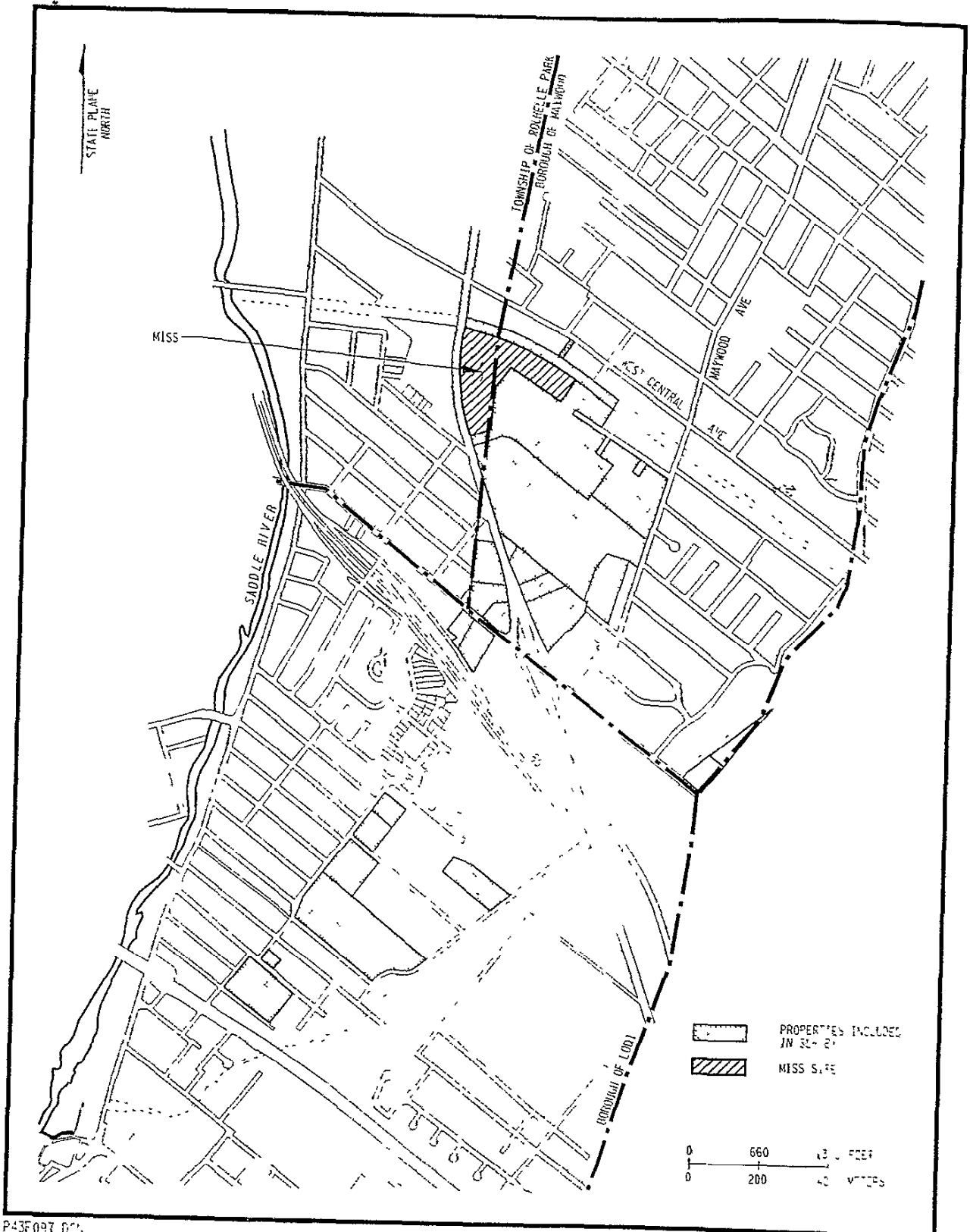


Figure 1-1
Locations of the Properties Included in the Radon/Gamma Exposure Survey at the Maywood Site

TABLES FOR SECTION 1.0

Table 1-1
Commercial and Governmental Properties

Company	Address	Characterization Report
New Jersey Vehicle Inspection Station	8 Mill Street, Lodi	BNI 1987a
National Community Bank	160/174 Essex Street, Lodi	BNI 1989a
Hunter Douglas	87-99 Route 17 North, Maywood	BNI 1987b
Sunoco Station	167 Route 17 North, Maywood	BNI 1987c
Federal Express	137 Route 17 North, Maywood	BNI 1987d
Myron Manufacturing	205 Maywood Avenue, Maywood	BNI 1992a
Joseph Muscarelle	Route 17 and Essex Street, Maywood	BNI 1992a
Sears Truck Repair Center	200 Route 17 South, Maywood	BNI 1992a
Airco Medical	80 Hancock Street, Lodi	BNI 1989b
Appleton Electric (Heather Hill)	100 Hancock Street, Lodi	BNI 1989c
Flint Ink	80 Industrial Road, Lodi	BNI 1989d
National Community Bank	113 Essex Street, Maywood	BNI 1992a
Sears Distribution Center	149-151 Maywood Avenue, Maywood	BNI 1987e
Gulf Station	239 Route 17 North, Maywood	BNI 1989e
DeSaussure Property	23 W. Howcroft Avenue, Maywood	BNI 1989f
Stepan Property	100 West Hunter Avenue, Maywood	BNI 1992a
Bergen Cable	170 Gregg Street, Lodi	Kannard 1987
John F. Kennedy Municipal Park	Money and Sidney Streets, Lodi	BNI 1989g
Fire Station No. 2	Kennedy Drive, Lodi	BNI 1989h

Table 1-2
Commercial and Governmental Properties not Included in Sampling Effort

Company	Address	Characterization Report
Ballod Associates	Route 17, Rochelle Park	BNI 1985a
Scanel	Essex Street, Maywood	BNI 1985b
Municipal Property	New Jersey Route 17, Maywood and Rochelle Park	BNI 1986a
New York, Susquehanna, and Western Railroad Property (Western right-of-way)	Maywood	BNI 1986b
Firemen's Memorial Park	Garibaldi Avenue, Lodi	BNI 1989i
Schenk Chevrolet	72 Sidney Street, Lodi	BNI 1989j
Municipal Property	Interstate 80 (Right-of-way), Lodi	BNI 1989k

2.0 SITE DESCRIPTION AND HISTORY

The Maywood site is located in a highly developed area of northeastern New Jersey in the boroughs of Maywood and Lodi and the township of Rochelle Park. It is approximately 20 km (12 mi) north-northeast of New York City and 21 km (13 mi) northeast of Newark, New Jersey. The population density of this area is approximately 10,000 people per square mile. The Maywood site includes the former Maywood Chemical Works property (now owned by the Stepan Company); DOE-owned MISS, and several residential, commercial, and governmental vicinity properties. Figure 1-1 shows the location of the Maywood site.

Maywood Chemical Works was constructed in 1895. From 1916 until 1956, plant operations included the extraction of thorium and rare earths from monazite sands for use in the manufacture of various lighting devices such as mantles for gas lanterns. The manufacturing process included the production of mantle-grade thorium nitrate (Harris 1951) from monazite sands and various lithium compounds, especially lithium hydroxide and lithium chloride. Although thorium extraction stopped in 1956, thorium processing of stockpiled material continued until 1959. In 1959, the property was sold to the Stepan Company.

The slurry, containing process waste from the thorium processing operations, was pumped into two areas surrounded by earthen dikes on property west of the plant (Cole et al. 1981). In 1932, the disposal areas were separated from the plant and partially covered during construction of New Jersey State Route 17.

Some of the process wastes were removed for use as mulch and fill on nearby properties, thereby contaminating those properties with radioactive thorium (Mata 1984). Although the fill consisted primarily of tea and coca leaves from other Maywood Chemical Works processes, it apparently included some of the thorium-processing wastes.

Additional waste apparently migrated off the property via natural drainage associated with the former Lodi Brook. Historical photographs and maps indicate that the former course of the brook, which originated on the Maywood Chemical Works property, generally

coincides with the distribution of contaminated properties in the borough of Lodi. Most of the open stream channel in Lodi has been replaced by a subsurface storm drain system.

In the mid-1960s, the Stepan Company agreed to clean up residual thorium wastes. Residues and tailings on the property west of Route 17 were partially stabilized at that time. In 1966, 6,391 m³ (8,400 yd³) of contaminated material was removed from the property west of Route 17 and buried on the Stepan property beneath the lawn area adjacent to the office building. This was followed in 1967 with the removal of 1,570 m³ (2,053 yd³) of material from the same general area and burial on the Stepan property beneath what is now a parking lot. The third and last removal action performed by Stepan occurred in 1968 when 6,575 m³ (8,600 yd³) was excavated and buried on the Stepan property beneath what is now Building 3, a large warehouse.

By enacting the Energy and Water Development Appropriations Act of 1984, Congress authorized DOE to undertake a decontamination research and development project at the Maywood site. The site was assigned to FUSRAP, and DOE negotiated access to a 4.7-ha (11.7-acre) portion of the Stepan property for use as an interim storage facility for contaminated materials that were to be removed from vicinity properties. This area is now known as MISS. In 1984 and 1985, DOE performed removal actions on 25 vicinity properties in Maywood, Lodi, and Rochelle Park. In September 1985, ownership of MISS was transferred to DOE. Between 1986 and 1991, no removal actions were conducted at the Maywood site. In July 1991, a time-critical removal action was conducted by DOE at a residence in Lodi, New Jersey. Contaminated soil and building debris were transported to MISS and placed in interim storage there in low-specific-activity (LSA) boxes.

Further details of the Maywood site description and history can be found in the remedial investigation report and in the work plan-implementation plan (BNI 1992, 1993). A baseline risk assessment for the Maywood site provides detailed discussion of human health risk and potential receptor pathways (SAIC 1993).

3.0 SAMPLING APPROACH AND RATIONALE

This section describes radon characteristics and the sampling methodology, rationale, and analytical methods used to accomplish the data objectives for the radon and gamma radiation exposure measurement investigations.

3.1 RADON AND THORON CHARACTERISTICS

Radon (radon-222) is a naturally occurring radioactive gas produced by the decay of uranium-238 to radium-226 and subsequently to radon-222. Radon is a dense, colorless, and odorless gas. It has a half-life of 3.82 days; that is, half of the original concentration would not be present after 3.82 days. It is present throughout the earth's crust, soluble in water, and found virtually everywhere in the United States. As radon decays, it produces a series of radioactive products called radon progeny or "radon daughters." Although these "daughters" only live a short time (less than 30 minutes) before they decay, they present the major health risk of radon exposure.

Radon alone would be of little concern because if it is present in the air, it would be inhaled along with all the other gases in the air and exhaled promptly as part of normal breathing. However, a health hazard results from inhalation of radon daughters, which emit alpha radiation. A typical alpha particle can only penetrate about 0.005 cm (0.002 in.) into tissue and can be effectively shielded by a sheet of paper. The hazard from exposure to alpha radiation is internal dose. Because they cannot penetrate the skin except through an open wound, alpha particles can only enter the body by inhalation or ingestion. Therefore, inhalation of radon daughters or dust particles carrying radon daughters, and the lodging of the daughters in the lungs, presents the potential health hazard. Lodged in lung tissue, these alpha particles decay further and deposit their energy in surrounding tissue before the body's natural mechanisms (coughing) for clearing the lungs can remove them (Bodansky 1987).

Thoron (radon-220), a daughter product of radon has characteristics similar to those of its parent; that is, it is a colorless, odorless gas. However, the half-life for thoron is only 55 seconds, significantly shorter than its parent. The health hazard from exposure to thoron is

internal dose from inhalation or ingestion. If sufficient radon concentrations are present, it is possible that thoron will be present in the breathing zone and could be inhaled, with a potential for lodging in lung tissue. However, because of its extremely short half-life (55 seconds) it is unlikely that thoron would reach the breathing zone before it decays to its daughter product. Therefore, while thoron could be present because thorium-232 is the primary contaminant of the Maywood site, it would have to be present at significant concentrations to present an immediate risk to human health.

3.2 DATA REQUIREMENTS AND SAMPLING METHODOLOGY FOR COMMERCIAL AND GOVERNMENTAL PROPERTIES

- Objective 1: Obtain interior and exterior gamma exposure rate measurements at all properties.
- Objective 2: Determine indoor radon concentrations at all properties and thoron concentrations at properties where contamination is present under buildings.
- Objective 3: Determine the need for follow-up radon measurements based on results.

The first objective was accomplished as described in the *Plan for Radon and Gamma Radiation Measurements at the Commercial Properties of the Maywood Site* (BNI 1994) by obtaining approximately three interior and six exterior gamma exposure rate measurements at each property using a pressurized ionization chamber (PIC). The number of sampling locations varied according to the size of the property and the degree to which the building interiors were accessible for use of the PIC instrument. The locations for PIC measurements to be taken inside the buildings were selected so that exposure rates could be measured in areas where workers might spend part of their day. In addition, some measurement locations were biased over known or suspected areas of surface and subsurface contamination.

The second objective was accomplished by the deployment and retrieval of 7.6-cm (3-in) activated charcoal absorption canisters. These are passive devices that require no power to function and that allow continual absorption and desorption of radon. The canisters were deployed at a rate of one device for every 186 m² (2,000 ft²) of basement or ground-floor area. In large open areas, canisters were deployed at a rate of one device for

every 465 m² (5,000 ft²). The canisters remained in place for 7 days. Wherever possible, closed house conditions were in place for approximately 12 h before testing began, and canisters were placed at least 0.6 m (2 ft) above the floor or as close to the breathing zone as possible. Canisters were deployed in areas where occupants actually perform work and away from external walls. At properties where contamination is known to be present under the buildings, 10 percent of the canisters deployed for radon analysis were also analyzed for thoron. Because thoron has a much shorter half-life than radon, these canisters were delivered to the laboratory for analysis within 2 h of retrieval.

Evaluation of the laboratory's analytical results and comparison to DOE criteria and guidelines were used to accomplish the third objective. This is discussed in more detail in Section 4 0

3.3 ANALYTICAL METHODS

The 7 6-cm (3-in.) activated charcoal absorption canisters used in the investigation were obtained from and analyzed by Teledyne Brown Engineering, Environmental Services in Westwood, New Jersey. The following sections describe the analytical methods used in the preparation of unexposed canisters and the determination of radon and thoron concentrations in the canisters after exposure.

3.2.1 Radon (Radon-222)

The 7 6-cm (3-in.) activated charcoal canisters consist of a metal can with a lid and a cartridge containing a known mass of charcoal. The canister was heated, with the lid removed, in an oven at 75°C for at least 3 h. After the canister was removed from the oven, the canister lid was replaced and the canister was cooled in a room with low, known radon-222 activity (<1 pCi/L) for a short time. After the canister cooled, the seam between the lid and base was sealed with plastic tape similar to electrical tape. The canister was assigned a unique laboratory reference number and weighed. The weight was recorded in the laboratory's computer file, and the canister was then ready for use.

After exposure, the canister was resealed and returned to the laboratory, accompanied by a record of exposure dates, times, and test locations. Upon receipt by the laboratory, the canister was weighed a second time and the weight recorded in the laboratory's computer file. The canister was analyzed using sodium-iodide or lithium-drifted germanium gamma ray detectors. Computer software programs were used to calculate the concentration of radon in pCi/L referenced to the middle of the 7-day exposure period. (The activity was referenced to the mid-collection period by applying the appropriate radon-222 radioactive decay factor for the time elapsed.) Next, a conversion factor was applied to relate the pCi per canister at mid-collection time to pCi/L of room air. The conversion factor was previously determined for the sodium-iodide detector under controlled conditions (canisters were exposed to a known and constant radon-222 concentration for four days and then analyzed on the sodium-iodide detector).

3.2.2 Thoron (Rn-220)

The same canisters used for measurement of radon were used for measurement of thoron (radon-220). Thus, the canisters were prepared as described above. The following additional counting was performed on the canisters selected for thoron analysis. The canisters were required to reach the laboratory within 10 h of having been sealed in the field. They were counted by gamma ray spectroscopy using high-resolution germanium detectors. The counting was done within 6 h of arrival at the laboratory. The radon activity in pCi per canister ($A_{222} \cdot \text{pCi}$) was then calculated at the mid-collection time. The thoron activity in pCi per canister ($A_{220} \cdot \text{pCi}$) was then calculated to the mid-collection time. The parallel between the two isotopes makes it possible to apply the same conversion factor (pCi per canister to pCi/L of room air) for thoron as was accomplished for radon.

After the gamma ray spectroscopy analysis with the germanium detector was completed, the canister was counted on the sodium-iodide detector to determine the radon concentration in pCi/L ($A_{222} \cdot \text{pCi/L}$). The calculation was performed by means of a computer program which did not explicitly reveal the conversion factor. The conversion factor was determined using the following formula:

$$CF = (A_{222} \cdot \text{pCi}) / (A_{222} \cdot \text{pCi/L})$$

The thoron activity in pCi/L of room air could then be calculated by:

$$\text{Rn-220} = (\text{A220:pCi})/\text{CF}$$

4.0 ANALYTICAL RESULTS AND DATA INTERPRETATION

This section presents the analytical results of the radon and thoron measurements at the 16 commercial and 3 governmental properties and the gamma exposure rate measurements at each property in the investigation. The data presented in this section were compared with background concentrations or naturally occurring levels of radon and gamma radiation in the atmosphere at the Maywood site. These background concentrations or levels were obtained during previous remedial investigation (BNI 1992a) or radiological characterization activities. The background level of radon in Maywood is approximately 1.0 pCi/L and can fluctuate based on rainfall, soil porosity, and other seasonal or terrestrial influences. Background levels of gamma radiation at the Maywood site range from 8 to 12 $\mu\text{R/h}$ and average approximately 9 $\mu\text{R/h}$. At the time of this investigation, a background measurement was obtained at a local park where no radioactive contamination has been identified, and that measurement was approximately 8 $\mu\text{R/h}$.

The data were compared with DOE, Environmental Protection Agency (EPA), and New Jersey Department of Environmental Protection (NJDEP) guidelines. These guidelines are used by the agencies to determine whether or not there is an imminent health risk and can also be used when comparing data to determine long-term health risk. The guidelines are as follows:

Radon

DOE	3.0 pCi/L above background
EPA	4.0 pCi/L, including background
NJDEP	4.0 pCi/L, including background

Thoron

DOE	3.0 pCi/L above background (currently under review)
EPA	None
NJDEP	None

The DOE guideline for external gamma radiation is 20 $\mu\text{R}/\text{h}$ above background for habitable structures, and the level must comply with the basic dose limit (100 mrem/yr for the general public) when an "appropriate use" scenario is considered. External gamma radiation levels on open lands must also comply with the basic limit and the objective of keeping exposures as low as reasonably achievable (ALARA), considering appropriate use scenarios for those areas (DOE Order No. 5400 5) Background has not been subtracted from the data presented in this section. Data tables and figures showing gamma exposure rate measurement locations and locations of radon canisters have been included for each property.

4.1 COMMERCIAL PROPERTIES

4.1.1 National Community Bank - 160/174 Essex Street

The National Community Bank property at 160/174 Essex Street in Lodi was recently purchased by the Bank of New York. The property at 160 Essex Street is a partially paved parking lot and is located adjacent to the 174 Essex Street property. The only buildings on these properties are a single-story office building and a small storage building located at the rear of the property at 174 Essex Street. The office building is occupied by fewer than 20 employees during this transition period. The facility is operational 5 days per week.

Three interior gamma exposure rate measurements were made at the bank property; locations and data for these measurements are shown in Figure 4-1. All three interior measurements were 8.8 $\mu\text{R}/\text{h}$ and were within background. The six exterior measurements ranged from 7.1 to 9.5 $\mu\text{R}/\text{h}$ and were within background (see Figure 4-1 for locations). None of the interior gamma exposure rate measurements exceeded the DOE guideline of 20 $\mu\text{R}/\text{h}$ above background for habitable structures. Exterior gamma exposure rate measurements taken during this investigation were compared with exterior measurements taken during radiological characterization of the property in 1987 (BNI 1989a). The 1987 exterior measurements ranged from 5 to 8 $\mu\text{R}/\text{h}$ and were within background. No significant change is seen between the 1987 and 1994 measurements.

Radon concentrations were measured in six locations inside the building (see Figure 4-2) Concentrations measured ranged from less than 0.2 pCi/L to 0.3 pCi/L and

were within background; the data for each canister are presented in Table 4-1. The 7.6-cm (3-in) activated charcoal canisters were positioned in areas of the building where employees spend most of their time. The concentrations of radon measured at this property were significantly below background (1.0 pCi/L) for the Maywood site. The DOE guideline of 3.0 pCi/L, above background, for radon was also not exceeded.

No radioactively contaminated soils are present under the buildings (BNI 1989a); therefore, no thoron analysis was performed on canisters deployed on this property.

4.1.2 National Community Bank - 113 Essex Street

This property was recently purchased by the Bank of New York. Currently there are no full-time employees except for a security guard. Most of the property is covered by asphalt pavement, and there is a small landscaped lawn area in front of the building. The brick veneer building is two stories tall with a full basement, which contains a full cafeteria, several large work areas, and a boiler room. The first floor also contains large work areas, including a large computer area, and individual offices. The second floor contains offices and a large conference room. The furniture in the building is office furniture such as desks and chairs. Previous characterization (BNI 1992a) indicated that the former stream channel of Lodi Brook once flowed across this property. Today that channel is contained in a box culvert that underlies the parking lot at the rear of the building and parallels the building on the eastern side.

A total of 15 gamma exposure rate measurements (12 interior and 3 exterior) were made at the 113 Essex Street property. Interior gamma radiation measurements ranged from 9.2 to 12 μ R/h, including background. The measurement of 12 μ R/h, including background, was recorded in the basement along the eastern side of the building, where contamination is suspected to extend beneath the building. The exterior gamma exposure rate measurements ranged from 8.6 to 13.6 μ R/h, including background. The highest exterior measurement, 13.6 μ R/h, including background, was recorded in front of the building near the southern corner, where radioactively contaminated soil was identified during previous characterization activities (BNI 1992a). The interior gamma exposure rate measurements do not exceed the

DOE guideline for habitable structures of 20 $\mu\text{R}/\text{h}$ above background. Figure 4-3 shows the locations and the data for each of these measurements.

Seven exterior gamma radiation measurements were taken during previous remedial investigation activities at this property (BNI 1992a). Exterior gamma exposure rate measurements taken during this survey were compared with that data, which ranged from 5 to 17 $\mu\text{R}/\text{h}$, including background, and show no significant increase or change in conditions at the property.

Radon concentrations were measured by deploying 12 activated charcoal canisters throughout the basement and first floor of the building. Analytical results indicated concentrations ranging from less than 0.2 to 0.6 pCi/L, all within background. These concentrations are well below the DOE guideline of 3.0 pCi/L above background (background is 1.0 pCi/L for the Maywood site). Locations of the radon canisters are shown in Figures 4-4 and 4-5; data for each canister are presented in Table 4-2.

During previous characterization activities at this property (BNI 1992a), radioactively contaminated soil was identified at the rear of the building (eastern corner) and at the front of the building (southern corner). This contamination is probably the result of overbank deposition of contaminated material transported by the former channel of Lodi Brook that once flowed across this property. Because of the presence of this material, three of the canisters were analyzed for thoron concentrations. Concentrations of thoron ranged from less than 0.9 to less than 1.0 pCi/L (within background) and do not exceed the DOE guideline. DOE is reviewing the guideline for thoron at present and therefore currently applies the same guideline for thoron as for radon of 3.0 pCi/L above background. Figure 4-4 shows the location of the canisters analyzed for thoron, and Table 4-2 presents the data.

4.1.3 Hunter Douglas

The property called Hunter Douglas is no longer occupied by that company. The building is owned by a development company and has been divided into three sections, which are leased to Meta-Lite, Inc., Mark Correctional, and PC Warehouse. The building is

constructed of cinder block with brick veneer. New Jersey Route 17 North borders the property on the west, and commercial properties border the property on the remaining three sides. For clarity, the interpretation of data will be discussed below by individual tenant.

4.1.4 Meta-Lite, Inc.

This company occupies the southern third of the building and has approximately 24 employees. The company operates 8 to 9 hours per day, 5 days per week, and is engaged in the machining, fabrication, and painting of highway signs and toll booths for customers such as the New Jersey Turnpike. A reception area and offices occupy the front portion of the building, and the manufacturing operations are conducted in the rear of building. The manufacturing area includes a drill press area, paint booth, sanding area, supply racks, an employee break area, and a supervisor's enclosed office. Radon canisters were deployed and gamma exposure rate measurements were made during normal business hours.

Six interior gamma exposure rate measurements were obtained at Meta-Lite. The measurements ranged from 8.9 to 11.7 $\mu\text{R}/\text{h}$, including background. The highest measurement, 11.7 $\mu\text{R}/\text{h}$, was obtained in the manufacturing area (see Figure 4-6) but does not exceed the DOE guideline of 20 $\mu\text{R}/\text{h}$ above background. The exterior gamma exposure rate measurements ranged from 8.6 to 15.6 $\mu\text{R}/\text{h}$, including background. The highest measurement, 15.6 $\mu\text{R}/\text{h}$ including background, was obtained in the parking area in front of the building and may be the result of granitic material mixed with the asphalt pavement covering the area. There is no known radioactive contamination present at this location. There are no previous external gamma radiation data for comparison with the data collected during this investigation. However, the exterior measurements at this property are consistent with the range of exterior gamma exposure rate measurements at neighboring properties.

Deployment of 14 activated charcoal canisters was performed during a normal work day to measure concentrations of radon. The locations of the canisters are shown in Figure 4-7, and the data are presented in Table 4-3. Canisters were placed in locations where the greatest number of employees were located and in areas where "closed house" conditions could be approximated as closely as possible to ensure collection of a

representative sample. "Closed" or "closed house" conditions refers to the building being closed, that is, the windows and doors are kept closed and no heating or cooling systems such as attic fans are in operation for at least 12 hours before the radon canisters are deployed. Radon concentrations ranged from less than 0.2 to less than 0.3 pCi/L, all within background. These concentrations are well below background for the Maywood site, which is 1.0 pCi/L, and are also significantly below DOE's guideline of 3.0 pCi/L above background.

Analysis for thoron was not performed at this property because radioactive contamination is not known to extend beneath the building.

4.1.5 Mark Correctional, Inc.

Mark Correctional, Inc., occupies the center third of the former Hunter Douglas building. There are approximately 45 employees at the facility engaged in the fabrication and sales of self-contained cells for correctional facilities. The facility operates 5 days per week, 8 h per day. A reception area, sales offices, engineering staff offices, restrooms, and a small lunchroom occupy the front portion of the building space, and the fabrication area is in the rear portion. The fabrication area includes a paint booth, metal cutting and riveting areas, and a supervisor's small office.

Six interior and six exterior gamma exposure rate measurements were made at this property. The locations of these measurements and the data are shown on Figure 4-6. Interior gamma exposure measurements ranged from 7.9 to 10.1 $\mu\text{R/h}$ and were within background. Average background for the Maywood site is 9 $\mu\text{R/h}$. These measurements do not exceed the DOE guideline of 20 $\mu\text{R/h}$ above background for habitable structures. The range of exterior gamma radiation measurements was 8.6 to 15.6 $\mu\text{R/h}$, including background. The highest exterior measurement, 15.6 $\mu\text{R/h}$ including background, was obtained in the parking area at the front of the building and may be the result of granitic material mixed with the asphalt pavement covering the area. There is no known radioactive contamination at this location.

Fifteen 7.6-cm (3-in.) canisters were deployed in the facility to measure concentrations of radon. Canisters were placed in areas where the largest number of employees are present for most of the work day and in areas where "closed house" conditions could be maintained as much as possible to ensure representative sampling. Analytical results showed that radon concentrations ranged from less than 0.2 to 0.3 pCi/L and were within background. The locations of the canisters are shown in Figure 4-8, and the data for each canister are presented in Table 4-4. These concentrations are within background for the Maywood site, which is 1.0 pCi/L, and do not exceed the DOE guideline of 3.0 pCi/L above background.

No analysis was performed for thoron because there is no evidence of radioactive contamination beneath the building (BNI 1987b).

4.1.6 PC Warehouse

PC Warehouse is the tenant for the final third of the former Hunter Douglas building. The company is engaged in the manufacture, sales, and repair of a large variety of personal computers, printers, and associated computer equipment. There are approximately 35 to 40 employees who work 40 h per week. The space occupied by PC Warehouse has been divided into several areas, including a reception/telemarketing office area, sales area, various repair areas, warehouse areas, shipping dock, and a wholesale sales area. Deployment of the radon canisters and interior gamma exposure rate measurements were not easily accomplished because of the vast inventory crowded into the space occupied by the firm.

Nine interior and six exterior gamma exposure rate measurements were obtained at the PC Warehouse property. Figure 4-6 shows the location and data for each of these measurements. Interior gamma radiation measurements ranged from 9.2 to 12.1 $\mu\text{R}/\text{h}$, including background. The highest measurement, 12.1 $\mu\text{R}/\text{h}$, was recorded in northwest corner of the facility but does not exceed the DOE guideline of 20 $\mu\text{R}/\text{h}$ above background for habitable structures. The exterior gamma exposure rate measurements were the same as those for the two other tenants of the former Hunter Douglas, ranging from 8.6 to 15.6 $\mu\text{R}/\text{h}$, including background.

Sixteen 7.6-cm (3-in.) activated charcoal canisters were placed to measure radon concentrations. Analytical results, shown in Table 4-5, ranged from less than 0.2 pCi/L to 0.4 pCi/L, all within background. Background for the Maywood site is 1.0 pCi/L. The locations of the canisters are shown in Figure 4-9. None of the radon concentrations exceeds background levels or the DOE guideline of 3.0 pCi/L above background.

Because there is no known radioactive contamination present beneath the building (BNI 1987b), thoron analyses were not performed.

4.1.7 Gulf Station

The Gulf Station property is located on Route 17 North in Maywood and is an active business. Though small, the property contains a one-story brick veneer building and two gasoline service islands. The building is divided into three sections: a storage room, a center office area, and an area containing a sink, circuit breaker box, and miscellaneous maintenance supplies. There is no service bay. The property surrounding the building is completely covered by asphalt pavement except for two landscape planters containing shrubs and a small strip of grass at the rear of the building. The station operates 24 h per day, 7 days a week, and employs one person on each work shift.

One interior and three exterior gamma exposure rate measurements were made on the property. The interior measurement was 10.9 $\mu\text{R/h}$, including background. The exterior measurements ranged from 9.6 to 14.4 $\mu\text{R/h}$, including background. Figure 4-10 shows the locations of the measurements and the data for each one. The interior measurement does not exceed the DOE guideline of 20 $\mu\text{R/h}$ above background for habitable structures. The highest exterior measurement, 14.4 $\mu\text{R/h}$, was recorded adjacent to the landscape planter on the southeastern side of the property. This is an area of known radioactive contamination (BNI 1989e). There are no previous external gamma radiation measurements for this property with which to compare the data collected during this investigation. However, when the data from this investigation are compared with external gamma radiation measurements taken at neighboring properties, no significant difference is evident.

Two radon canisters were deployed at the Gulf Station property. One was placed in the office area and the other in the adjacent storage room where maintenance supplies are kept. Figure 4-11 shows these locations. In the office area, the concentration of radon was 1.3 pCi/L, including background. The concentration measured in the storage room was 1.0 pCi/L, including background (see Table 4-6). Background for the Maywood site is 1.0 pCi/L. These measurements do not exceed the DOE guideline of 3.0 pCi/L above background.

One canister was analyzed for thoron because radioactive contamination is suspected to be present beneath the building. Figure 4-11 shows the location, and the data are presented in Table 4-6. The concentration measured was less than 2.0 pCi/L, including background. DOE is currently reviewing the derived concentration guides (DCGs) for thoron, and until the review is completed, the same guideline applies to thoron as to radon: 3.0 pCi/L above background.

4.1.8 Stepan Company

Stepan Company is a large chemical company on West Hunter Avenue in Maywood adjacent to the DOE-owned MISS property. Stepan's processes include various extractions for natural flavorings used in soft drink products and the manufacture of fatty acid esters for the cosmetic, personal care, and food industries. Approximately 80 to 100 employees work either full-time or part-time in the 15 buildings where gamma exposure rates and radon and thoron measurements were obtained during this investigation. Of the 15 buildings, only Buildings 3, 4, 8, 14, 15, 86, and portions of Buildings 2, 10H, and 78 could be classified as "closed" or "closed house" for testing purposes. The remaining buildings have open bays or large roll-up doors that are left open much of the time, and although the testing was planned for winter to increase the potential for "closed house" conditions, it was impossible to have "closed house" conditions in all buildings because Stepan is an active facility

A total of 28 interior gamma exposure rate measurements and 28 exterior measurements were obtained at the Stepan Company property (see Figure 4-12). Interior gamma exposure rate measurements ranged from 8.5 $\mu\text{R/h}$ to 27.7 $\mu\text{R/h}$, all within background. The highest interior measurement (the only measurement above 20 $\mu\text{R/h}$, including background) was

obtained in Building 86, an unoccupied shed used for the storage of laboratory supplies. The shed is located adjacent to a large grass-covered area on the DOE-owned MISS property where the thorium process buildings were once located. This area is known to be radioactively contaminated, and elevated gamma exposure rate measurements have been recorded in other nearby locations. Exterior gamma radiation measurements ranged from 7.5 to 54.4 $\mu\text{R}/\text{h}$, including background. The measurement of 54.4 $\mu\text{R}/\text{h}$ was obtained outside Building 78 on the Stepan property. Building 78 is located adjacent to the grass-covered area. There are no Stepan employees working full-time in the section of Building 78 closest to the location of this measurement. Ninety exterior gamma radiation measurements were made during the remedial investigation conducted in 1992 (BNI 1992a). These measurements ranged from 5 to 228 $\mu\text{R}/\text{h}$ (background was not subtracted). The exterior measurements taken during this survey, while not as numerous, were within the range of the 1992 data. No significant changes were noted during this investigation.

Seventy-six 7.6-cm (3-in.) activated charcoal canisters were deployed in 15 buildings on the Stepan Company property. Table 4-7 lists the number of canisters deployed in each building, the number of employees in each building, the building's use, and the analytical results or radon concentration for each canister. The location of each canister and its sample number can be found in Figures 4-13 through 4-21. Radon concentrations ranged from less than 0.2 to 3.4 pCi/L, including background. The highest concentration, 3.4 pCi/L, was obtained in Building 3, a warehouse constructed above a known burial area for radioactively contaminated soils. This area, Burial Area 3, contains thorium process wastes and residues that were excavated from former Maywood Chemical Works property west of Route 17 in 1968 by the Stepan Company as part of its cleanup activities (see Section 2.0). The building is not occupied by Stepan employees except during removal of materials and inspection of the building.

None of the measured radon concentrations exceed the DOE guideline for radon of 3.0 pCi/L above background. The background concentration for radon in the Maywood area is 1.0 pCi/L. The EPA and NJDEP action level of 4.0 pCi/L, including background, also was not exceeded. EPA and NJDEP do not require the property owner to take immediate action if radon concentrations of 4.0 pCi/L (including background) or less are detected. At those concentrations, EPA and NJDEP guidelines state that the property owner should be

informed, and the need for any followup action (e g., repeated short-term measurement or long-term measurement) should be evaluated on a case-by-case basis.

Seven of the 76 activated charcoal canisters deployed for radon measurements were also analyzed for thoron. Table 4-7 lists the buildings, locations, concentrations measured, and sample numbers for these analyses. Locations of canisters analyzed for thoron are shown in Figures 4-13 through 4-21. The minimum thoron concentration reported by the laboratory was 1.0 pCi/L, and the maximum concentration was 2.0 pCi/L.

DOE is currently assessing DCGs for thoron; until the review is complete, the guideline used is the same as that for radon, 3.0 pCi/L above background. None of the thoron concentrations measured at the Stepan Company property exceeded this guideline. No guidelines for thoron have been established by EPA or NJDEP.

4.1.9 Sunoco Station

The Sunoco Station property is an active business on Route 17 North in Maywood. It is bordered on the southeast by an above-ground section of Lodi Brook, which was probably the transport mechanism for radioactive contamination found on the property (BNI 1987c). The property contains a gasoline service area and a single-story building constructed of cinder block. The area adjacent to Route 17 is covered by asphalt pavement, and the remaining property is covered by packed gravel, clay, and some concrete. The building is representative of a gasoline service station of the 1960s and earlier when stations were full service. There is a small office area, a now unused and empty double service bay with large roll-up doors, and a small storage room that is accessed from the service bay. There are two restrooms on the western side of the building that are accessed from the outside. The station operates 7 days a week, 24 h per day, with one or two full-time employees on each shift.

The single interior gamma exposure rate measurement obtained at this property was 9.6 μ R/h, including background. The four exterior measurements obtained ranged from 7.7 to 8.5 μ R/h and were within background. Figure 4-22 shows the locations and data for each measurement. None of these measurements exceeds the background range for gamma radiation of 8 to 12 μ R/h for the Maywood site (BNI 1992a). The interior measurements are

also significantly below DOE guidelines of 20 $\mu\text{R}/\text{h}$ above background for habitable structures. No external gamma radiation data are available from previous surveys of this property; however, comparison of the gamma exposure rate measurements made during this investigation with those at nearby properties shows them to be within the range of external gamma radiation measured for this area of the Maywood site.

Two 7.6-cm (3-in.) activated charcoal canisters were deployed to obtain radon measurements (see Figure 4-23). Analytical data, shown in Table 4-8, indicate that concentrations ranged from less than 0.2 to less than 0.3 pCi/L, all within background (1.0 pCi/L). The concentrations were also significantly below the DOE guideline of 3.0 pCi/L above background.

A single canister analyzed for thoron indicated a concentration less than 1.0 pCi/L, including background. This measurement does not exceed the DOE guideline of 3.0 pCi/L above background.

4.1.10 Uniform Fashions (formerly Federal Express)

Uniform Fashions currently leases the former Federal Express building at 137 Route 17 North in Maywood. The building is owned by a development company based in Hasbrouck Heights. The property contains one building constructed of cinder block with brick veneer, and the remainder of the property is covered by asphalt pavement. The northern side of the property is bordered by an above-ground section of Lodi Brook, which was probably the transport mechanism for radioactive contamination identified on the property (BNI 1987d). The building houses a retail store engaged in the ordering and sales of uniforms for waiters/waitresses, nurses, etc. The front portion of the building contains offices, a small storage area, and a retail showroom. The rear of the building is the warehouse for merchandise.

Five interior and six exterior gamma exposure rate measurements were taken at the Uniform Fashions property (see Figure 4-24). Interior measurements ranged from 8.7 to 10 $\mu\text{R}/\text{h}$, including background. The northeastern corner of the warehouse area was the location of the 10 $\mu\text{R}/\text{h}$ (including background) measurement. This corner of the building is

near the above-ground section of Lodi Brook and a drainage ditch tributary of the brook where radioactive contamination is known to be present. Exterior gamma radiation measurements ranged from 8.6 to 19.6 $\mu\text{R/h}$, including background. Background for the Maywood site ranges from 8 to 12 $\mu\text{R/h}$ with an annual average of 9 $\mu\text{R/h}$. The DOE guideline for habitable structures is 20 $\mu\text{R/h}$ above background. The highest exterior measurement was recorded adjacent to the drainage ditch tributary of Lodi Brook where radioactively contaminated soil has been identified during previous characterization activities (BNI 1987d). The exterior gamma exposure rate measurements taken on this property during this survey are comparable to those made on nearby properties (no previous gamma exposure rate data are available)

Eleven radon canisters were deployed throughout the building. The locations of these canisters are shown in Figure 4-25, and the data for each canister are presented in Table 4-9. Radon concentrations ranged from less than 0.2 pCi/L to 0.3 pCi/L, all within background. The DOE guideline is 3.0 pCi/L above background, background for the Maywood site is 1.0 pCi/L. None of the radon concentrations exceeded this guideline.

No thoron analyses were performed on samples collected at this property because no radioactive contamination is known to extend beneath the building.

4.1.11 Flint Ink

Flint Ink is located on Industrial Road in Lodi. This area is primarily residential, but several commercial properties are grouped in a small industrial section. The company no longer operates its facility in Lodi, and at the time of the investigation the property was listed for sale. When operating, the facility produced various types of ink used in the printing industry and employed approximately 45 to 50 people. The property is fairly large and contains one building of cinder block construction with brick veneer. Because the building is vacant at present and has been vandalized several times, a security guard is present in the evening and early morning hours. The building contains an office area, laboratory, lunchroom, shower facilities, and a large manufacturing area. "Closed house" conditions existed before and during the investigation because this is no longer an operating facility.

Eleven gamma exposure rate measurements were made at the Flint Ink property. Eight interior measurements ranged from 10.8 to 12.9 $\mu\text{R}/\text{h}$, and were within background; three exterior measurements ranged from 8 to 10 $\mu\text{R}/\text{h}$, including background. Background for the Maywood site averages 9 $\mu\text{R}/\text{h}$. The highest gamma radiation measurement recorded in the building, 10 $\mu\text{R}/\text{h}$ including background, was in the shower area adjacent to the former processing area. The DOE guideline for habitable structures is 20 $\mu\text{R}/\text{h}$ above background; none of the interior measurements exceeded this guideline. Figure 4-26 shows the locations and data for these measurements.

During radiological characterization of this property in 1987 (BNI 1989d) exterior gamma exposure rate measurements ranged from 7 to 20 $\mu\text{R}/\text{h}$ (background was not subtracted). Comparison of the 1987 exterior measurements with those collected during this investigation show that the 1994 measurements were within the range of the previous measurements.

Thirteen 7 6-cm (3-in) activated charcoal canisters were deployed in the building to measure radon concentrations (see Figure 4-27 and Table 4-10). Radon concentrations ranged from less than 0.3 pCi/L to 0.5 pCi/L, all within background. Background for the Maywood site is 1.0 pCi/L. The DOE guideline is 3.0 pCi/L above background.

During previous radiological characterization of this property (BNI 1989d), boreholes were drilled through the floor of the processing area, and radioactively contaminated soils were identified beneath the building. Because the former channel of Lodi Brook once flowed across this property, it is likely that the contamination found is the result of overbank deposition from Lodi Brook during flooding. Lodi Brook is known to be one of the primary transport mechanisms for radioactive contamination that originated from thorium processing at the former Maywood Chemical Works property. Because radioactive contamination is known to be present beneath the building, two canisters were analyzed for thoron. Figure 4-27 shows the locations of these canisters, and the data are presented in Table 4-10. The concentration of thoron measured in these canisters was less than 1.0 pCi/L, including background. DOE is currently reviewing the guideline for thoron; until the review is complete, the same guideline as that used for radon is applicable, 3.0 pCi/L above background. Neither of the canisters analyzed for thoron exceeded this guideline.

4.1.12 Bergen Cable

Bergen Cable is located at 170 Gregg Street in Lodi. The property is large and nearly rectangular, with a partially paved parking area across the front. The entire property is surrounded by chain-link fence. The one building on the property is constructed of cinder block with brick veneer; it is divided into several sections and contains offices for clerical, engineering, sales, and other staff as well as fabrication, quality control testing, maintenance, warehouse, and miscellaneous storage areas. The facility operates 5 days a week, 8 h per day. There are approximately 35 to 40 employees at the facility who are engaged in the fabrication and sales of steel cable for industrial use. The fabrication process includes the winding of various types of steel cable varying in size and tensile strength. After the wire has been twisted into cable, the wire cable is then machine wound into various thicknesses and wound onto large wooden spools. The fabrication areas are extremely noisy, and hearing protection is required for workers and other personnel in the area.

Two interior and three exterior gamma exposure rate measurements were obtained at the Bergen Cable property. The interior measurements were 8.8 and 9.1 $\mu\text{R}/\text{h}$, including background. The exterior measurements ranged from 8 to 10 $\mu\text{R}/\text{h}$, including background. The DOE guideline for habitable structures is 20 $\mu\text{R}/\text{h}$ above background; none of the interior measurements exceeded this guideline. Locations of these measurements and their data are shown in Figure 4-28. Exterior measurements were compared with gamma exposure rate data collected during the 1986 characterization of this property (Kannard 1987). The exterior measurements taken in 1986 ranged from 4.8 to 7.7 $\mu\text{R}/\text{h}$ (background was not subtracted), and no significant changes in conditions at the property are evident.

Activated charcoal canisters were deployed at 25 locations in the building to measure concentrations of radon. The locations of these canisters are shown in Figure 4-29, and the data are presented in Table 4-11. Radon concentrations ranged from less than 0.2 pCi/L to 0.4 pCi/L, all within background. These concentrations are below background, which is 1.0 pCi/L for the Maywood site, and are significantly below the DOE guideline of 3.0 pCi/L above background. In addition, the concentrations measured do not exceed the action level of 4.0 pCi/L, including background, set by EPA and NJDEP. At that concentration, both

agencies require no immediate retesting and recommend that the need for retesting be evaluated on a case-by-case basis.

No radioactive contamination is present beneath the building (Kannard 1987); therefore, no thoron analysis was performed on any of the canisters.

4.1.13 Airco Medical and Specialty Products

This facility, located on the corner of Hancock Street and Industrial Drive in Lodi, employs approximately 20 people in the sale and filling of compressed gases. Most of the exterior of the property is covered by asphalt pavement. The property contains one large building of cinder block construction that contains an office area and lunchroom in the front portion of the building and the gas cylinder filling and storage area, loading dock, maintenance area, and a small paint booth in the rear portion. The employees work a 40-h week (5 days, 8 h per day). The property is owned by a real estate brokerage and is leased by the current occupant.

Both interior and exterior gamma exposure rate measurements were obtained at this property using a PIC. Interior gamma radiation measurements at seven locations ranged from 7 to 11.4 $\mu\text{R}/\text{h}$ and were within background. The highest measurements, 11.2 and 11.4 $\mu\text{R}/\text{h}$, including background, were recorded in the front portion of the building in the office areas. Radioactively contaminated soil is known to be present beneath this portion of the building (BNI 1989b). The former channel of Lodi Brook once flowed unconfined across the front of this property and is probably the source of the contamination; Lodi Brook is a known mechanism for transport of radioactive contamination from the former Maywood Chemical Works property. Today Lodi Brook continues to flow beneath the front of this property, but the brook is confined to a concrete culvert and is no longer a source for contaminant deposition. The seven exterior gamma exposure rate measurements ranged from 6.5 to 9.3 $\mu\text{R}/\text{h}$, all within background. Background for the Maywood site ranges from 8 to 12 $\mu\text{R}/\text{h}$ and averages 9 $\mu\text{R}/\text{h}$. The highest of the interior and exterior measurements are slightly above background, but the interior measurements are well below the DOE guideline of 20 $\mu\text{R}/\text{h}$ above background for habitable structures. Figure 4-30 shows the locations for these measurements and presents the data.

One interior and seven exterior gamma exposure rate measurements were taken during the 1988 radiological characterization of this property. The interior measurement was 13 $\mu\text{R/h}$, including background; exterior measurements ranged from 4 to 9 $\mu\text{R/h}$, all within background. Comparison of these measurements with gamma exposure rate measurements collected during this investigation shows no significant change in conditions at this property.

Eleven 7.6-cm (3-in.) activated charcoal canisters were deployed in the building to measure radon concentrations. The concentrations measured ranged from less than 0.2 pCi/L to 0.4 pCi/L, all within background. These concentrations are well below the background level of 1.0 pCi/L for the Maywood area and do not exceed the DOE guideline of 3.0 pCi/L above background. Figure 4-31 shows the locations of these canisters, and Table 4-12 presents the data.

Because radioactive contamination is believed to be present beneath the building, two of the canisters were analyzed for thoron. The concentrations measured were less than 0.9 pCi/L and less than 2.0 pCi/L, including background. DOE is in the process of reviewing the DCGs for thoron and therefore uses the same guideline for thoron as for radon, 3.0 pCi/L above background. Neither of the thoron concentrations measured exceeds this guideline.

4.1.14 Heather Hill (former Appleton Electric)

Heather Hill occupies the building formerly occupied by Appleton Electric. The property is owned by a real estate brokerage and leased by the current tenant. The company is engaged in the ordering, sales, and shipping of sportswear. Heather Hill employs approximately 15 people and operates 5 days per week, 8 h per day. A large portion of the property is covered by asphalt pavement, but there are some grassy areas adjacent to the cinder block building. There is also an inactive railroad spur adjacent to the eastern side of the building. The former channel of Lodi Brook flowed unconfined across this property and is the source of radioactively contaminated soils that have been identified on the property. Today, Lodi Brook flows beneath the front portion of the property confined in a concrete culvert. Radioactive contamination is believed to be present beneath the building. The building is of cinder block construction with some brick veneer. Offices for clerical and

sales personnel are located in the front portion of the building, and the rear of the building contains the warehouse, shipping area, and loading dock.

Eight gamma exposure rate measurements, four interior and four exterior, were obtained at this property (see Figure 4-32). The interior measurements ranged from 9 to 10.2 $\mu\text{R/h}$, and were within background. The highest of these measurements, 10 and 10.2 $\mu\text{R/h}$ including background, were recorded in the warehouse supervisor's area and one of the front offices. These locations overlie portions of the building where radioactive contamination is known to be present beneath the building. The measurements are, however, within the range of background levels for gamma radiation in the Maywood area, which is 8 to 12 $\mu\text{R/h}$. In addition, none of the interior gamma exposure rate measurements exceed the DOE guideline of 20 $\mu\text{R/h}$ above background for habitable structures. The four exterior measurements ranged from 7.8 to 13.6 $\mu\text{R/h}$, including background. The highest of these measurements, 13.6 $\mu\text{R/h}$ including background, was recorded near the northeastern corner of the building and is slightly above the range for background. This location is in an area of known radioactive contamination (BNI 1989c). The interior and exterior measurements taken during this investigation were compared with interior and exterior measurements recorded during the radiological characterization. One interior and nine exterior measurements were taken during that activity; the interior measurement was 9 $\mu\text{R/h}$, including background, and the exterior measurements ranged from 5 to 41 $\mu\text{R/h}$, including background. The highest exterior measurement during characterization activities, 41 $\mu\text{R/h}$ including background, was recorded near the northeastern corner of the building near an open culvert through which Lodi Brook now flows. The nearest exterior measurement taken during the 1994 investigation was 13.6 $\mu\text{R/h}$, including background. Although the previous measurement is significantly higher than the 1994 measurement, overall comparison of the data indicates that there are no changes in conditions at this property.

Ten canisters were deployed to measure radon concentrations at this property. Canister locations are shown in Figure 4-33, and the data are presented in Table 4-13. Radon concentrations ranged from less than 0.4 pCi/L to 0.5 pCi/L, all within background. These concentrations are well below background (1.0 pCi/L for the Maywood site) and do not exceed the DOE guideline of 3.0 pCi/L above background or the EPA and NJDEP action

level of 4.0 pCi/L, including background. There is no imminent health risk for employees at this facility.

Because radioactive contamination is present beneath the building, three of the canisters were analyzed for thoron. The concentration measured in each of these was less than 1.0 pCi/L, including background. DOE currently uses the same guideline for thoron, 3.0 pCi/L above background, as for radon. These concentrations do not exceed that guideline.

4.1.15 DeSaussure

The DeSaussure property, located on West Howcroft Avenue in Maywood, employs approximately 26 people. Four of these employees work in the front office area of the building, and the remaining 22 are employed in the manufacturing area at the rear of the building. All employees work 5 days per week, 8 h per day. The company is engaged in the manufacture and sale of furniture products, specifically tables. These tables include large round and rectangular tables used in restaurant banquet areas and smaller tables (similar in size to bridge tables), some of which have gameboard tops. The manufacturing process includes cutting, covering, gluing, painting, and machining of all components of the tables. The front portion of the building is used for clerical and sales personnel and also contains a large lunchroom area that is accessed from the manufacturing area. Previous radiological characterization of the property included the drilling of boreholes through the floor of the manufacturing area. Radioactively contaminated soil is known to be present beneath a portion of the building (BNI 1989f). The property is located adjacent to property where Lodi Brook flows unconfined today and was most likely the source of contaminant deposition. The property is also located very near the property once owned by the former Maywood Chemical Works.

Six interior and five exterior gamma exposure rate measurements were obtained at the DeSaussure property (see Figure 4-34). The interior measurements ranged from 6.6 to 8.5 $\mu\text{R}/\text{h}$ and were within background. None of these measurements exceeds the annual average for gamma radiation or background of 9 $\mu\text{R}/\text{h}$ or the DOE guideline of 20 $\mu\text{R}/\text{h}$ above background for habitable structures. Exterior gamma radiation measurements ranged

from 7.6 to 27.4 $\mu\text{R/h}$, including background. The highest measurement, 27.4 $\mu\text{R/h}$ including background, was located along the western side of the building near the northwestern corner. This location is in an area known to be radioactively contaminated and is adjacent to a property where radioactive contamination has also been identified (BNI 1987e). Background for gamma radiation in the Maywood area ranges from 8 to 12 $\mu\text{R/h}$ and averages 9 $\mu\text{R/h}$.

During radiological characterization of this property in 1986, four interior and six exterior gamma exposure rate measurements were obtained. The interior measurements ranged from 3 to 13 $\mu\text{R/h}$ and the range of exterior measurements was 10 to 146 $\mu\text{R/h}$ (background was not subtracted from any of these measurements). The highest exterior measurement, 146 $\mu\text{R/h}$ including background, was recorded at the rear of the building in an area where radioactively contaminated soils were identified. Comparison of the data from the earlier characterization shows that most of the measurements taken during this investigation are within the ranges of those recorded during earlier characterization activities.

Thirteen 7 6-cm (3-in.) activated charcoal canisters were deployed within the building to measure radon concentrations. Figure 4-35 shows the location of these canisters; Table 4-14 presents the data for each canister. Radon concentrations ranged from less than 0.2 to 0.4 pCi/L, all within background. Background for radon for the Maywood area is 1.0 pCi/L. The DOE guideline for radon is 3.0 pCi/L above background or 4.0 pCi/L. EPA and NJDEP action levels are 4.0 pCi/L, including background, and at that concentration these agencies require no action other than notification to the property owner and a case-by-case evaluation regarding the need for immediate retesting. All of the radon concentrations measured within the building were significantly below background and DOE, EPA and NJDEP guidelines.

Analysis for thoron was performed on 2 of the 13 canisters because radioactive contamination is known to be present beneath the building. The concentrations measured were less than 0.6 pCi/L and less than 0.8 pCi/L, and were within background. The DOE guideline for thoron is the same as that for radon, 3.0 pCi/L above background. The DCG for thoron is presently being evaluated by DOE.

4.1.16 Joseph Muscarelle Associates

Joseph Muscarelle Associates is an engineering design firm employing approximately 12 people. The firm is engaged in the design of office complexes, shopping complexes, and other buildings. The Muscarelle property is located at the corner of Essex Street and Route 17 South (adjacent to the Route 17 South exit ramp for Essex Street). The property is surrounded by asphalt pavement, with small landscaped areas adjacent to the building on three sides. There is one multi-storied building on the property. The building is divided into numerous offices, open clerical areas, and conference rooms and also contains basement offices, storage areas, and a boiler room. Only the basement and first floor of the building are currently occupied. The employees are present 5 days per week for 8 h per day. There are both front and rear entrances to the building, but the front entrance appears to be the primary entrance. During this investigation, the ability to maintain "closed house" conditions was achieved fairly easily because of limited pedestrian traffic into and out of the building.

Three interior gamma exposure rate measurements were obtained at the Muscarelle property. The interior measurements ranged from 8.9 to 10.6 $\mu\text{R}/\text{h}$ and were within background. The highest of these measurements, 10.5 $\mu\text{R}/\text{h}$ and 10.6 $\mu\text{R}/\text{h}$ including background, were recorded in the first floor offices near the rear of the building and in an unoccupied portion of the basement, respectively. None of the interior measurements exceeded the background range for gamma radiation of 8 to 12 $\mu\text{R}/\text{h}$ or the DOE guideline of 20 $\mu\text{R}/\text{h}$ above background. The four exterior gamma exposure rate measurements ranged from 8.9 to 16.5 $\mu\text{R}/\text{h}$, including background. The northwestern corner of the building was the location of the highest measurement, 16.5 $\mu\text{R}/\text{h}$ including background. This location is in an area where radioactive contamination was identified during previous radiological characterization of the property (BNI 1992a). Contamination identified in this area is most likely the result of overbank deposition from Lodi Brook during flooding. The channel of Lodi Brook is known to have been unconfined on an adjacent property in past years, today, the channel is contained within a concrete box culvert on that property. Figure 4-36 shows the locations and data for the interior and exterior gamma exposure rate measurements.

Exterior gamma radiation measurements recorded during remedial investigation activities (BNI 1992a) ranged from 6 to 17 $\mu\text{R}/\text{h}$ (background has not been subtracted). No interior measurements were recorded. Comparison of the gamma radiation measurements from both investigations shows no significant change in property conditions.

Nine activated charcoal canisters were deployed in the Muscarelle building to measure radon. The locations of these canisters are shown in Figures 4-37 and 4-38, and the data for each canister are presented in Table 4-15. Radon concentrations ranged from less than 0.3 pCi/L to 0.4 pCi/L, all within background. These concentrations are well below background, 1.0 pCi/L for the Maywood area, and they are significantly below the DOE guideline of 3.0 pCi/L above background.

Because contamination is believed to lie beneath the building, one of the canisters was analyzed for thoron, the concentration measured was less than 1.0 pCi/L, including background. DOE is currently evaluating the DCGs for thoron and at present uses the same guideline for thoron as for radon, 3.0 pCi/L above background. The thoron concentration measured did not exceed this guideline.

4.1.17 Sears Repair Center

The Sears Repair Center located at 200 Route 17 South is a leased facility that includes a retail sales area, telemarketing area, television repair, small engine repair, offices for clerical personnel, parts warehouse, employee lunchroom, loading dock, and an unoccupied area that has been used for offices. There are approximately 30 to 35 employees at the facility, and it is operated 6 days per week. Most of the property's exterior is covered by asphalt pavement. The property is accessed from Route 17 South. An above-ground, unconfined portion of Lodi Brook flows parallel with Route 17 South along the southeastern property boundary. At the point where the brook exits the property, it enters a concrete conduit and subsequent box culvert on the adjacent property. Radioactive contamination has been found in the area where the brook is aboveground. At the southern end of the building, in the parking area, there is a buried petroleum tank and an above-ground gasoline pump used to fuel delivery/service vehicles operated by the Sears facility.

Both interior and exterior gamma exposure rate measurements were obtained on this property. The three interior gamma radiation measurements ranged from 9.6 to 10.1 $\mu\text{R}/\text{h}$, including background. These measurements do not exceed the background range for gamma radiation, which is 8 to 12 $\mu\text{R}/\text{h}$ (BNI 1992a) or the DOE guideline of 20 $\mu\text{R}/\text{h}$ above background for habitable structures. Four exterior gamma exposure rate measurements were recorded. These measurements ranged from 7.5 to 8.2 $\mu\text{R}/\text{h}$, all within background. Annual average background for gamma radiation in the Maywood area is 9 $\mu\text{R}/\text{h}$. Figure 4-39 shows the locations and the data for each of these measurements. Exterior gamma exposure rate measurements recorded during remedial investigation activities (BNI 1992a) ranged from 6 to 23 $\mu\text{R}/\text{h}$ (background has not been subtracted) and are comparable to measurements recorded during this investigation.

Radon concentrations were measured at 12 locations within the building using 7.6-cm (3-in) activated charcoal canisters. The concentration of radon at each location was less than 0.4 pCi/L, well below background. None of the radon concentrations exceed the DOE guideline of 3.0 pCi/L above background (background for the Maywood area is 3.0 pCi/L). The location of each canister is shown in Figure 4-40. Table 4-16 presents the data for each canister.

No radioactive contamination is present below the building; therefore, analysis for thoron was not performed at this property.

4.1.18 Sears Distribution Center

The Sears Distribution Center on Maywood Avenue in Maywood operates 7 days per week, 24 h per day. There are as few as 25 people or as many as 50 people working, depending on the time of day and the work being performed. The property is owned by an individual and is leased by the Sears facility. The property covers more than 3 acres and can be accessed from Maywood Avenue on the eastern end of the property or Route 17 North on the western end of the property. More than half of the property is covered by asphalt pavement, and the remainder of the property is covered by grass and a large two-story cinder block building. The first floor contains a large warehouse area, loading dock, boiler room, dispatch office, customer pickup area, employee locker room, and offices. The second floor

does not occupy the full extent of the structure. It contains offices, work areas for telemarketers, conference and staff training areas, an employee lunchroom, numerous office areas that are subleased to other tenants (such as a variety of small transportation firms), and a large area of unused office space. This facility receives and distributes Sears merchandise from a variety of suppliers. The property is located adjacent to the former Maywood Chemical Works property and is separated from that property by a chain-link fence and unused railroad spur.

Seventeen interior gamma exposure rate measurements were obtained on this property; the locations of these measurements and the data are presented in Figure 4-41. The interior measurements ranged from 9.6 to 13.9 $\mu\text{R}/\text{h}$, including background. The annual average for background gamma radiation at the Maywood site is 9 $\mu\text{R}/\text{h}$. The DOE guideline for habitable structures is 20 $\mu\text{R}/\text{h}$ above background. None of the interior gamma exposure rate measurements exceeded the DOE guideline. Six exterior measurements on the property ranged from 8 to 13.9 $\mu\text{R}/\text{h}$, including background.

During the 1986 radiological characterization of this property, 9 interior gamma exposure rate measurements were recorded (BNI 1987e) ranging from 11 to 15 $\mu\text{R}/\text{h}$, including background. Comparison with the interior gamma radiation measurements recorded during this investigation shows that the 1986 measurements were not significantly different from the measurements taken during this investigation.

Seventy-six 7.6-cm (3-in.) activated charcoal canisters were deployed in the Sears building to measure radon concentrations. The locations of these canisters are shown in Figures 4-42 and 4-43, and the data for each canister are presented in Table 4-17. Radon concentrations ranged from less than 0.4 pCi/L to 1.7 pCi/L, including background. Background for the Maywood area is 1.0 pCi/L. The DOE guideline is 3.0 pCi/L above background. All of the radon concentrations measured were within the DOE guideline and were below the EPA and NJDEP action level of 4.0 pCi/L, including background. At that level, EPA and NJDEP recommend that the property owner be notified and the need for retesting be evaluated on a case-by-case basis.

During previous radiological characterization of the property (BNI 1987e), boreholes were drilled through the floor of the building, and radioactively contaminated soils were found. Because radioactive contamination is known to be present beneath the building, thoron analyses were performed on 8 of the 76 canisters. The concentrations of thoron reported by the laboratory ranged from less than 1.0 pCi/L to less than 2.0 pCi/L, including background. At present DOE is reviewing the DCGs for thoron and until that review is complete, the DOE guideline for thoron is the same as that for radon. None of the concentrations of thoron measured exceeded this guideline. There is no imminent health risk to employees at this facility from the concentrations of radon or thoron measured on this property.

4.1.19 Myron Manufacturing

Myron Manufacturing owns three parcels of property that were included in this investigation: 50 and 61 West Hunter Avenue, and 205 Maywood Avenue. The parcel at 61 West Hunter Avenue is leased to several tenants, and the parcel at 50 West Hunter Avenue houses telemarketing personnel engaged in the sale of Myron products. The 205 Maywood Avenue parcel houses the main manufacturing facility and offices. Myron employees more than 150 people in the manufacture, sales, and distribution of appointment books, desk calendars, and other desk accessories. The manufacture of these products includes cutting of vinyl for covers, gilding, stitching, typesetting, imprinting, and assembly of products ranging from appointment books to personalized ballpoint ink pens. Packaging and shipping activities are also conducted in the 205 Maywood Avenue facility.

At 50 West Hunter Avenue, employees are engaged in telemarketing sales for various Myron products. Employees are present on two shifts, but the evening shift personnel are few. The building is one story and is constructed of cinder block with brick veneer. It contains small offices, a large training room, an open area occupied by telemarketing employees, restrooms, and an employee lunchroom. Many areas of the building are unused.

The property at 61 West Hunter Avenue contains a two-story brick veneer building. Only the first floor of this building was included in the investigation. The tenant for this area

is Design House. Employees of this company are engaged in the sales and distribution of a variety of office and desk accessory products.

Interior gamma exposure rate measurements were conducted in the buildings on all three properties. Two interior measurements were made at each building. At 50 West Hunter Avenue, the interior measurements were 9.5 and 9.8 $\mu\text{R/h}$, both within background. The interior measurements at 61 West Hunter Avenue were 9.1 and 10.3 $\mu\text{R/h}$, including background. Interior gamma exposure rate measurements at the 205 Maywood Avenue parcel were 7.4 and 8.6 $\mu\text{R/h}$, all within background. None of the interior measurements on these three Myron properties exceeded the DOE guideline of 20 $\mu\text{R/h}$ above background for habitable structures. The measurements also fall within the range for background gamma radiation for the Maywood site, which is 8 to 12 $\mu\text{R/h}$.

A total of 14 exterior gamma radiation measurements were made on these 3 properties: 3 at 50 West Hunter Avenue, 2 at 61 West Hunter Avenue, and 9 at 205 Maywood Avenue. The exterior measurements ranged from 7.1 to 12.5 $\mu\text{R/h}$ and were within background. These measurements were within the range for background gamma radiation at the Maywood site. Figure 4-44 shows the locations and the data for the gamma exposure rate measurements. Exterior gamma exposure rate measurements recorded during remedial investigation activities at this property ranged from 5 to 13 $\mu\text{R/h}$ (background has not been subtracted) (BNI 1992a). These measurements are comparable to the exterior measurements recorded during this investigation and do not indicate a significant change in conditions at this property.

A total of 45 activated charcoal canisters were deployed at the Myron properties: 6 at 50 West Hunter Avenue, 5 at 61 West Hunter Avenue, and 34 at 205 Maywood Avenue. The locations of the canisters are shown in Figures 4-45 through 4-48, and the data are presented in Table 4-18. Radon concentrations ranged from less than 0.2 pCi/L to 0.5 pCi/L, all within background. Background for the Maywood area is 1.0 pCi/L. The DOE guideline for radon is 3.0 pCi/L above background. None of the measurements exceeded the DOE guideline. The radon concentrations measured were also within the EPA and NJDEP action level of 4.0 pCi/L, including background. At that level, EPA and NJDEP

recommend that the property owner be notified and the need for retesting be evaluated on a case-by-case basis.

Although no radioactive contamination is known to be present beneath the building (BNI 1992a), 3 of the 56 canisters were analyzed for thoron. The concentrations of thoron ranged from less than 0.6 to less than 0.7 pCi/L, all within background.

There is no imminent health risk to employees at any of the three Myron properties as a result of exposure to gamma radiation, radon, or thoron.

4.2 GOVERNMENTAL PROPERTIES

4.2.1 New Jersey Vehicle Inspection Station

The New Jersey Vehicle Inspection Station is a large, rectangular property bordered by Hancock Street on the northeast and Gregg Street on the east in the Borough of Lodi. Columbia Lane parallels the property and intersects Hancock and Gregg Streets at either end of the property. Most of the property is covered with asphalt pavement. There is a one-story cinder block/brick veneer building on the property that houses offices for inspection station personnel and personnel employed by the licensing agency. The western side of the property and building is used for vehicle inspection by approximately 10-15 employees, most of whom work outdoors in the inspection bay. The remainder of the property and the eastern-northeastern portion of the building are occupied by the licensing agency and driver testing facilities (both indoor and outdoor). Approximately 15-25 people are employed by the licensing agency. The facility operates on a 5-day, 8-h work schedule. Primary access to the building is through the licensing area on the northern side of the property. During a typical day's activity, several hundred people are present on the property both indoors in the licensing area and outdoors participating in vehicle inspections and driver testing.

An interior gamma exposure rate measurement of 8.7 μ R/h, within background, was obtained in the large open clerical area of the licensing agency offices. Seven exterior measurements ranged from 7.3 to 13 μ R/h, including background. The interior measurement

does not exceed the DOE guideline of $20 \mu\text{R/h}$ above background for habitable structures. Figure 4-49 shows the locations of the interior and exterior measurements and provides the data for each location. The data from these measurements were compared with gamma radiation measurements recorded during the 1986 radiological characterization activities (BNI 1987a). Eight exterior measurements were recorded and ranged from 4 to $5 \mu\text{R/h}$ (background has not been subtracted). These measurements are within the range of exterior measurements recorded during this investigation and show no significant changes in conditions at this property.

Six 7.6-cm (3-in.) activated charcoal canisters were deployed on the property to obtain measurements of indoor radon. Figure 4-50 shows the location of each of these canisters, and the analytical data for each canister are presented in Table 4-19. Analytical results show that radon concentrations in the building ranged from less than 0.3 pCi/L to 0.6 pCi/L , all within background. These concentrations are well below background (1.0 pCi/L) for the Maywood site.

Because radioactively contaminated soil is not suspected to be present beneath the building, the canisters were not analyzed for thoron.

4.2.2 Fire Station No. 2

The recently remodeled fire station building, located at the corner of Kennedy Drive and Brook Street, houses the equipment used by the volunteer firefighters of Lodi Hose Company No. 2. The original one-story structure has undergone extensive remodeling that included a two-story engine bay addition. This addition also contains a sleeping loft and equipment storage room and is attached to the original structure, which has been expanded to include a full-size kitchen, men's and women's restrooms, weight room, and social hall. The facility is not occupied on a full-time basis.

Three interior and five exterior gamma exposure rate measurements were made at the fire station property. Figure 4-51 shows the locations of these measurements. The interior measurements ranged from 9.9 to $10.5 \mu\text{R/h}$ and were within background. The locations of the highest interior measurements, $10.5 \mu\text{R/h}$, were the women's restroom and the equipment

storage room at the rear of the engine bay addition; these are both in areas of the building that lie above radioactively contaminated soils. These soils were probably contaminated by overbank deposition of Lodi Brook during flooding because the stream channel once flowed across this property. Exterior gamma exposure rate measurements ranged from 7.3 to 9.2 $\mu\text{R}/\text{h}$ (within background). The highest measurements were recorded near the Kennedy Drive entrance to the building and in a parking area on the eastern side of the building. Both of these locations, although covered by asphalt pavement or grass, are areas of known radioactive contamination. Five exterior gamma exposure rate measurements were recorded during radiological characterization of this property in 1987 (BNI 1989h). These measurements ranged from 7 to 11 $\mu\text{R}/\text{h}$, all within background. Comparing these measurements with those recorded during this investigation indicates that there have been no significant changes in conditions at this property.

Six activated charcoal canisters were deployed at the fire station property to measure radon. Figure 4-52 shows the locations of these canisters, and the analytical data are presented in Table 4-20. Radon concentrations ranged from less than 0.4 pCi/L to 0.8 pCi/L, all within background; background for the site is 1.0 pCi/L. None of the canisters indicated radon concentrations in excess of natural background levels or in excess of the DOE guideline of 3.0 pCi/L above background.

Two of the six canisters deployed for radon measurements were analyzed for thoron. Analytical results from these two canisters were less than 0.9 pCi/L and less than 1.0 pCi/L, including background. The locations of the two canisters that were analyzed for thoron are also shown in Figure 4-52. The concentrations of thoron measured did not exceed the DOE guideline, which is the same as that used for radon, 3.0 pCi/L above background.

4.2.3 John F. Kennedy Park

Kennedy Park is bordered by Kennedy Drive, Money Street, and Sidney Street in Lodi. It is enclosed by chain-link fence, but access is not restricted to any areas of the park except for the building that contains the maintenance shop and park office. The park contains two baseball diamonds, dugouts, bleachers, and a basketball court. The park building is a single-story brick structure at the southeastern end of the property and is divided into two areas:

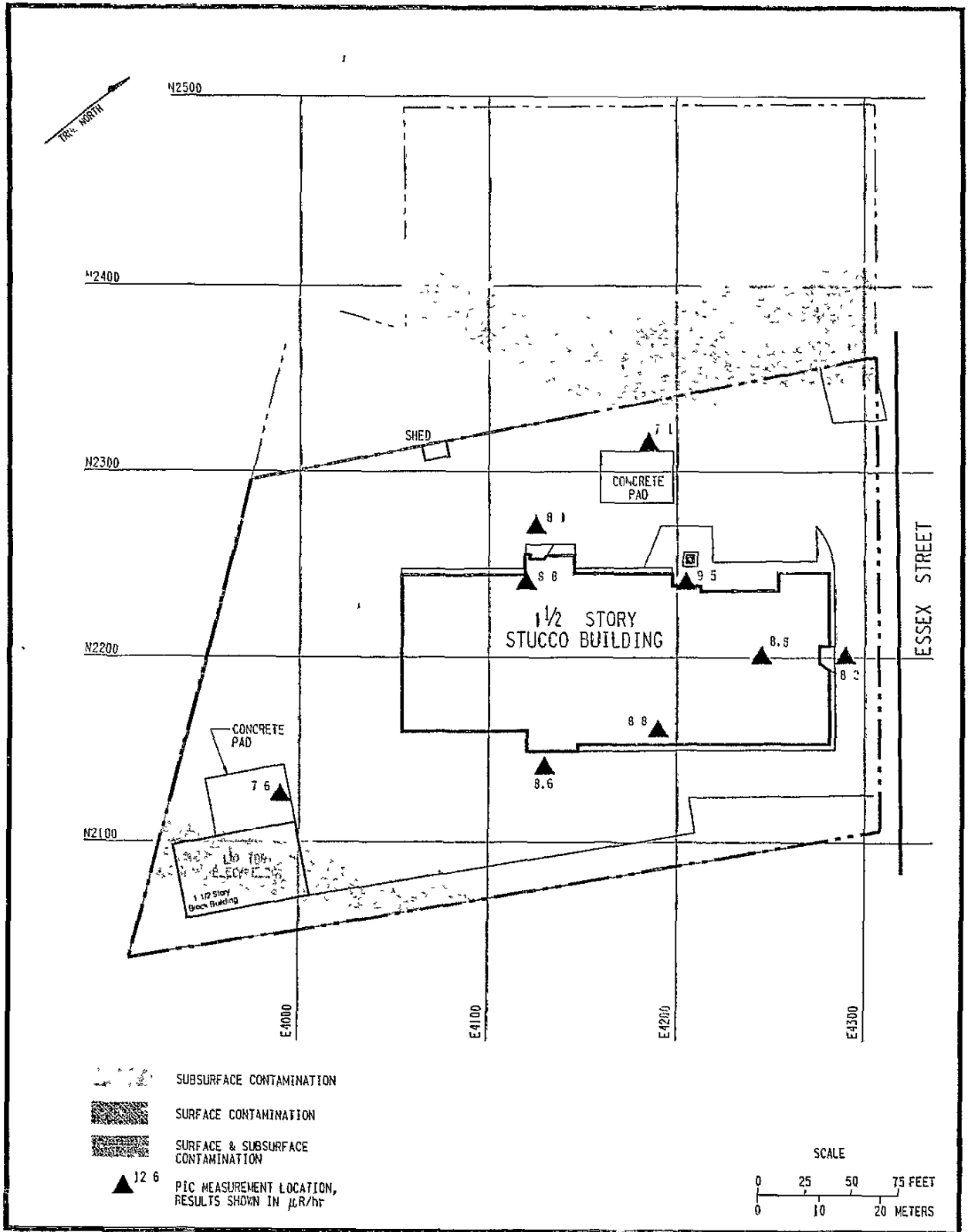
one is used for storage of maintenance equipment and supplies such as mowers, paint, fertilizers, and assorted tools, and the other is an office area. There are no full-time employees present in the building. During the investigation, "closed house" conditions were applied, and access to the building was limited to borough employees.

The two interior gamma exposure rate measurements made in the park building (see Figure 4-53) were 8.6 $\mu\text{R/h}$ in the maintenance area and 9.3 $\mu\text{R/h}$ in the office area. These measurements are within the range of background, which is 8 to 12 $\mu\text{R/h}$. No radioactive contamination is known to be present beneath the building. The seven exterior gamma exposure rate measurements ranged from 8.2 to 12.3 $\mu\text{R/h}$ and were within background. Radioactively contaminated soils are known to be present at the end of the park bordered by Money Street. These soils were identified during radiological characterization of the property in 1987 (BNI 1989g), and this area is suspected to be near the original channel of Lodi Brook before it was contained in conduit during development of the area. The measurement of 12.3 $\mu\text{R/h}$, including background, was obtained in this area. The interior gamma exposure rate measurements do not exceed the DOE guidelines of 20 $\mu\text{R/h}$ above background for habitable structures. Data from these measurements were compared with data recorded during the 1987 radiological characterization of this property (BNI 1989g). Exterior gamma radiation measurements in 1987 ranged from 5 to 22 $\mu\text{R/h}$ (background has not been subtracted). Comparison of the data from this investigation indicates no significant changes at this property.

Three activated charcoal canisters were placed in the park building to measure radon concentrations. The analytical results ranged from 0.6 to 1.1 pCi/L, within background. The locations of the canisters are shown in Figure 4-54, and the data are presented in Table 4-21. The concentrations of radon measured did not exceed the DOE guideline of 3.0 pCi/L above background and were within the EPA and NJDEP action level criteria of 4.0 pCi/L including background, which requires no immediate action to be taken.

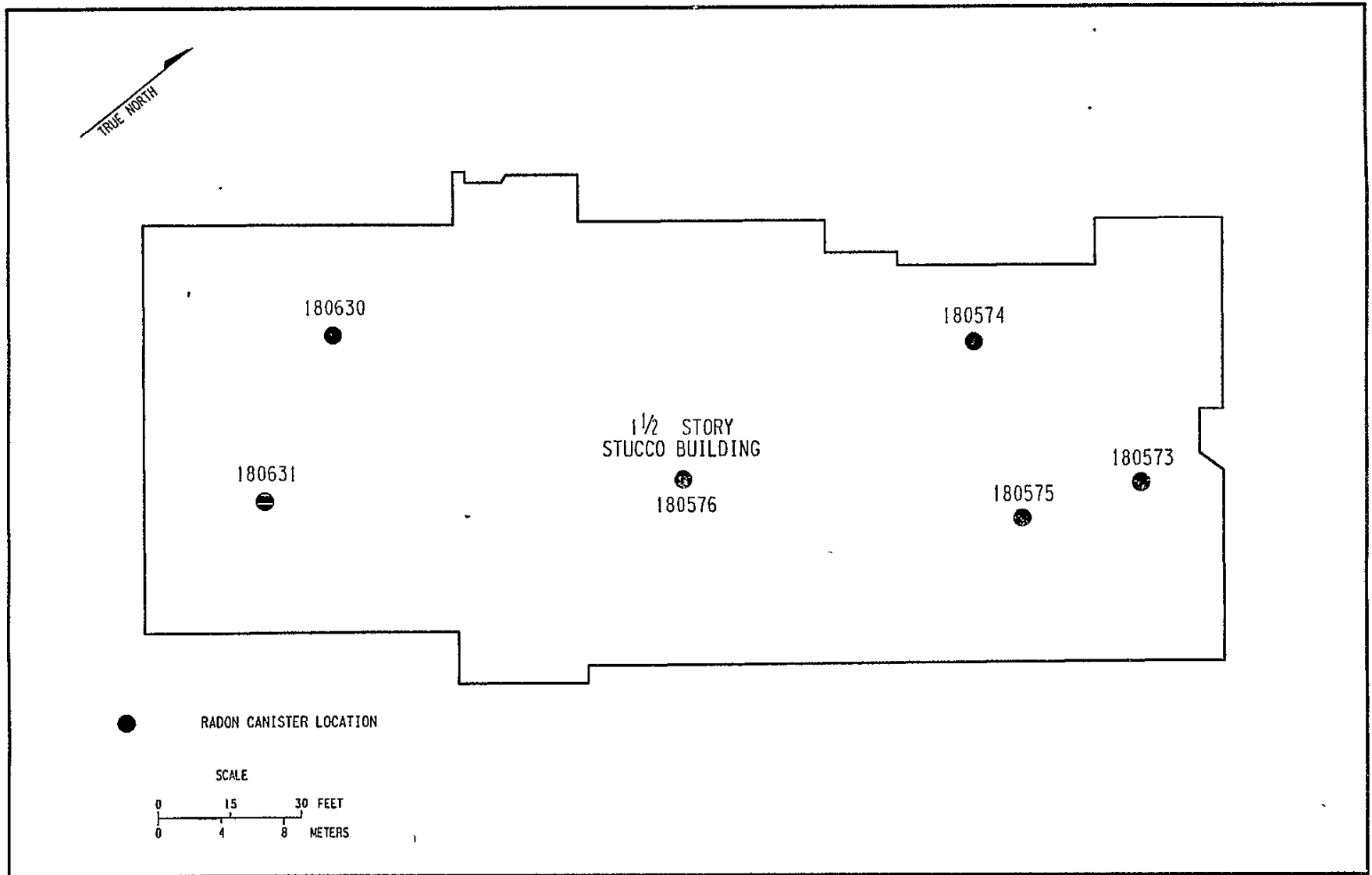
Previous characterization data for this property did not identify the presence of radioactive contamination beneath the building; therefore, no thoron analysis was performed.

FIGURES FOR SECTION 4.0



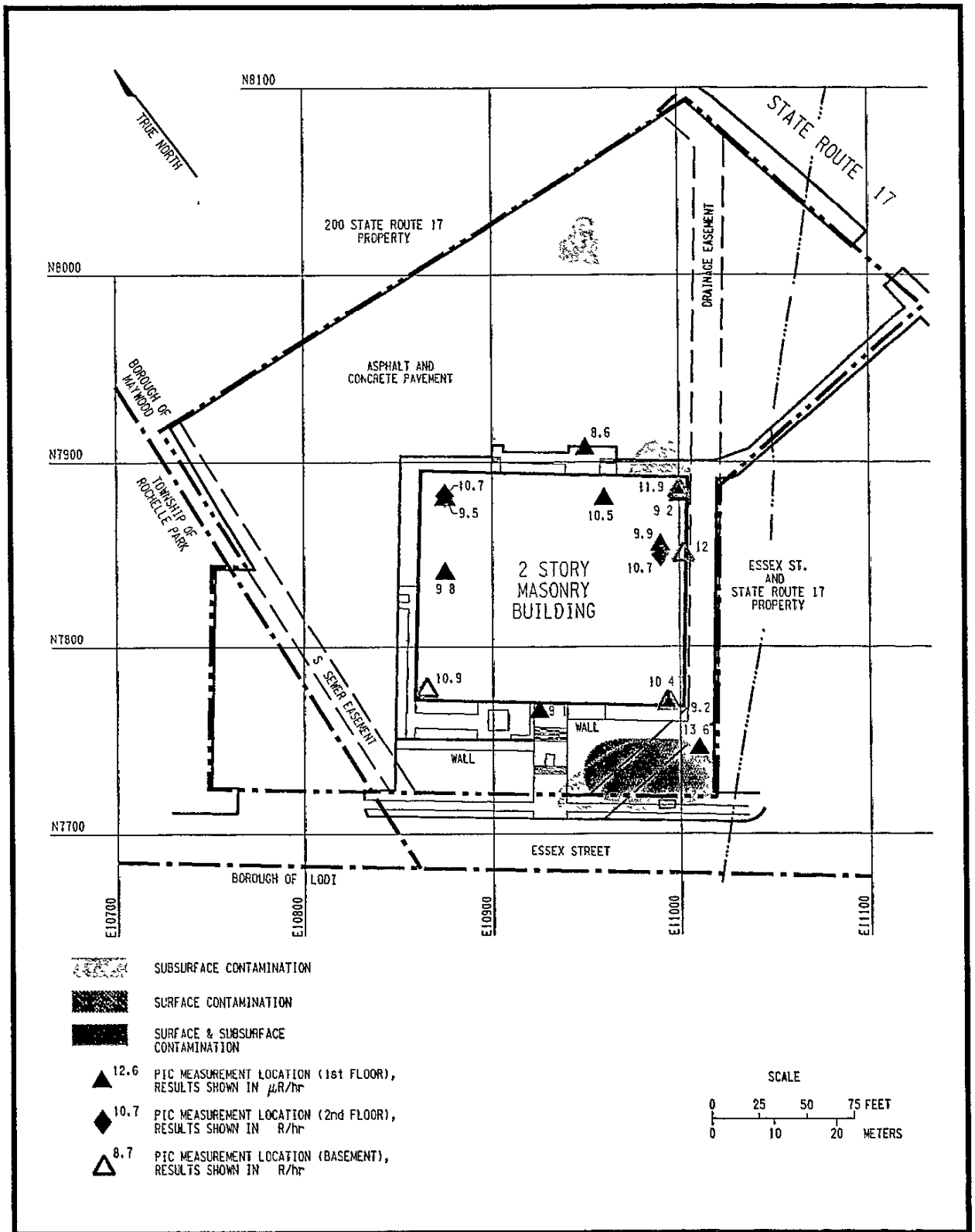
R43F004 DGN

Figure 4-1
PIC Measurement Locations and Areas of Contamination
at National Community Bank 160 and 174 Essex Street



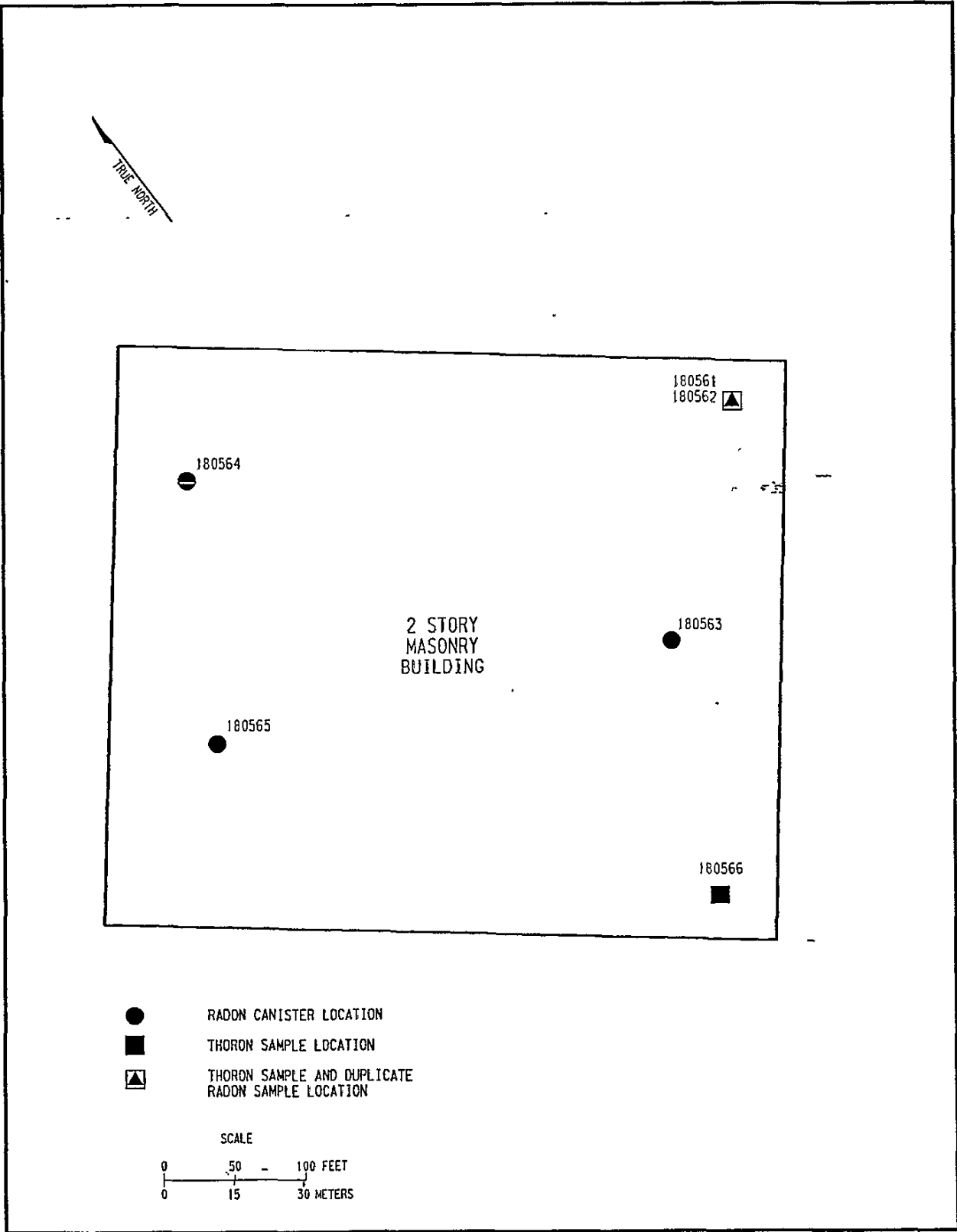
R43F064.DGN

Figure 4-2
Locations of Radon Canisters at
National Community Bank 160 and 174 Essex Street



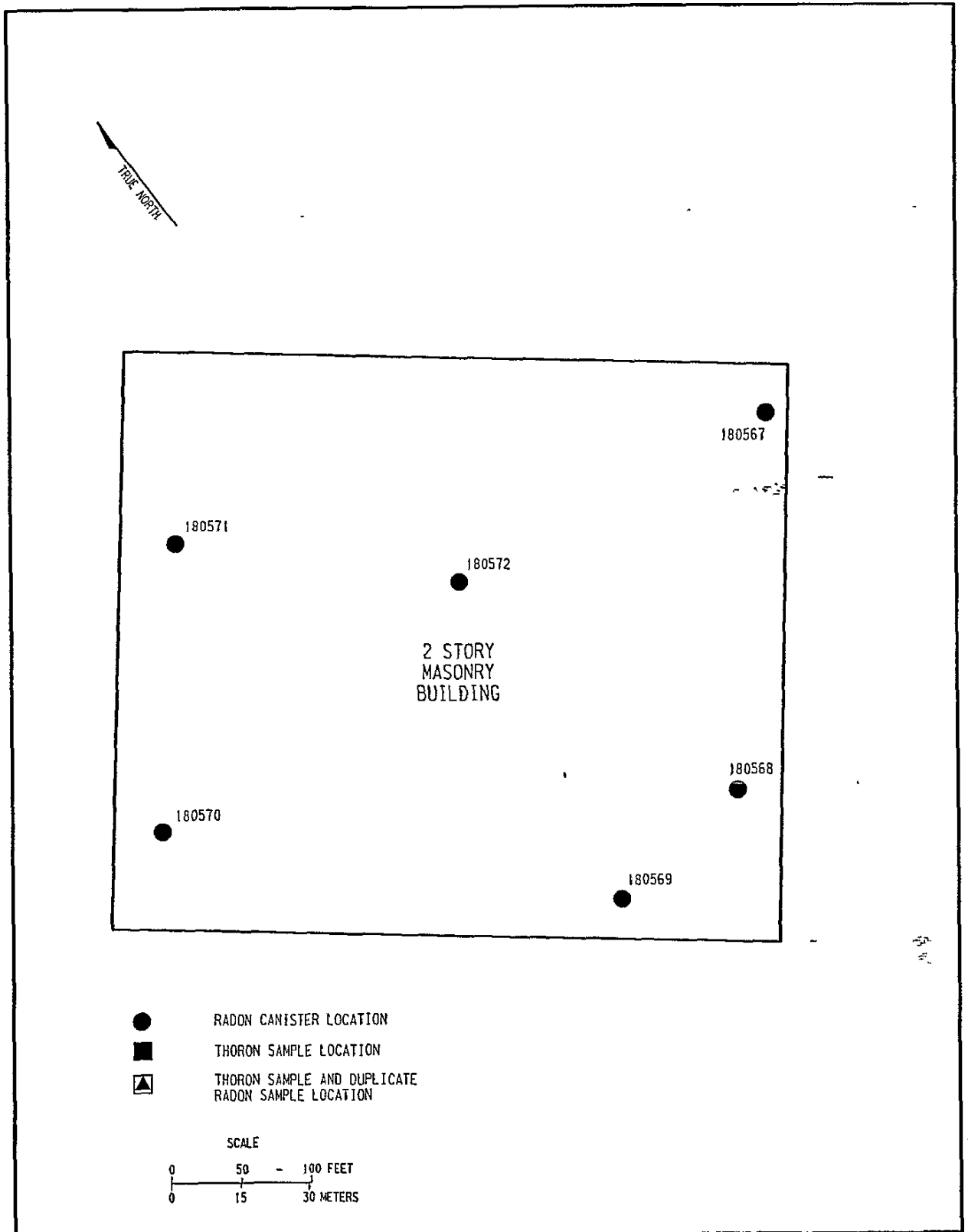
R43F014 DGN

Figure 4-3
PIC Measurement Locations and Areas of Contamination at
National Community Bank 113 Essex Street



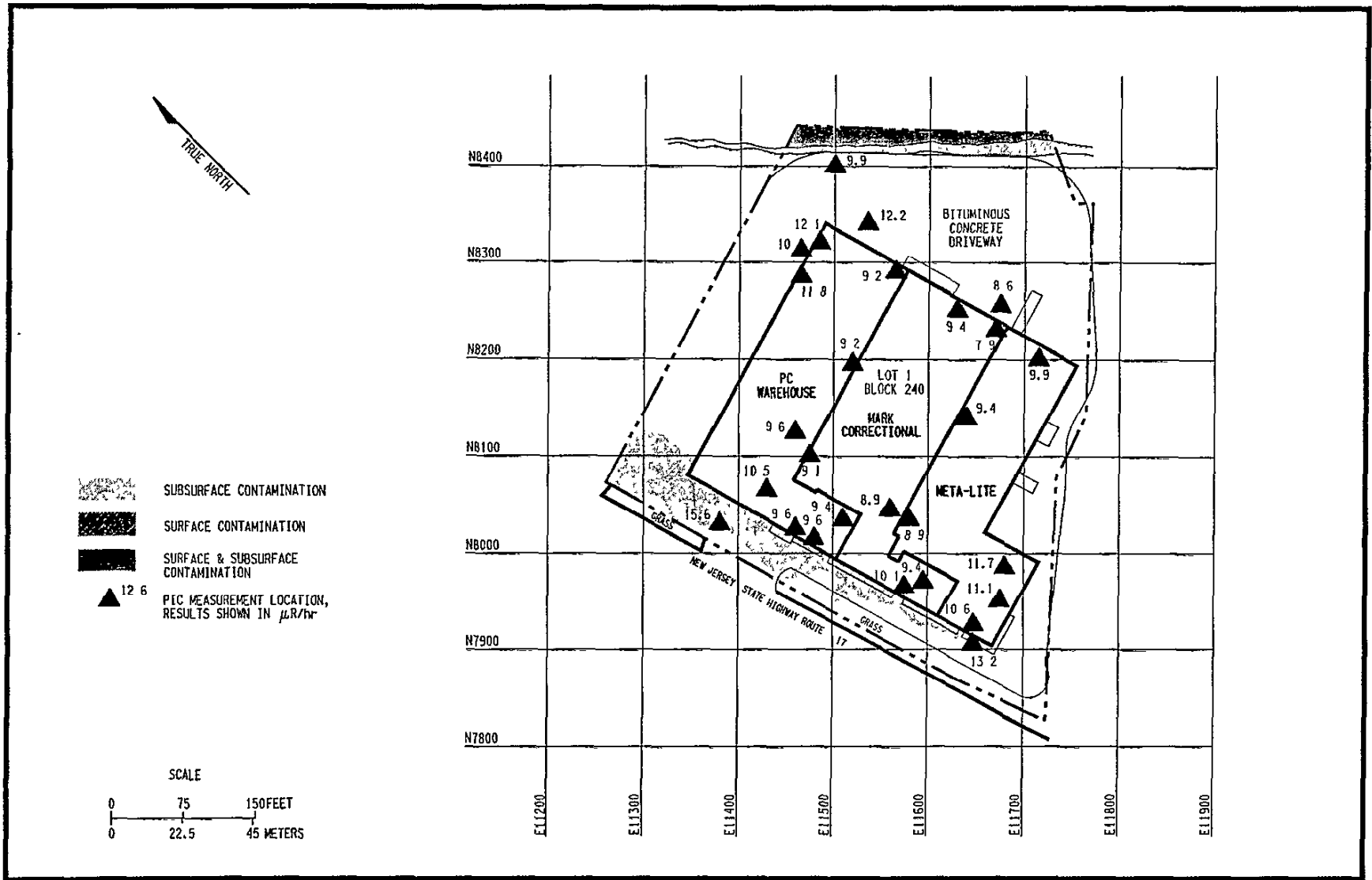
R43F074 DGN FL2

Figure 4-4
 Locations of Radon Canisters in the Basement
 at National Community Bank 113 Essex Street



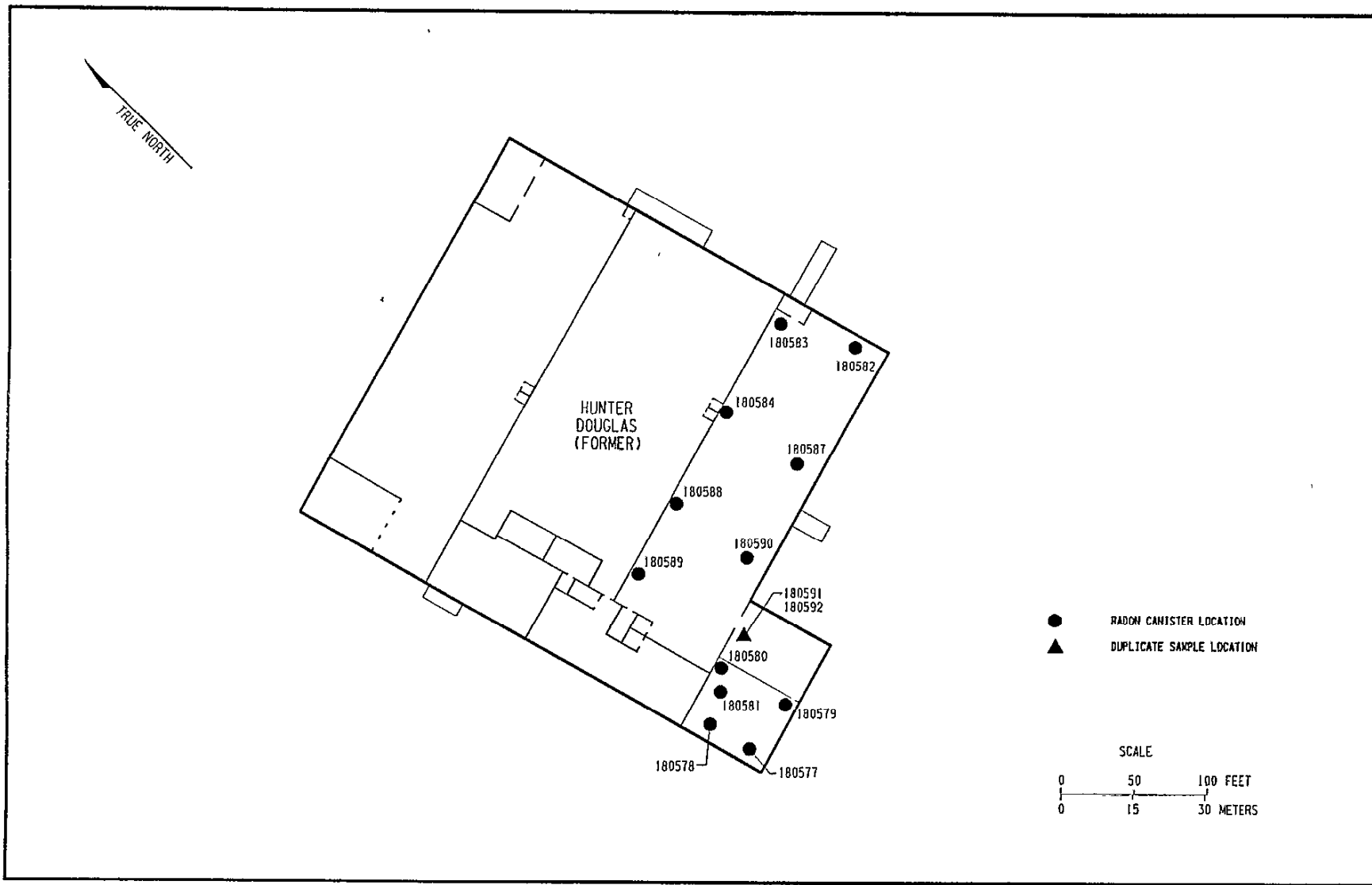
R43F074.DGN FL1

Figure 4-5
 Locations of Radon Canisters in the First Floor
 at National Community Bank 113 Essex Street



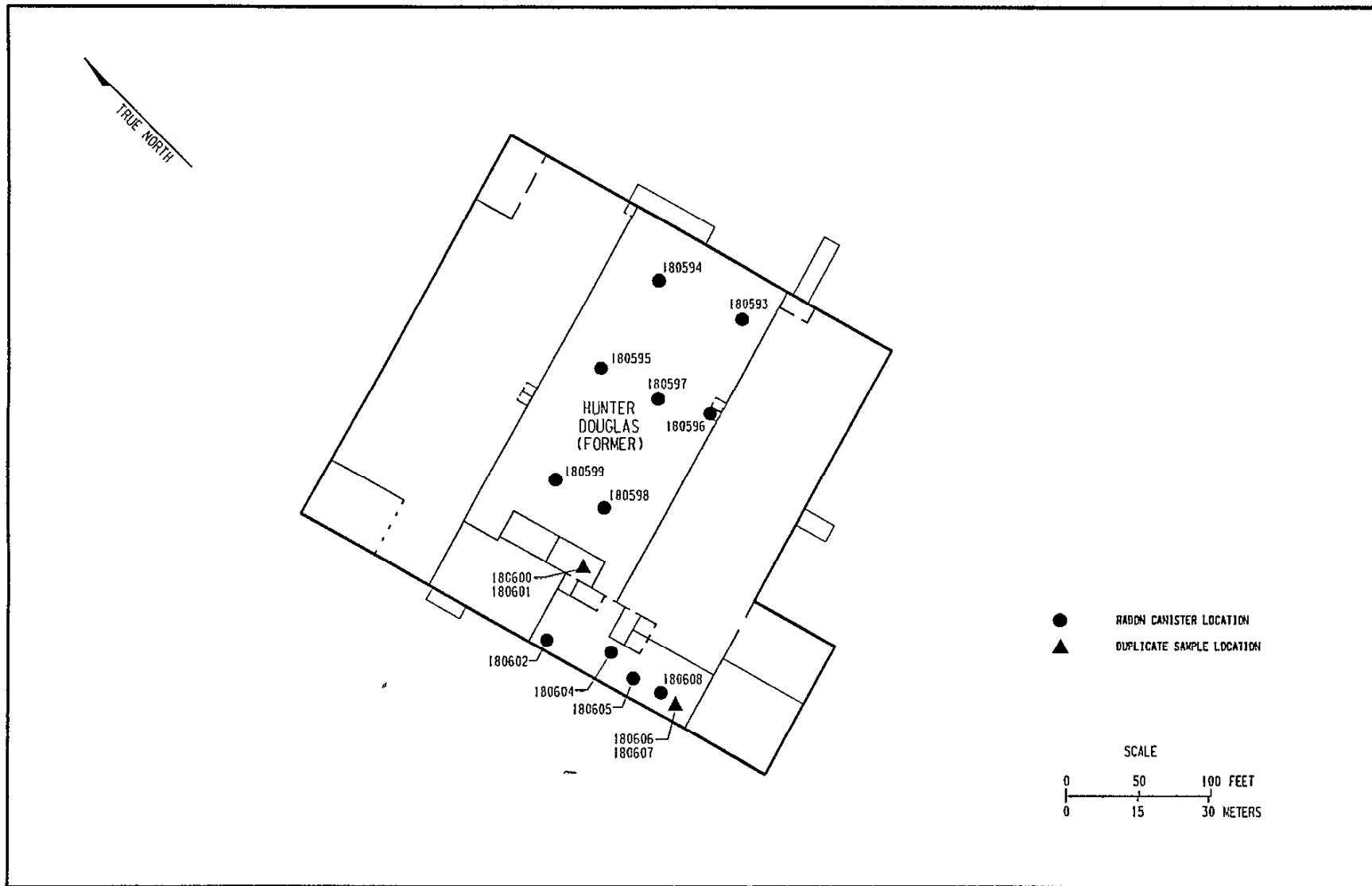
R43F005 D&N

Figure 4-6
 PIC Measurement Locations and Areas of Contamination at the
 Former Hunter Douglas Property 85-99 Route 17 North



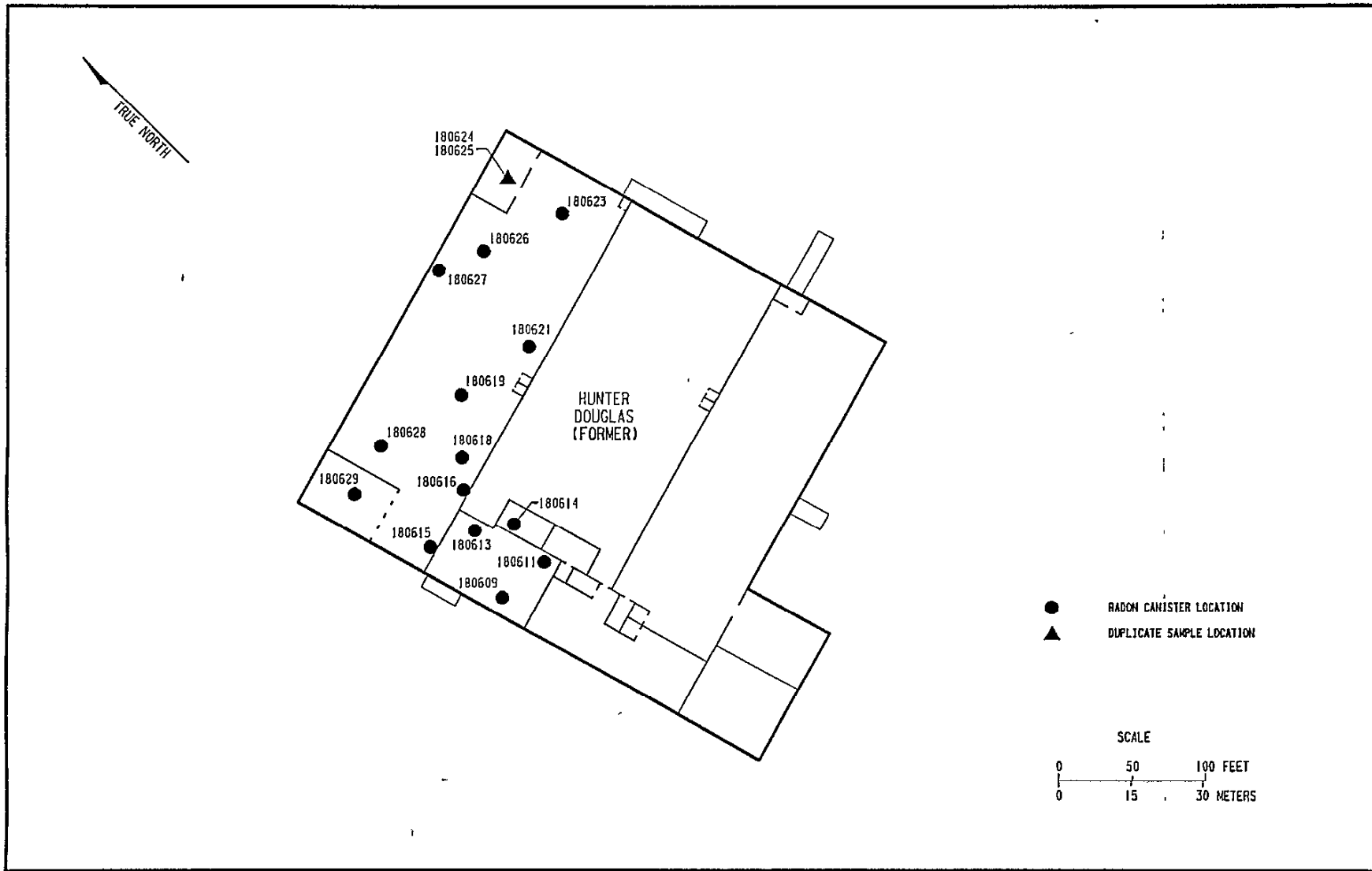
R43F065.DGN

Figure 4-7
Locations of Radon Canisters at Meta-Lite
(Portion of Former Hunter Douglas Property)
85-99 Route 17 North



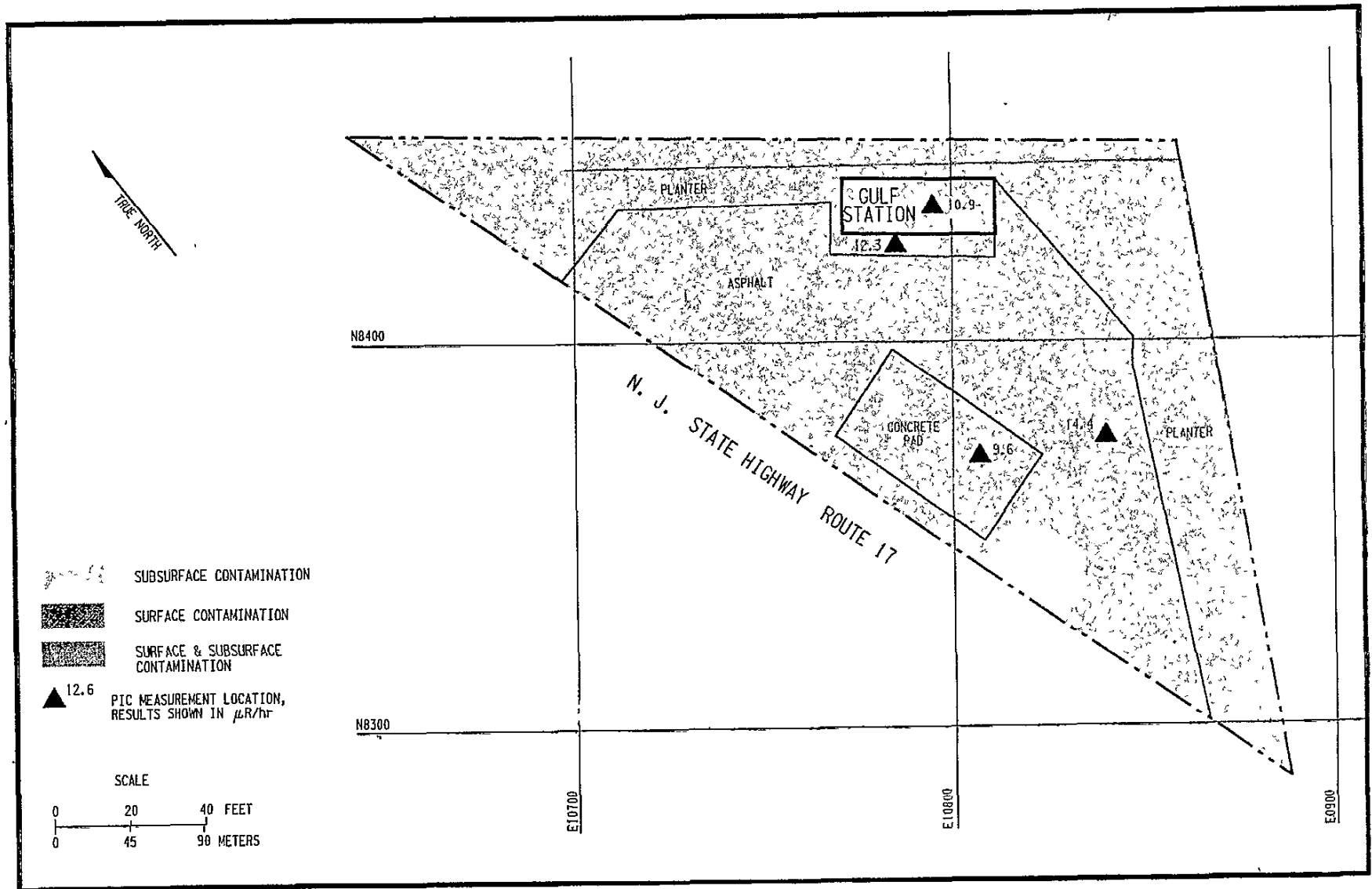
R43F092 DGH

Figure 4-8
Locations of Radon Canisters at Mark Correctional
(Portion of Former Hunter Douglas Property)
85-99 Route 17 North



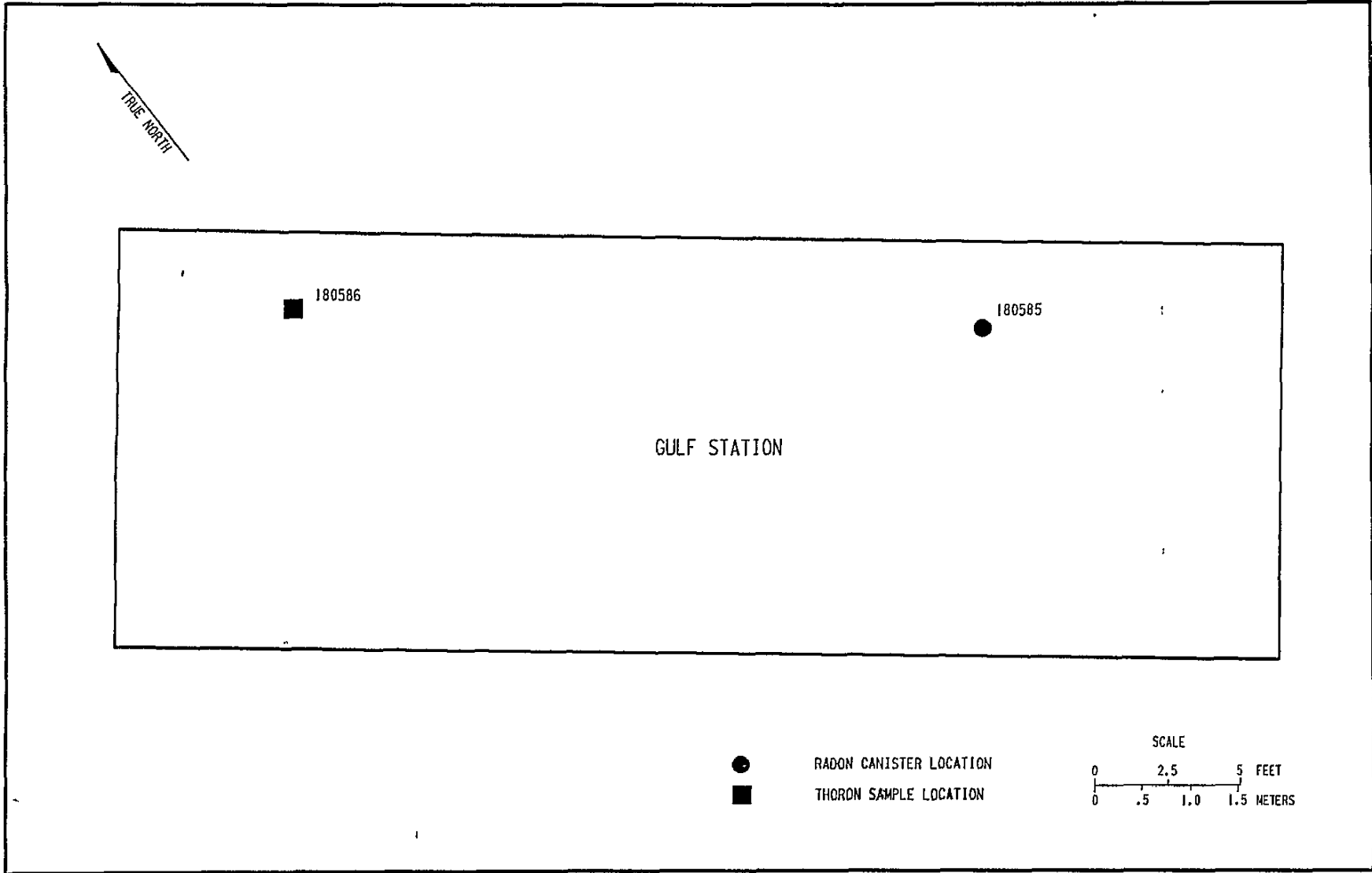
R43F093.DGN

Figure 4-9
Locations of Radon Canisters at PC Warehouse
(Portion of Former Hunter Douglas Property)
85-99 Route 17 North



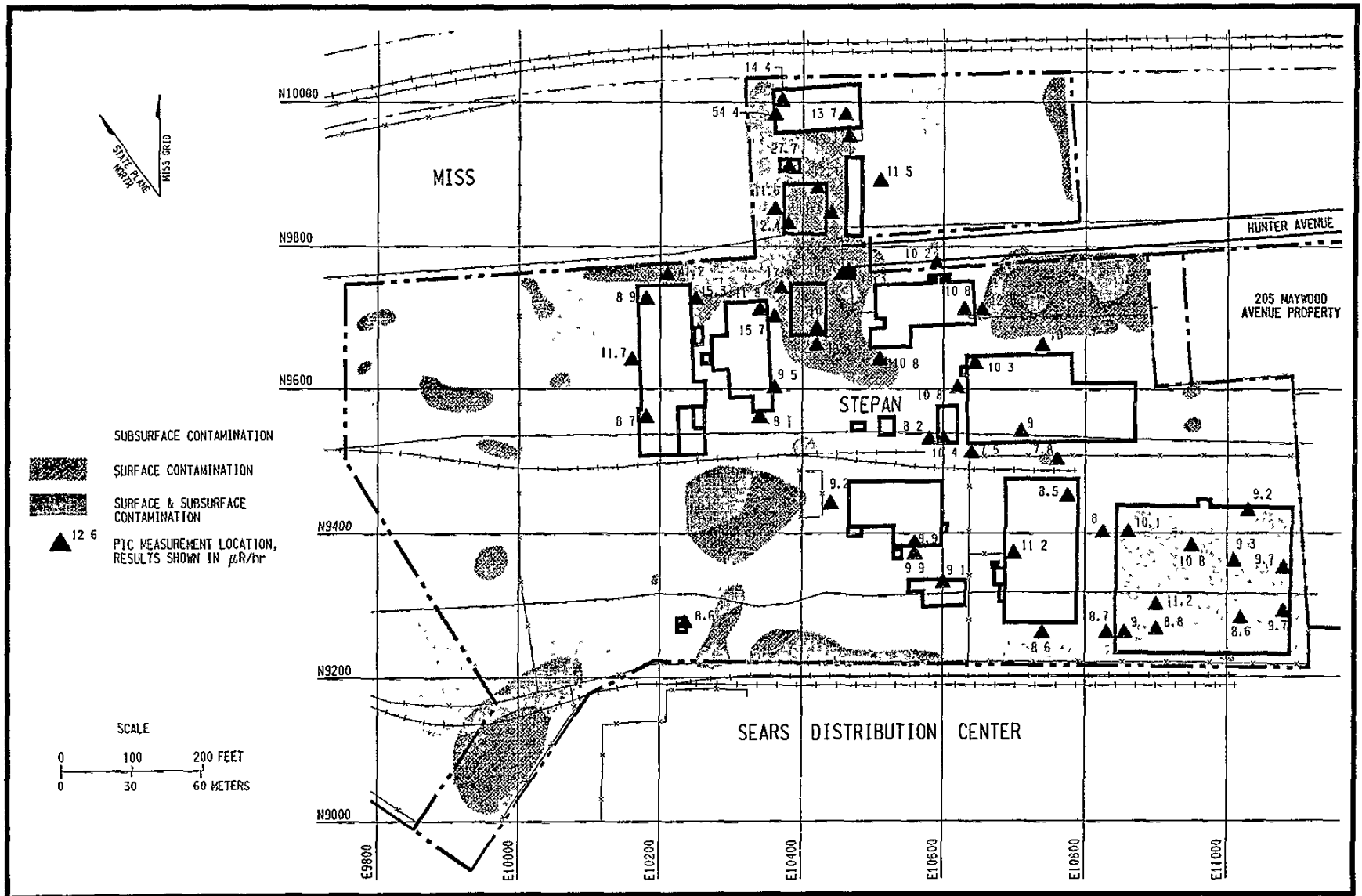
R43F002.DGN

Figure 4-10
 PIC Measurement Locations and Areas of Contamination
 at the Gulf Station Property 239 Route 17 North



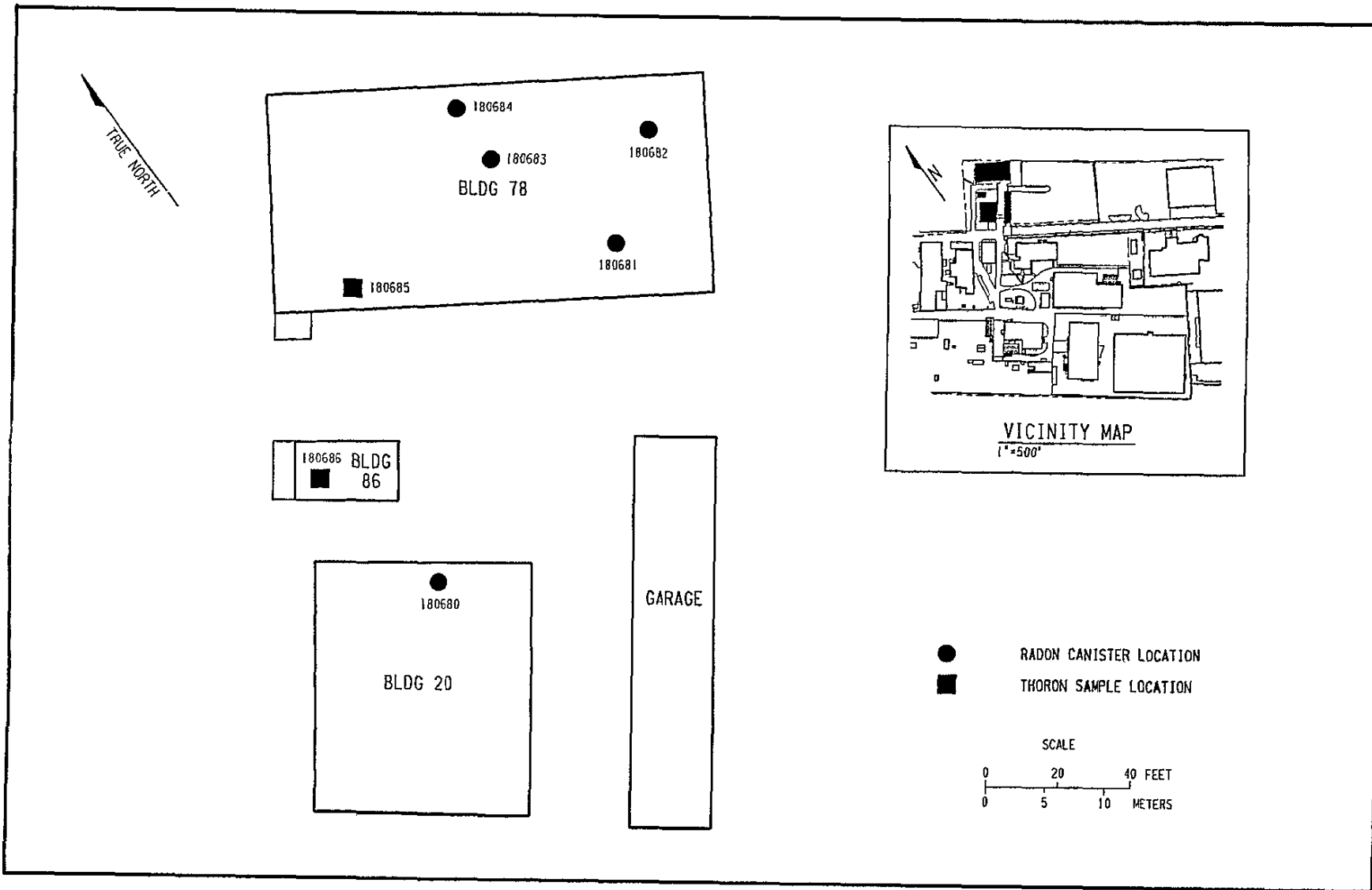
R43F062.DGN

Figure 4-11
Location of Radon Canister at the Gulf Station Property
239 Route 17 North



R43F016.DGN

Figure 4-12
PIC Measurement Locations and Areas of Contamination at the
Stepan Property 100 West Hunter Avenue



R43F083 DGN

Figure 4-13
Locations of Radon Canisters at Stepan Property
Buildings 78, 86, and 20
100 West Hunter Avenue

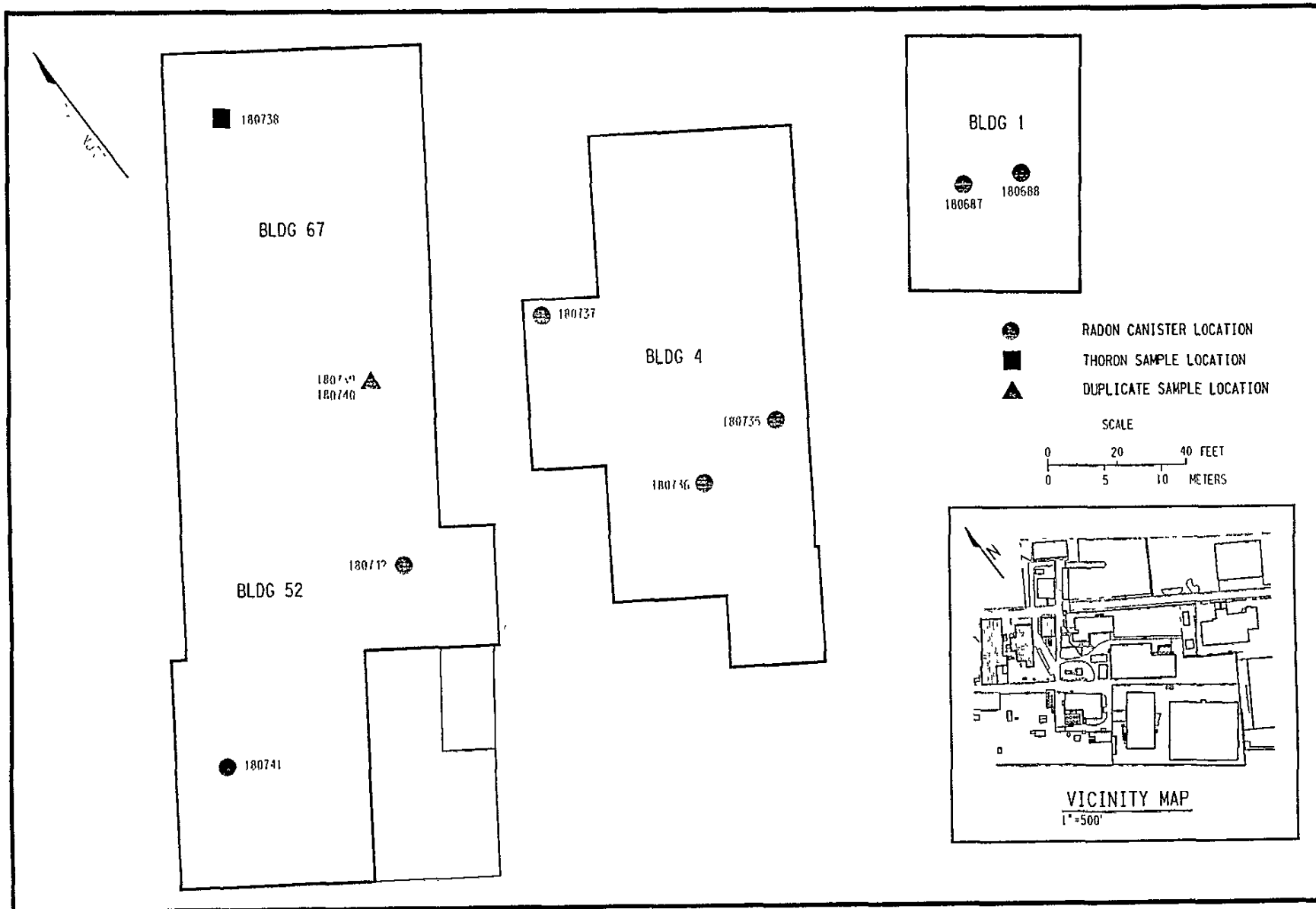


Figure 4-14
Locations of Radon Canisters at Stepan Property
Buildings 67, 52, 4, and 1
100 West Hunter Avenue

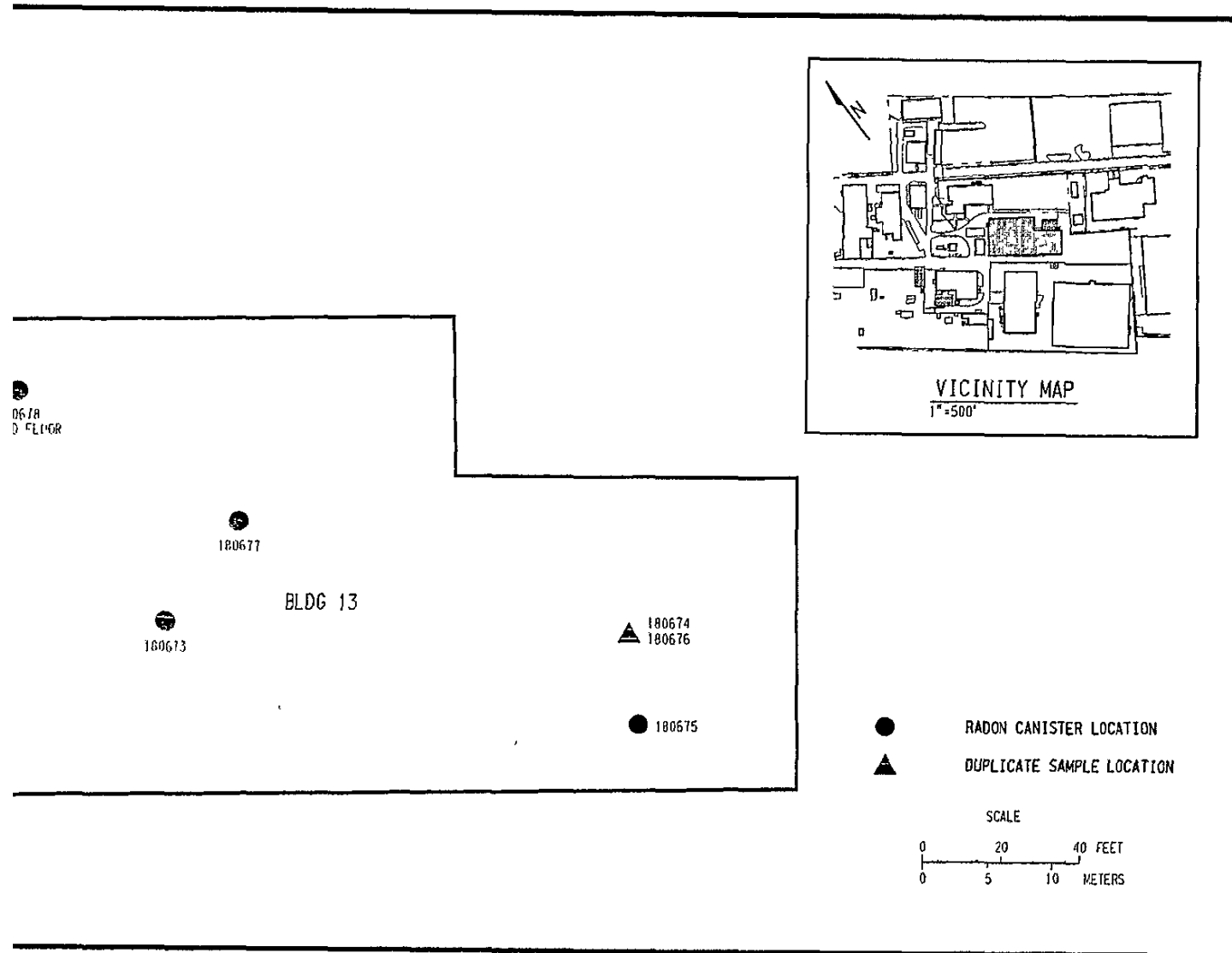
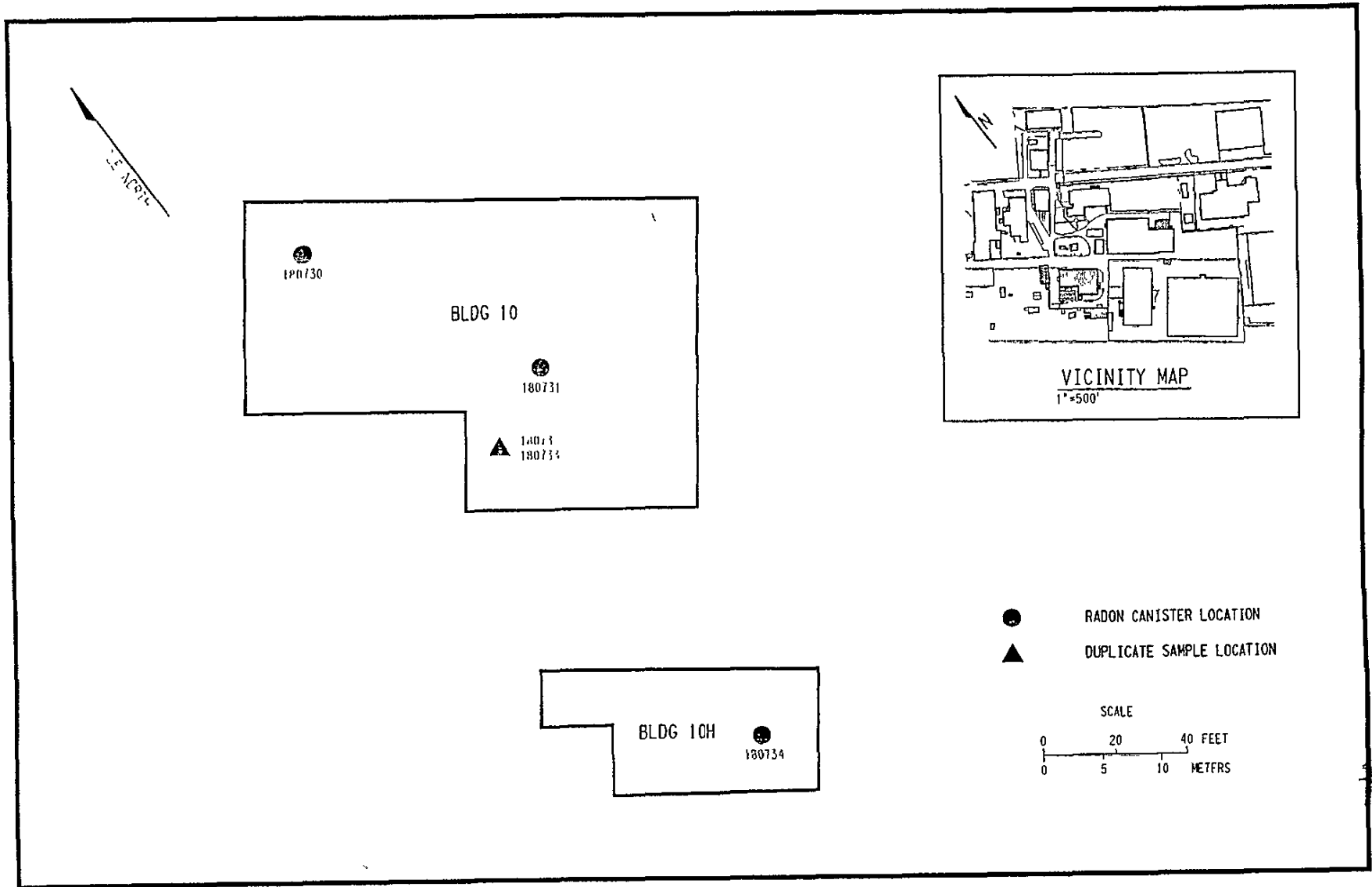
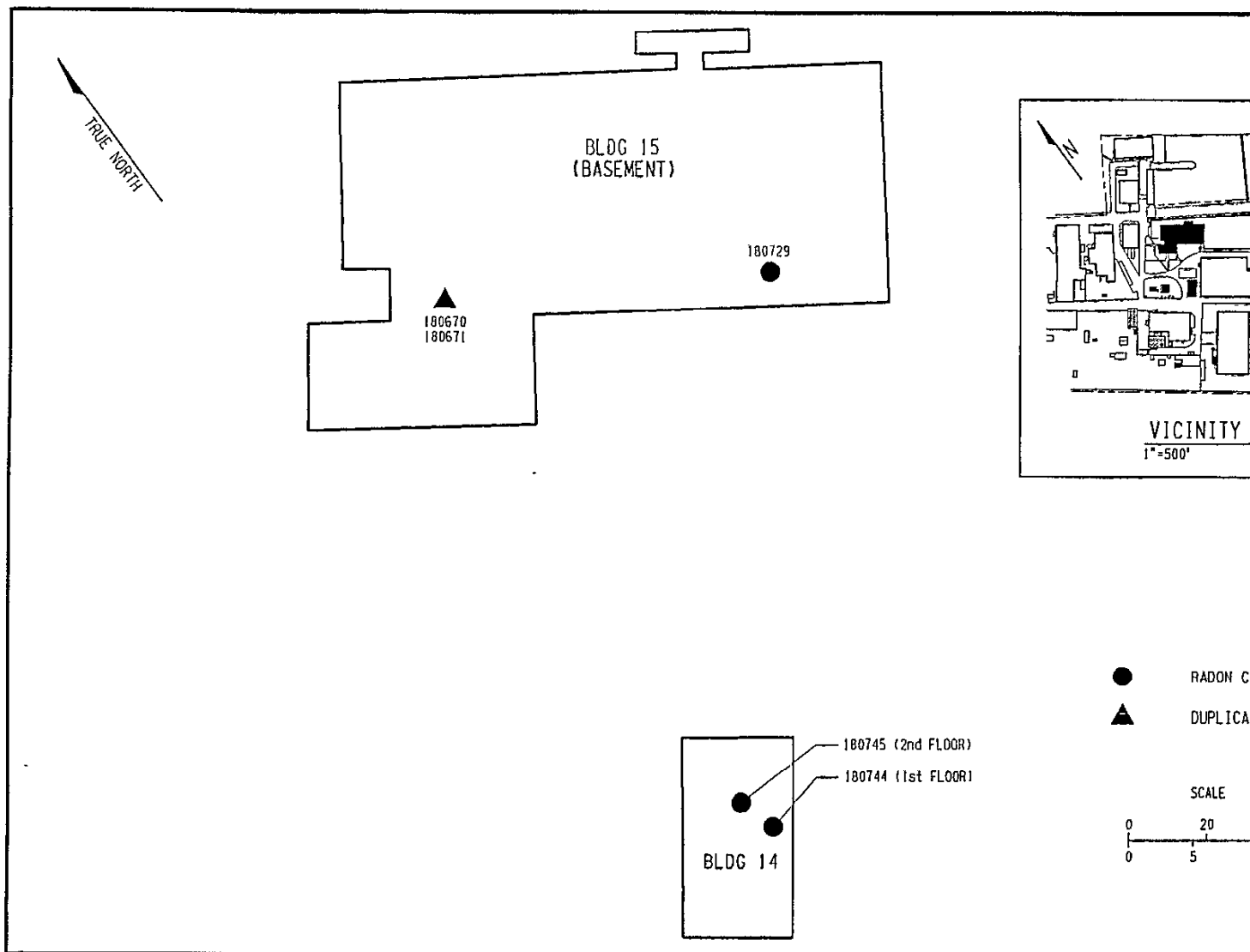


Figure 4-15
Locations of Radon Canisters at Stepan Property Building 13
100 West Hunter Avenue



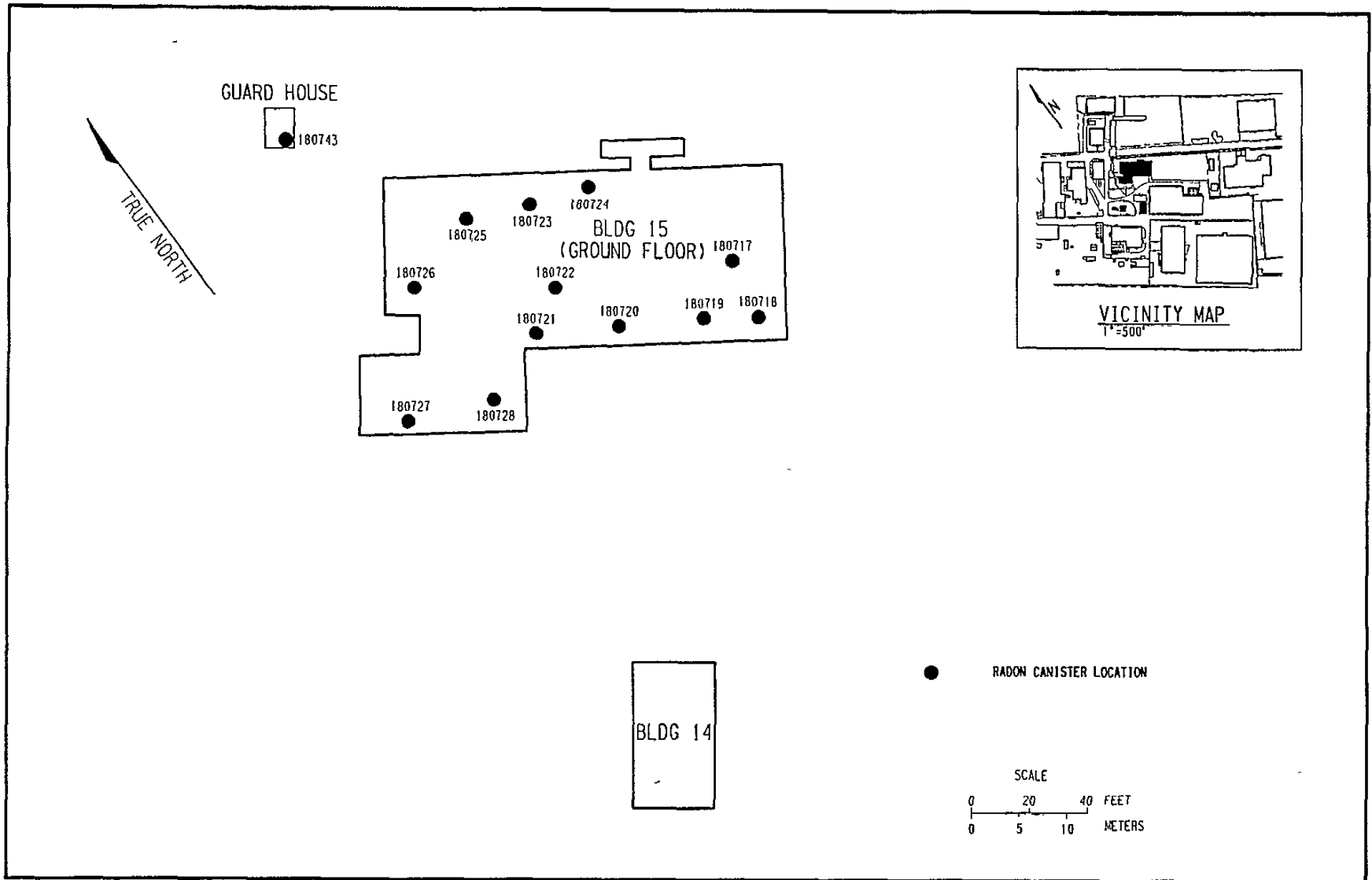
R. FORBEN

Figure 4-16
Locations of Canisters at Stepan Property
Buildings 10 and 10H
100 West Hunter Avenue



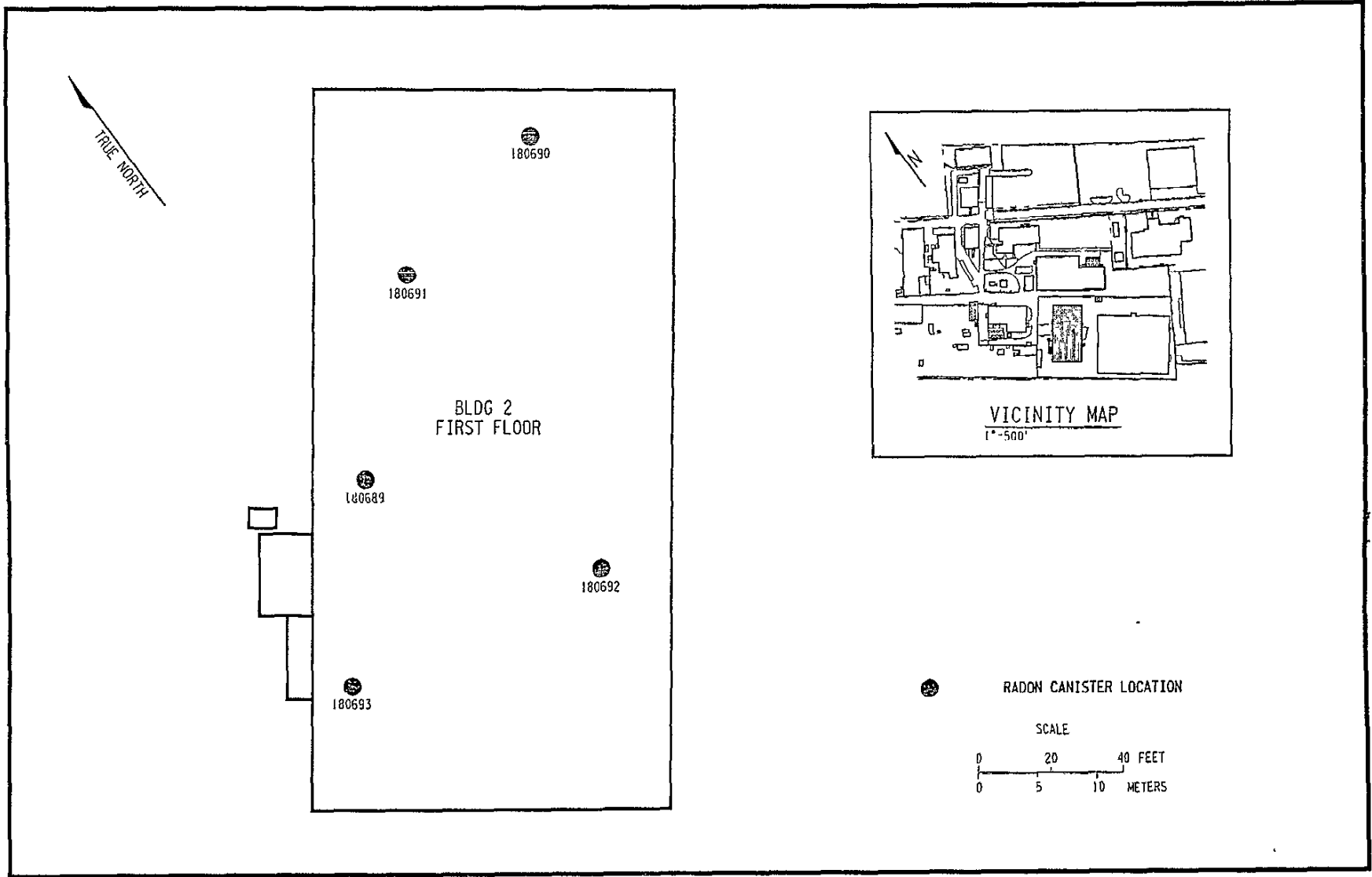
R43F085 DGN

Figure 4-17
Locations of Radon Canisters at Stepan Property
Buildings 15 (Basement) and 14
100 West Hunter Avenue



R43F094 DGN

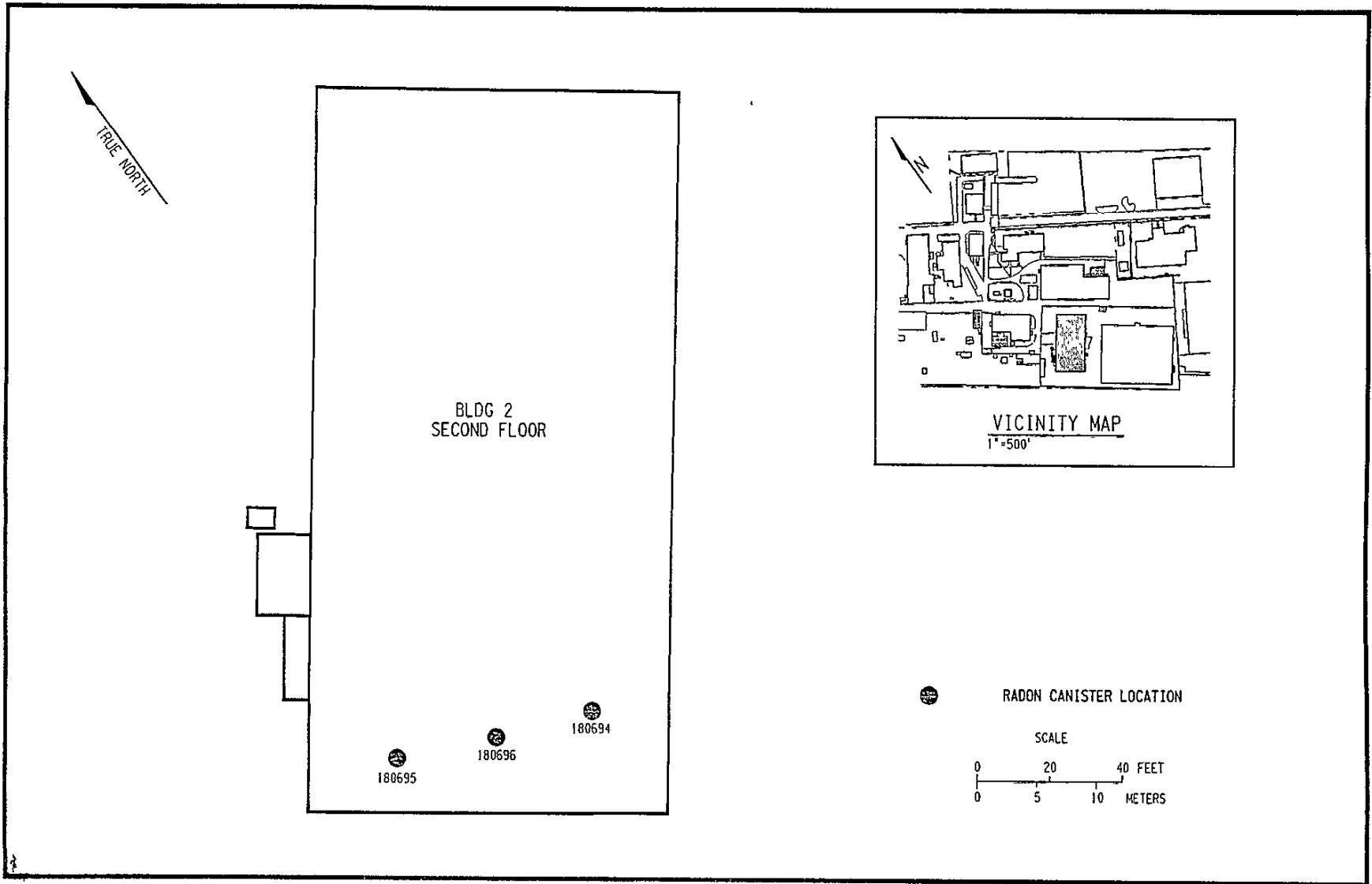
Figure 4-18
Locations of Radon Canisters at Stepan Property
Building 15 (Ground Floor)
100 West Hunter Avenue



R43F088.DGN

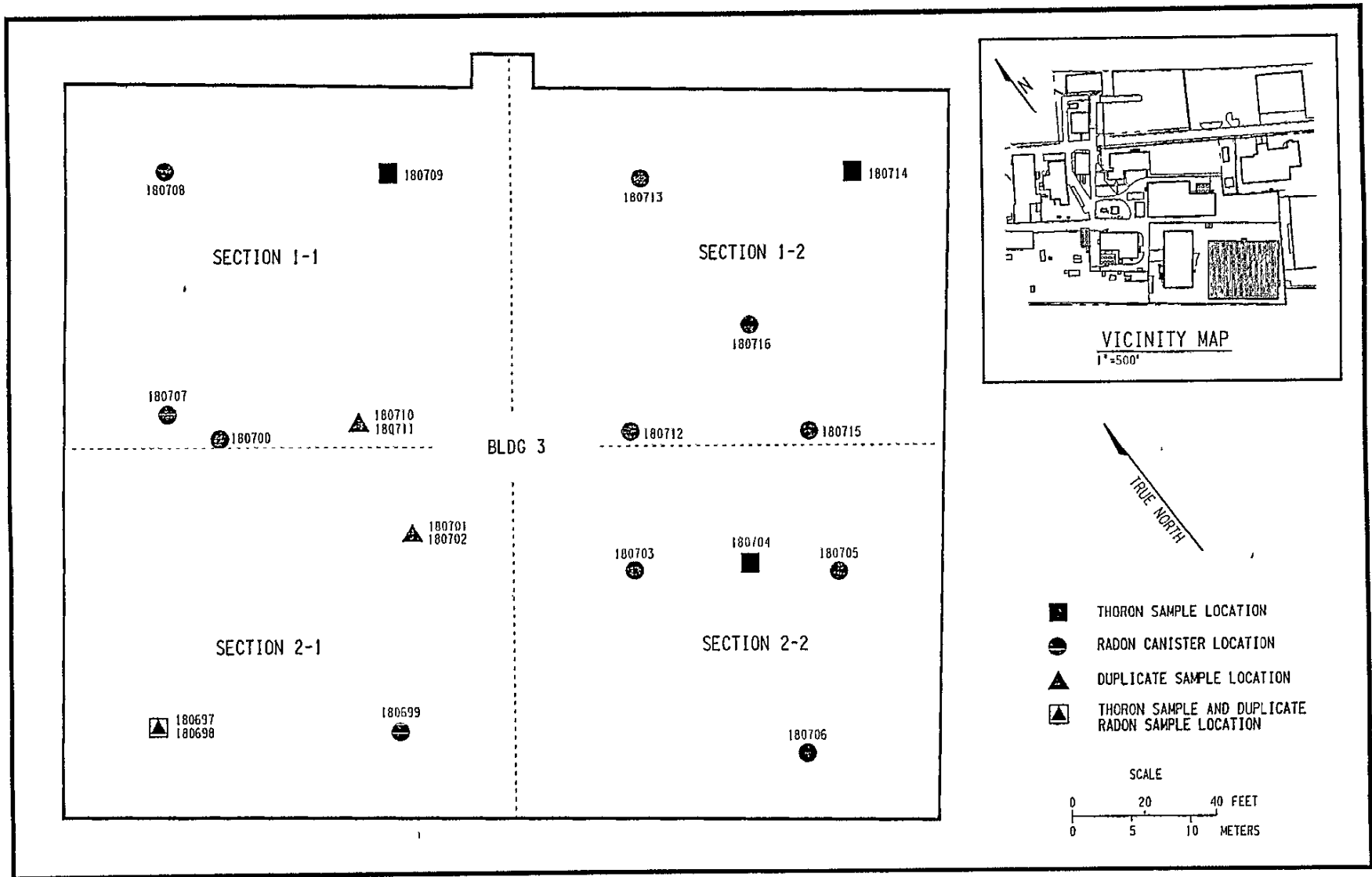
Figure 4-19
Locations of Radon Canisters at Stepan Property
Building 2 (First Floor)
100 West Hunter Avenue

70



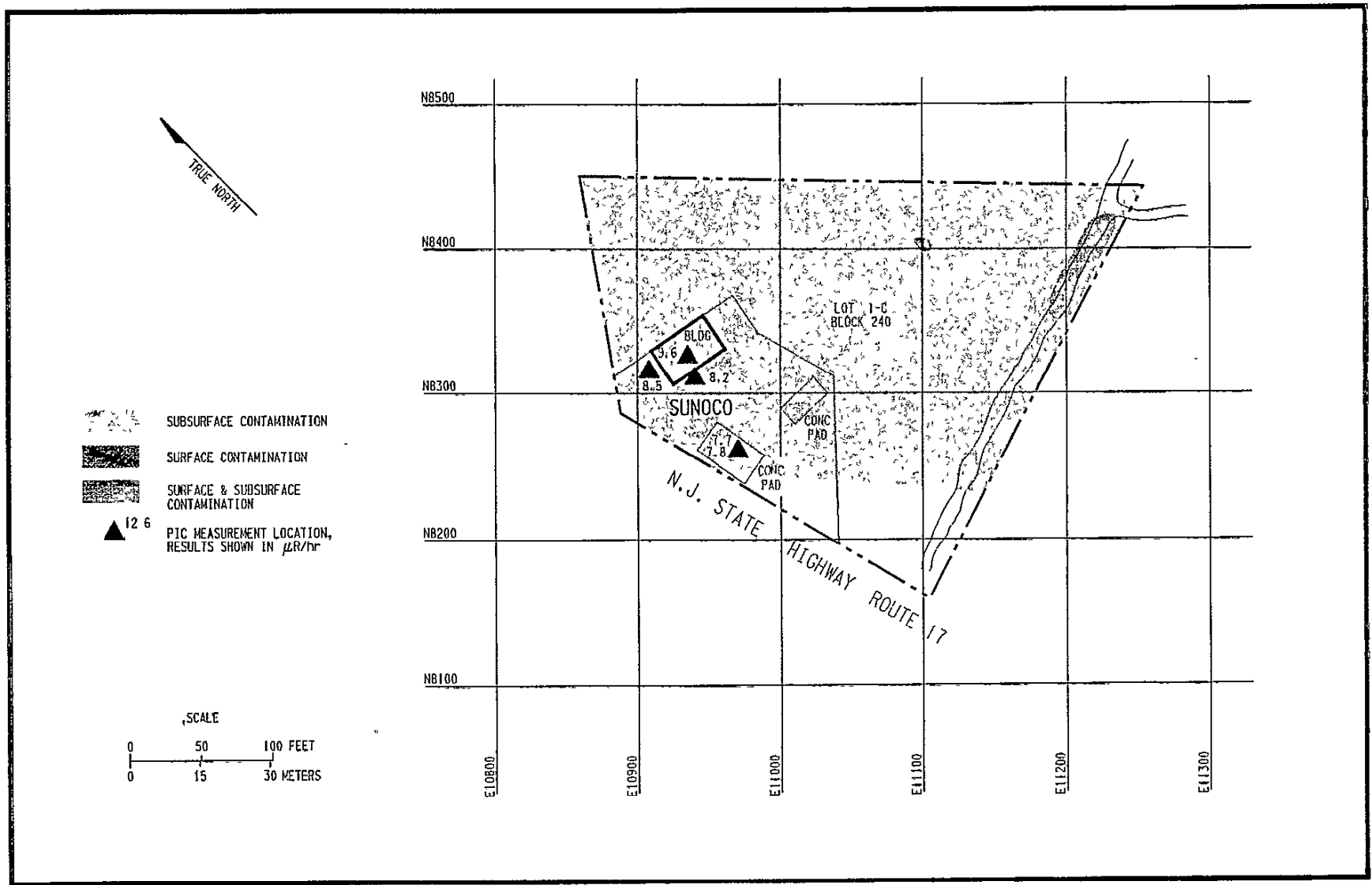
R43F095 DGN

Figure 4-20
Locations of Radon Canisters at Stepan Property
Building 2 (Second Floor)
100 West Hunter Avenue



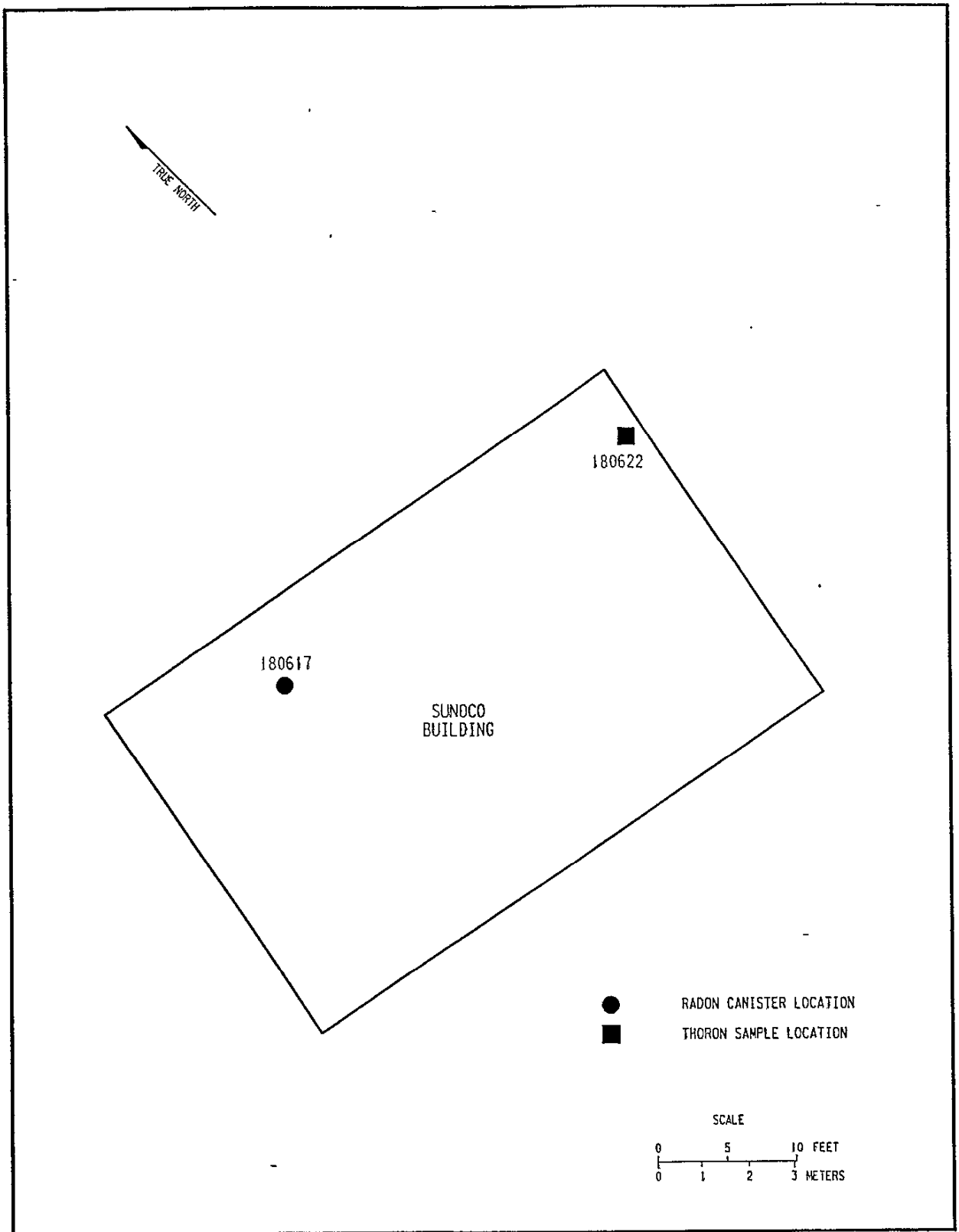
R43F089.DGN

Figure 4-21
Locations of Radon Canisters at Stepan Property
Building 3
100 West Hunter Avenue



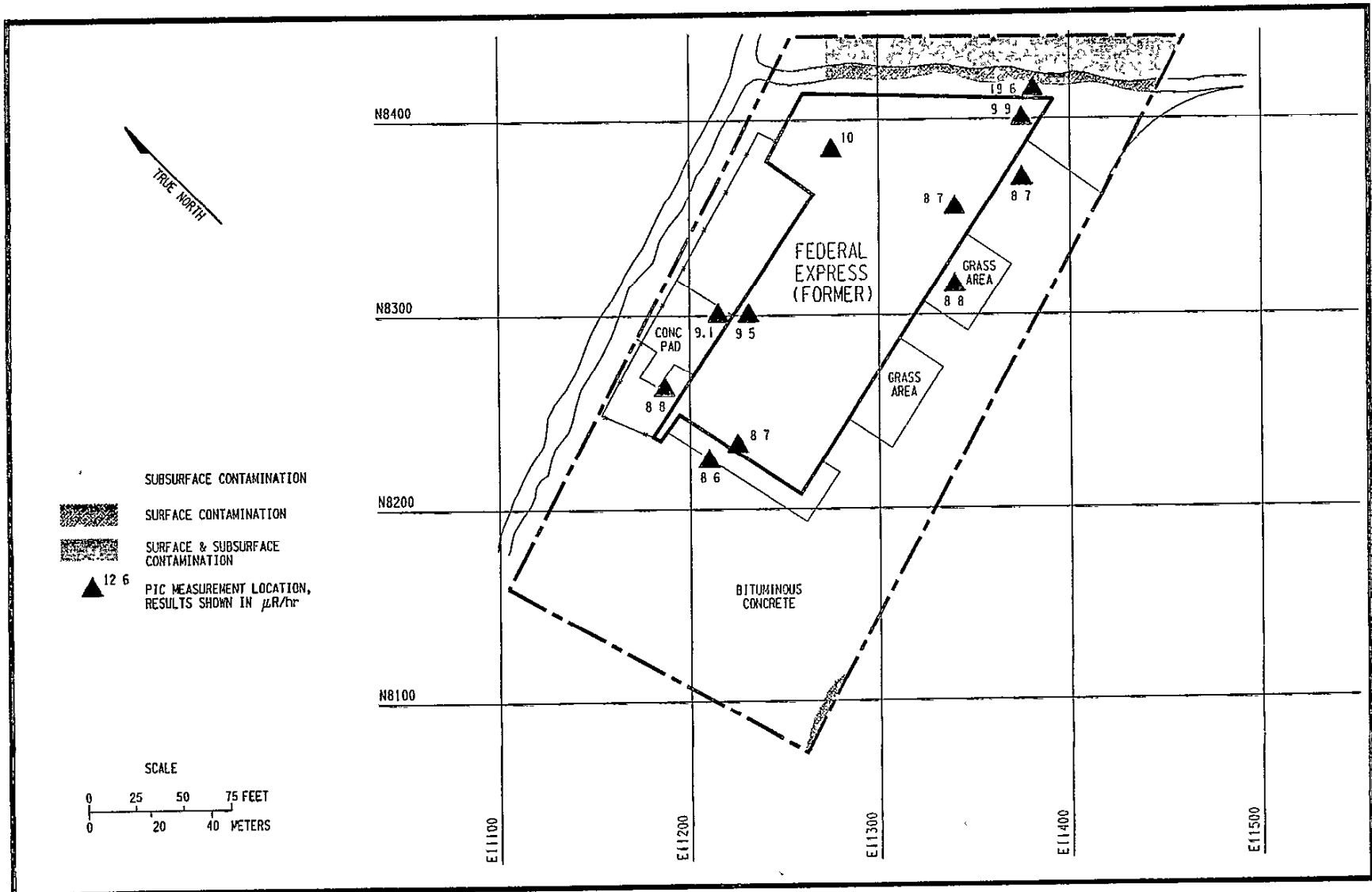
R43F010.DGN

Figure 4-22
 PIC Measurement Locations and Areas of Contamination at the Sunoco Station Property
 167 Route 17 North



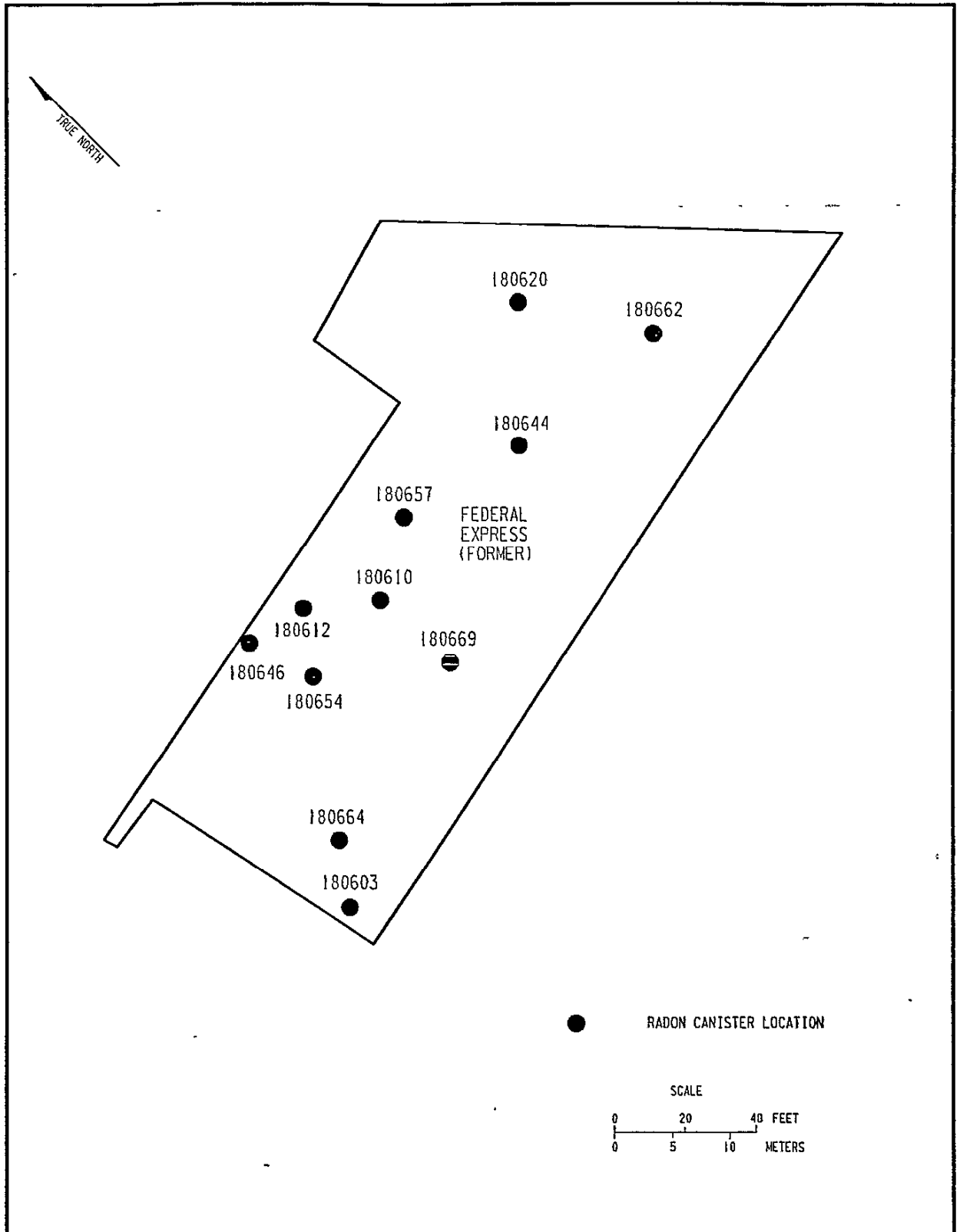
R43F070.DGN

Figure 4-23
 Locations of Radon Canisters at the Sunoco Station Property
 167 Route 17 North



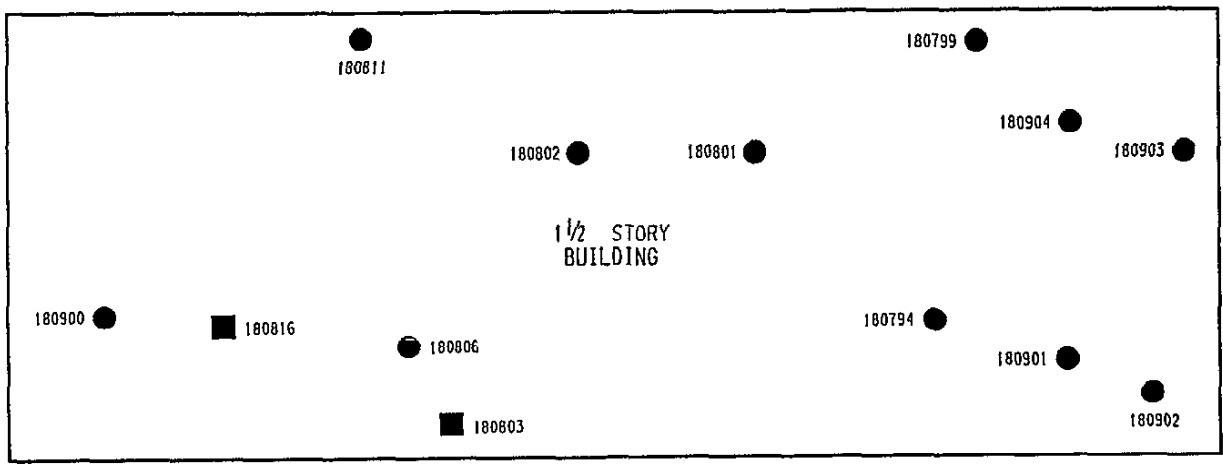
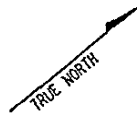
R43F009.DGN

Figure 4-24
PIC Measurement Locations and Areas of Contamination at the Former Federal Express Property
137 Route 17 North

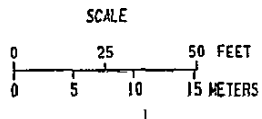


R43F069.DGN

Figure 4-25
 Locations of Radon Canisters at the Former Federal Express Property
 137 Route 17 North



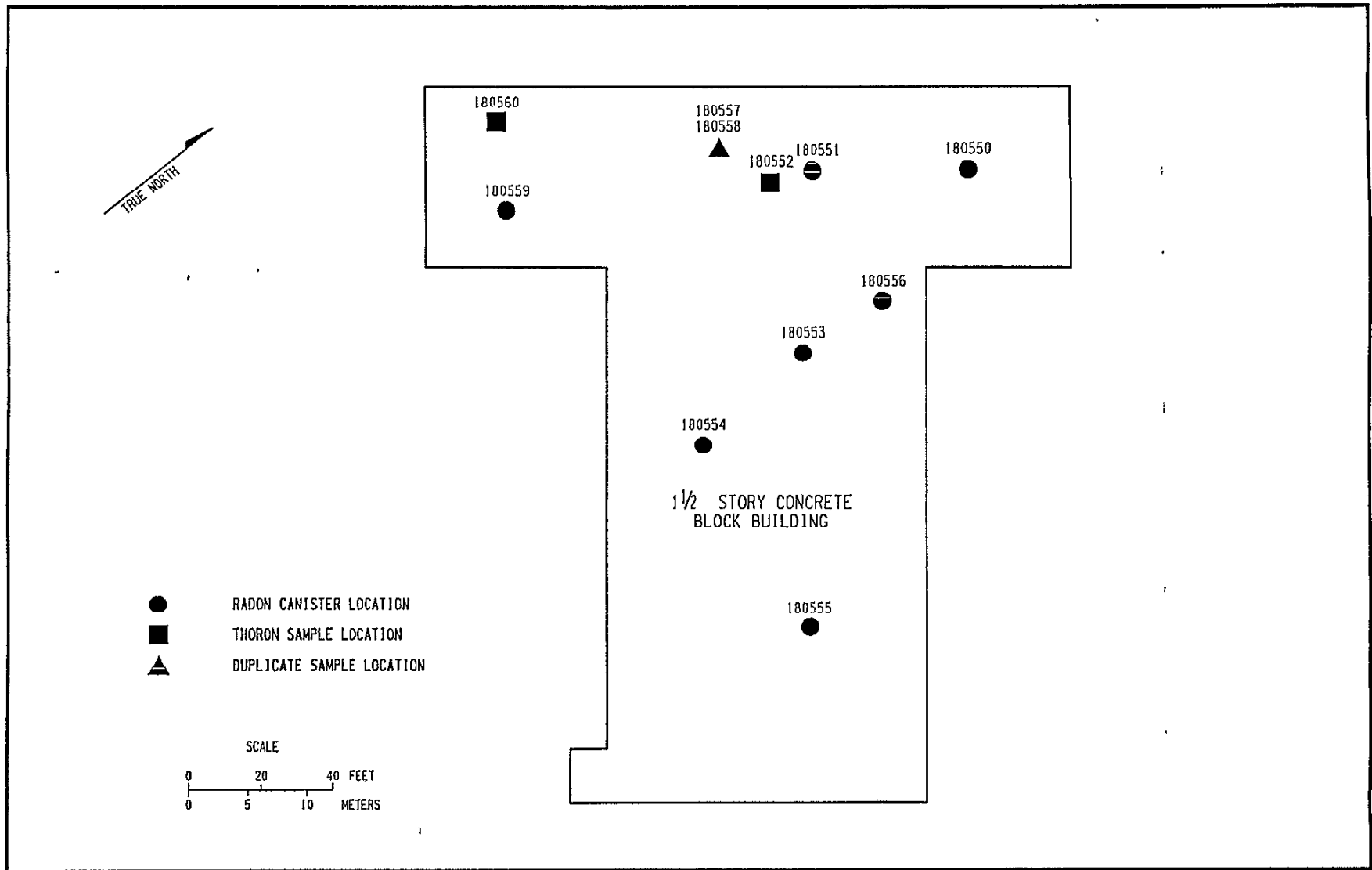
● RADON CANISTER LOCATION
■ THORON SAMPLE LOCATION



R43F061.DGN

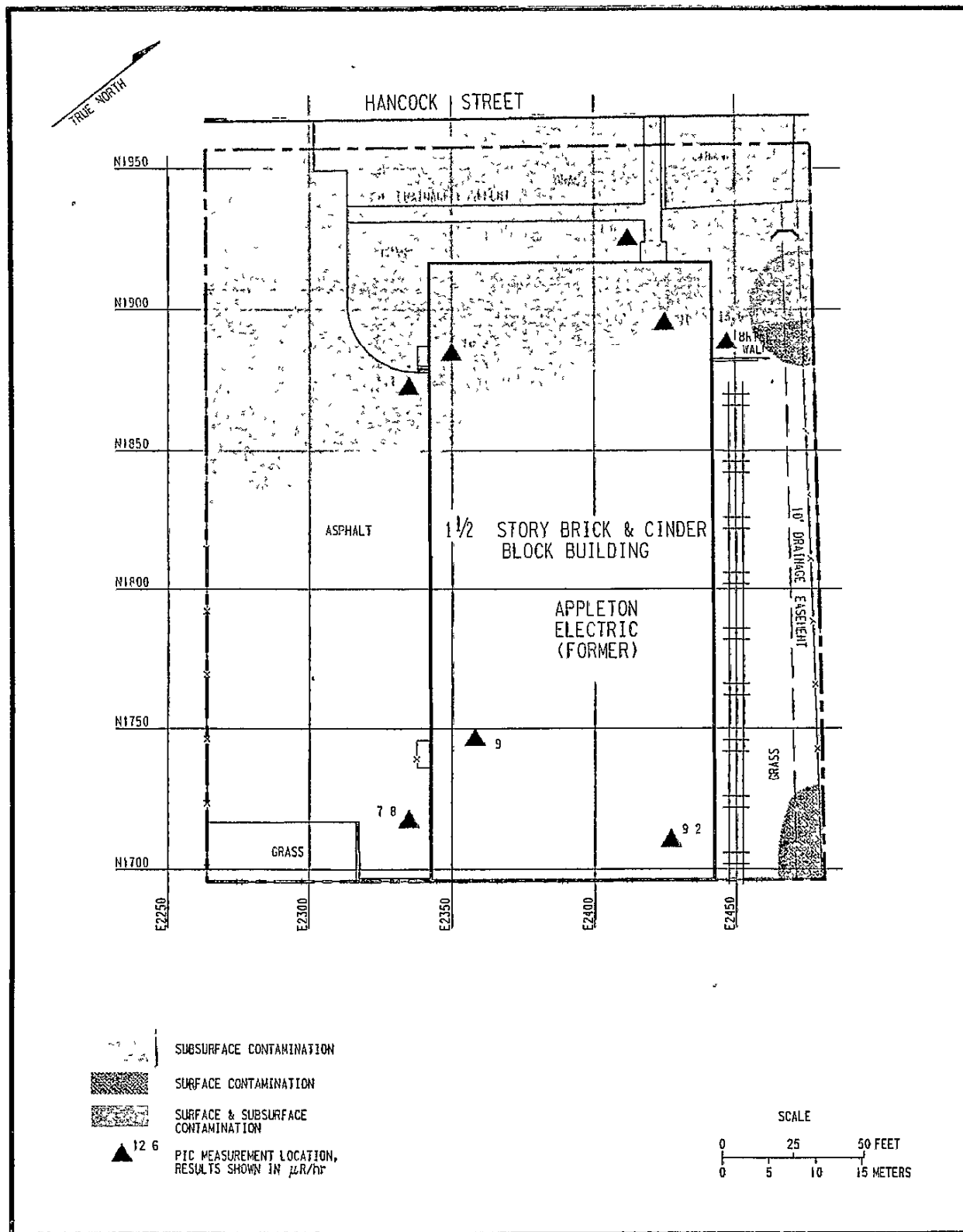
Figure 4-27
Locations of Radon Canisters at the Flint Ink Property
80 Industrial Road

Figure 4-26
PIC Measurement Locations and Areas of Contamination at the
Flint Ink Property 80 Industrial Road



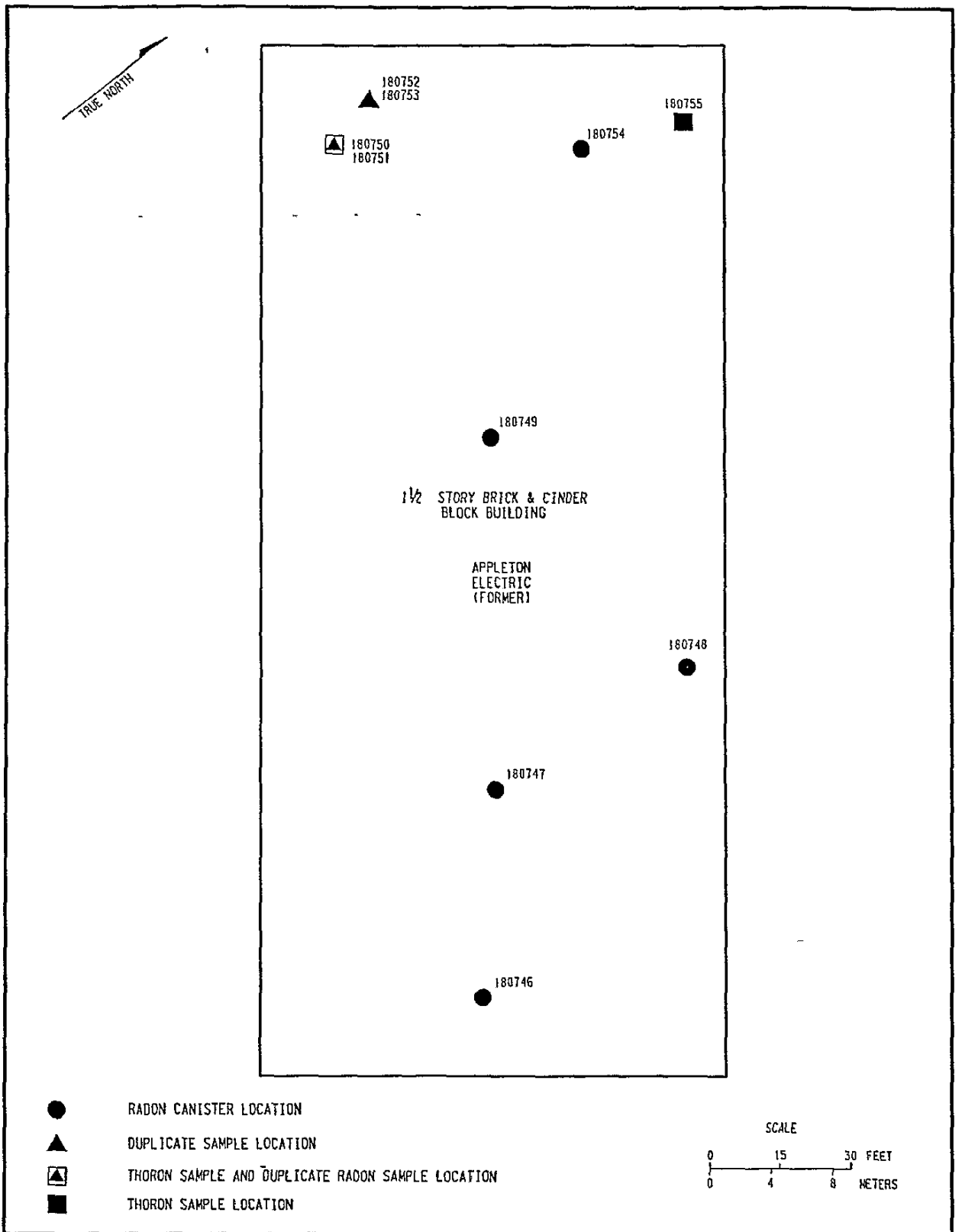
R43F066 DGN

Figure 4-31
Locations of Radon Canisters at Airco Medical and Specialty Products
80 Hancock Street



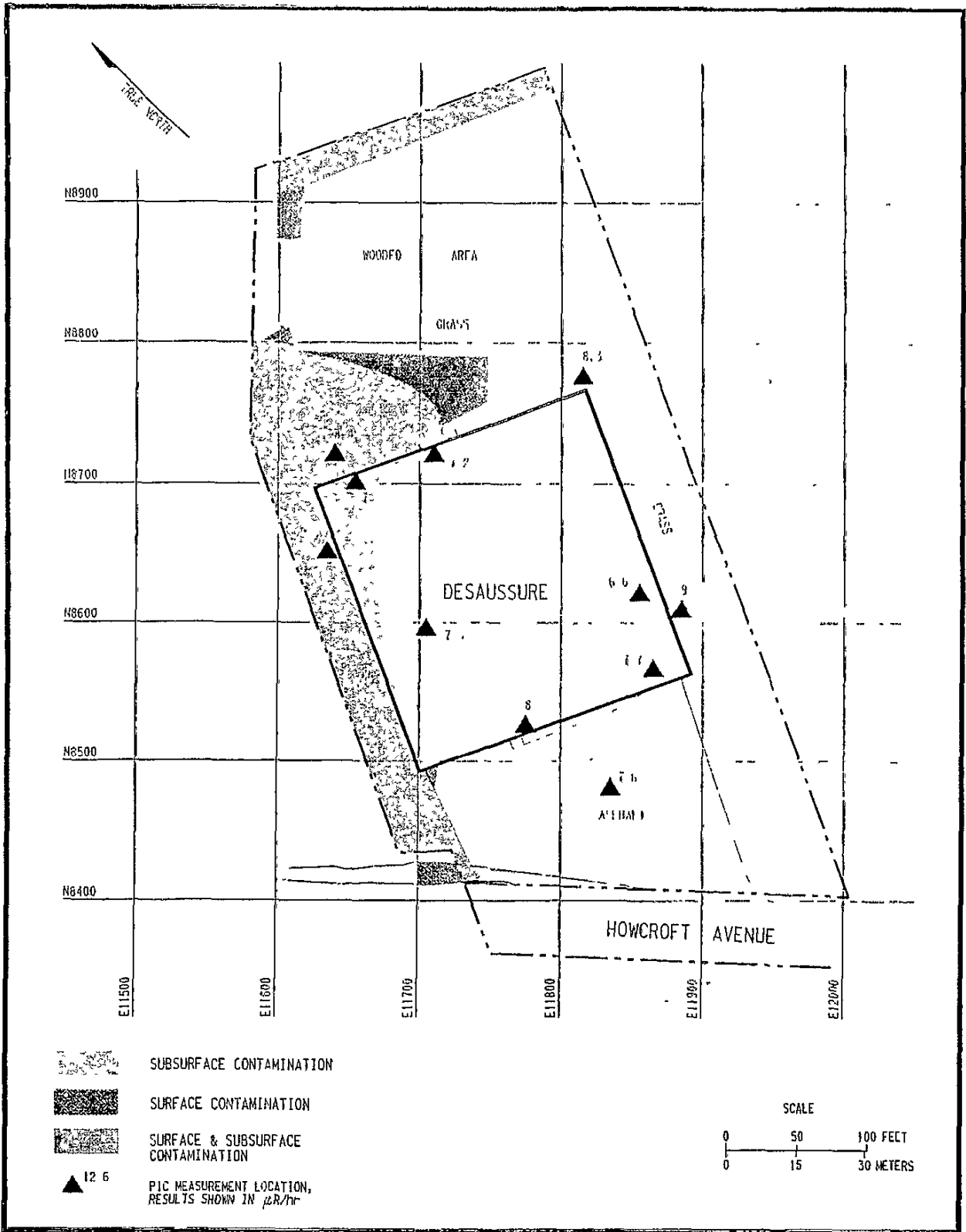
R43F 007 DGN

Figure 4-32
 PIC Measurement Locations and Areas of Contamination at the
 Former Appleton Electric Property 100 Hancock Street



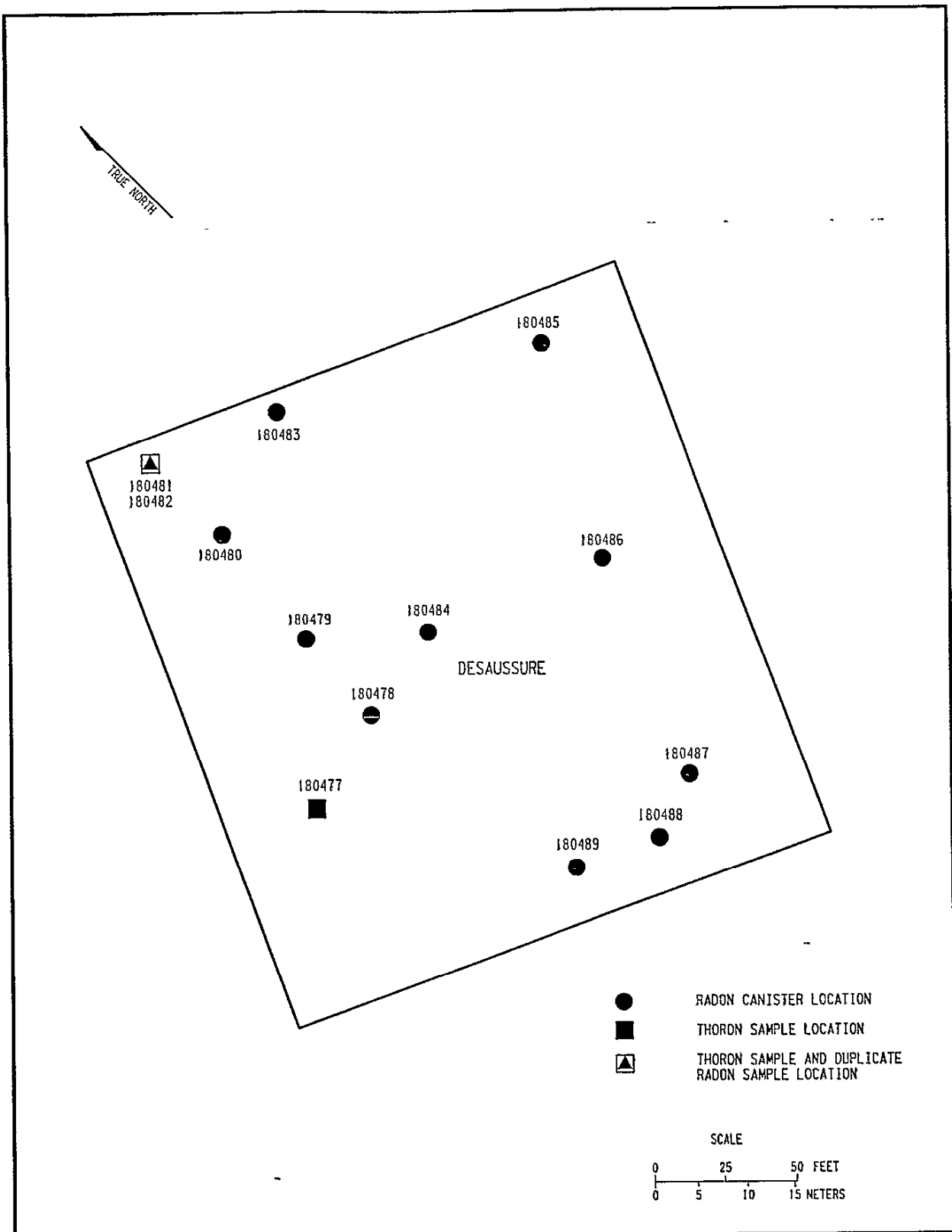
R43F067 DGN

Figure 4-33
Locations of Radon Canisters at the Former Appleton Electric Property
100 Hancock Street



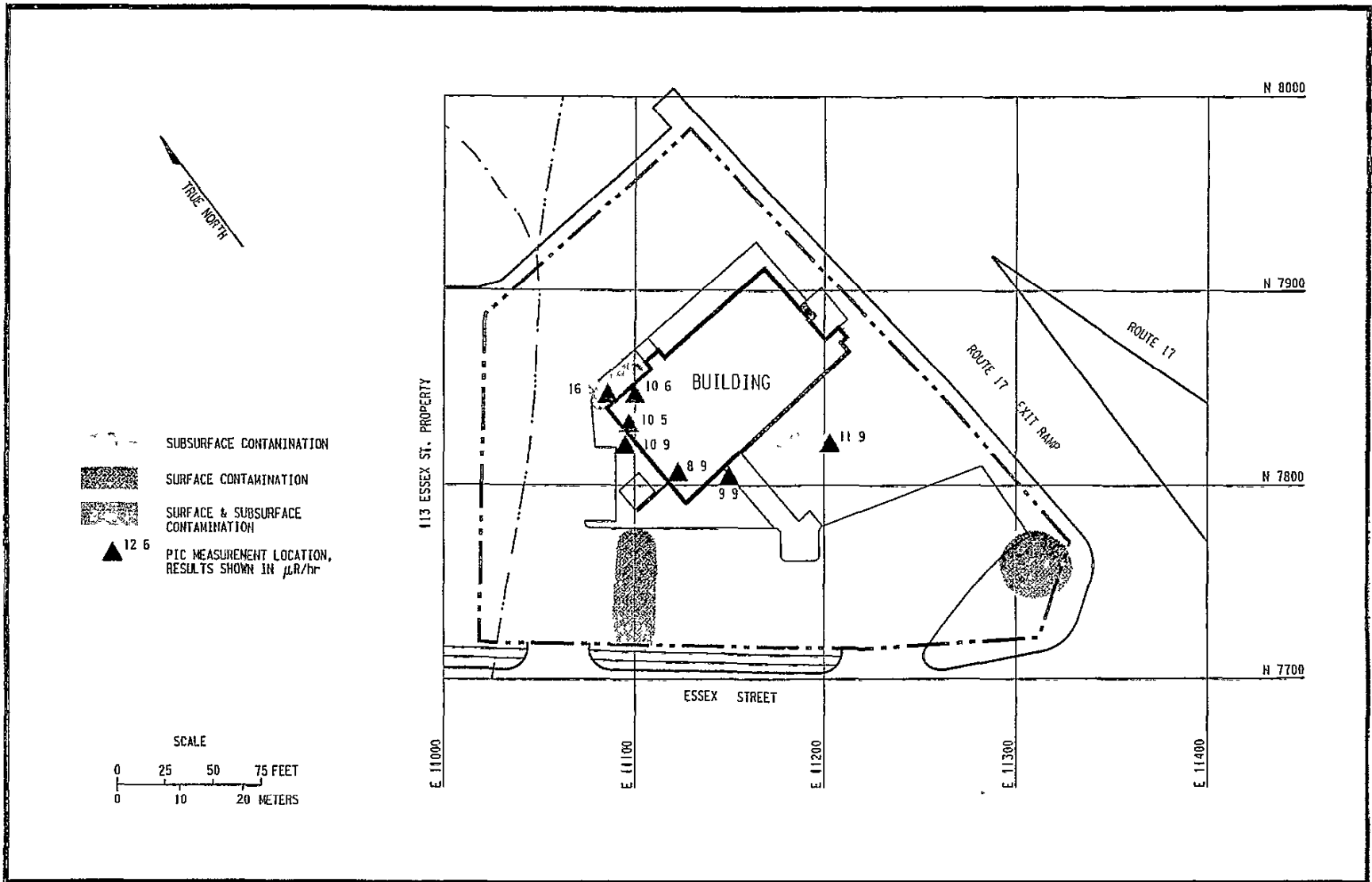
R43F008 DGN

Figure 4-34
PIC Measurement Locations and Areas of Contamination at the
DeSaussure Property 23 West Howcroft Avenue



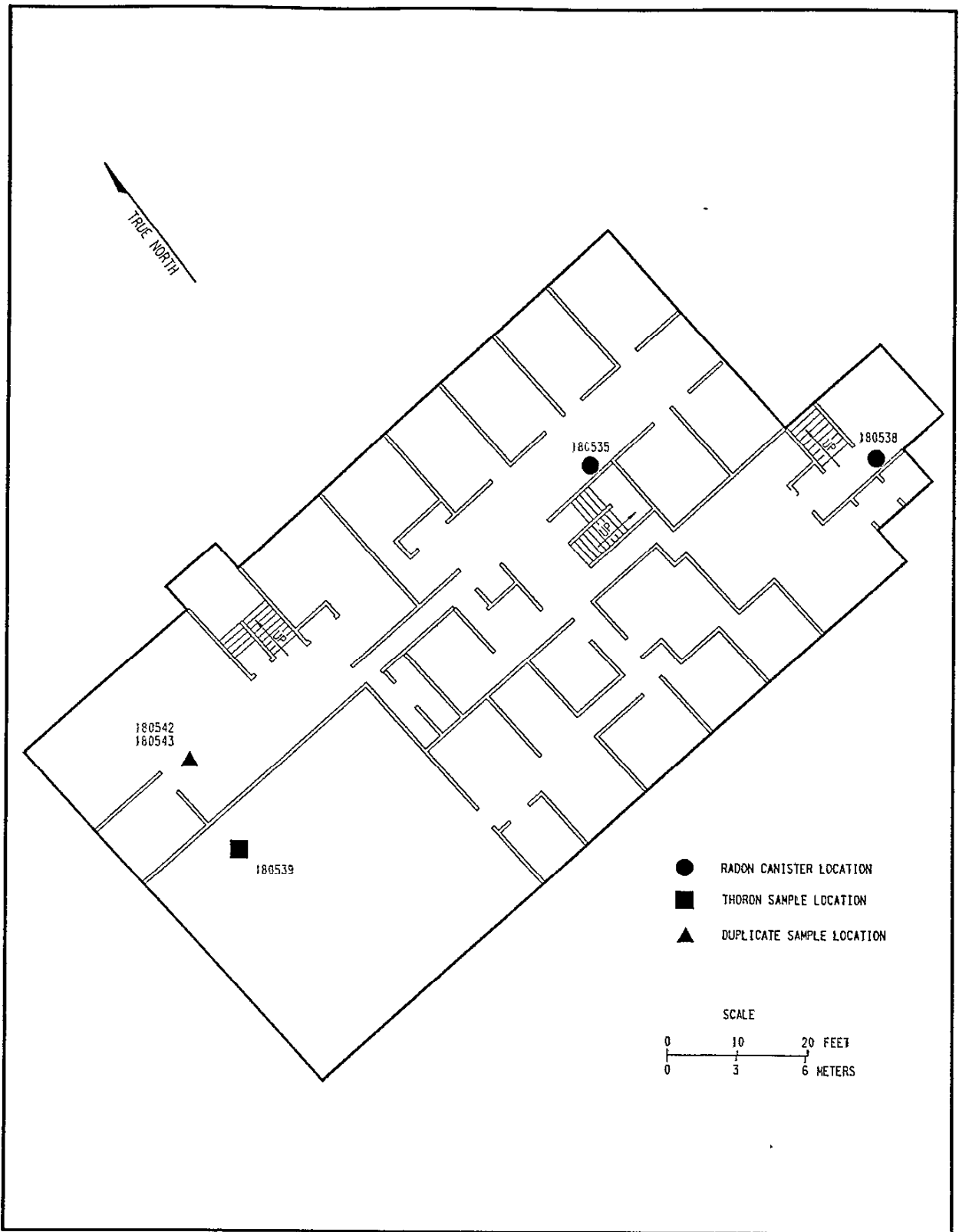
R43F068.DGN

Figure 4-35
 Locations of Radon Canisters at the
 DeSaussure Property 23 W. Howcroft Avenue



R43FD12 DGN

Figure 4-36
 PIC Measurement Locations and Areas of Contamination at the Joseph Muscarelle Property
 Essex Street and State Route 17



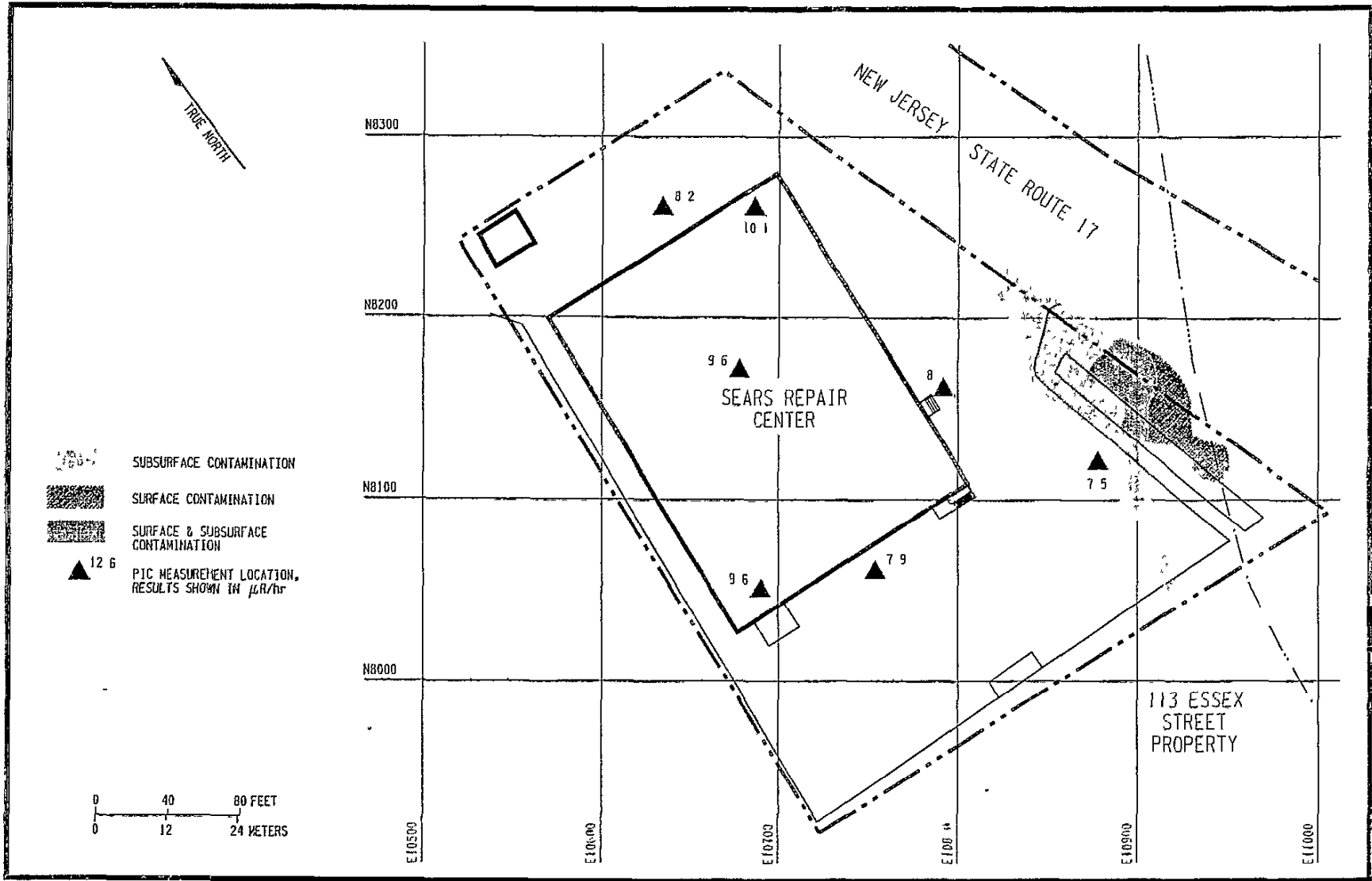
R43F090 DGN

Figure 4-37
Locations of Radon Canisters at the Joseph Muscarelle Property
Essex Street and State Route 17
(Basement)



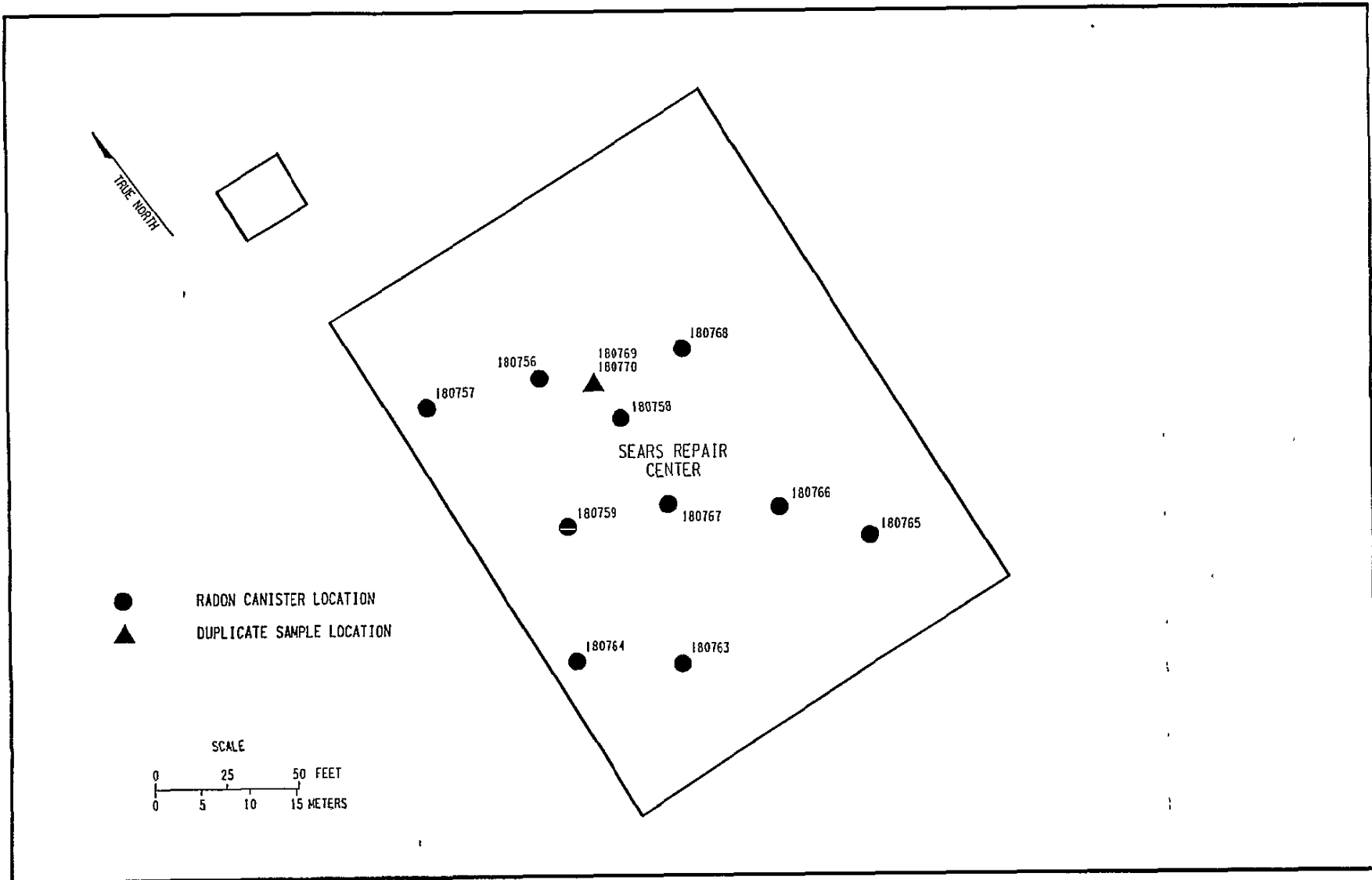
5-23-00 11

Figure 4-38
 Locations of Radon Canisters at the Joseph Muscarelle Property
 Essex Street and State Route 17
 (First Floor)



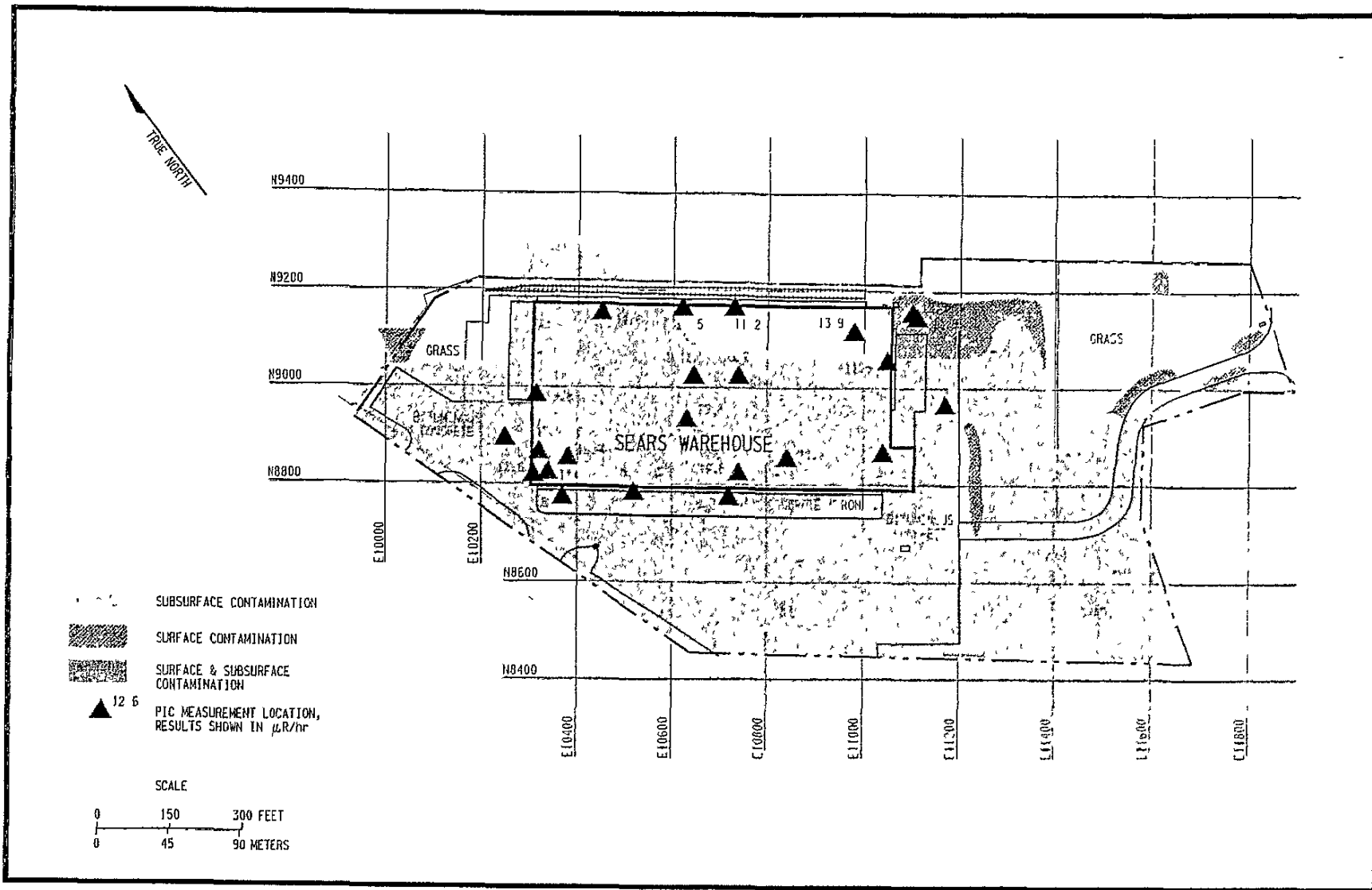
R43F013.DGN

Figure 4-39
 PIC Measurement Locations and Areas of Contamination at
 Sears Repair Center Property 200 State Route 17 South



R43F073.DGN

Figure 4-40
Locations of Radon Canisters at Sears Repair Center Property
200 State Route 17 South



R43F003.DGN

Figure 4-41
 PIC Measurement Locations and Areas of Contamination at the
 Sears Distribution Center Property 149-151 Maywood Avenue

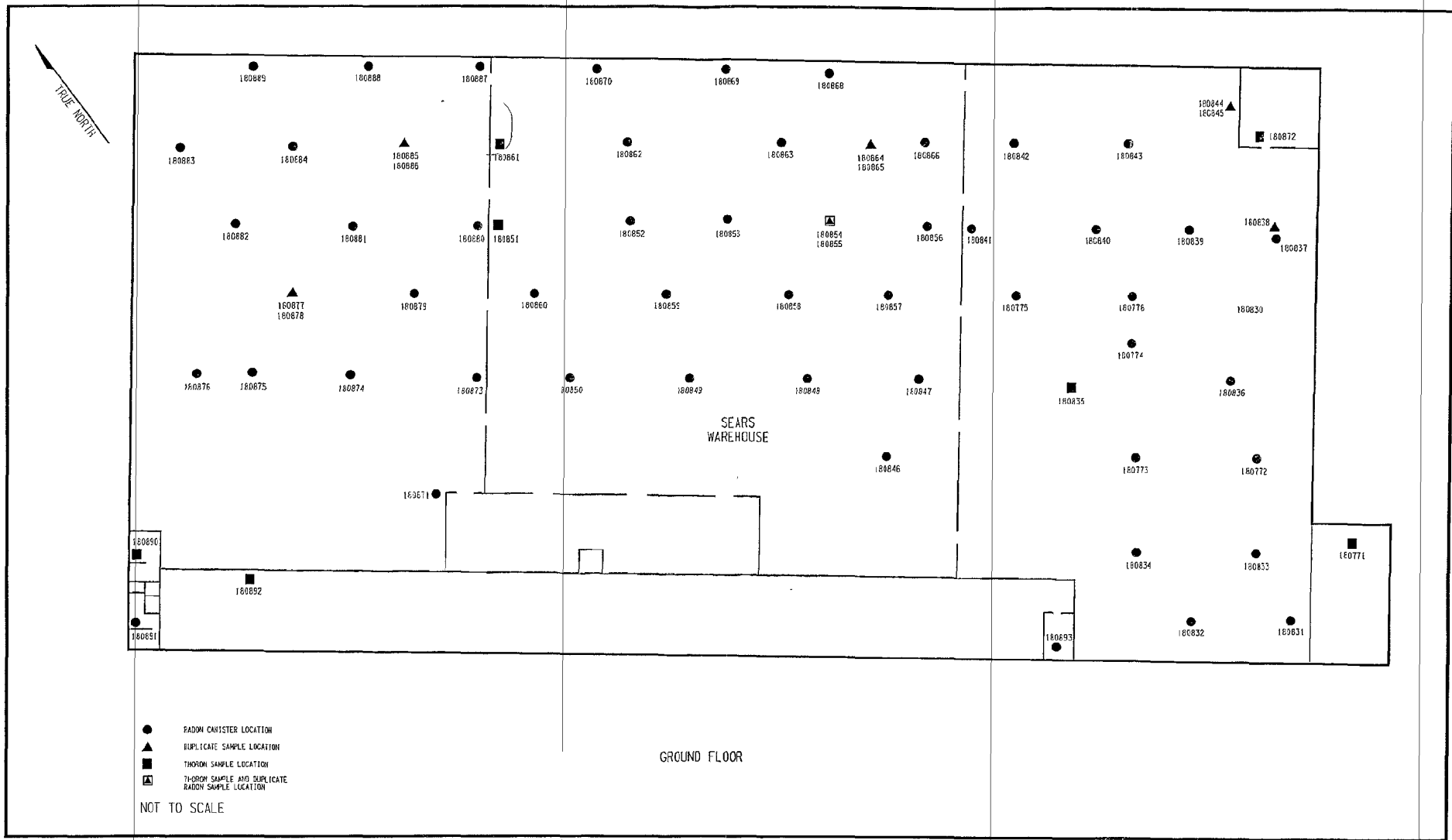
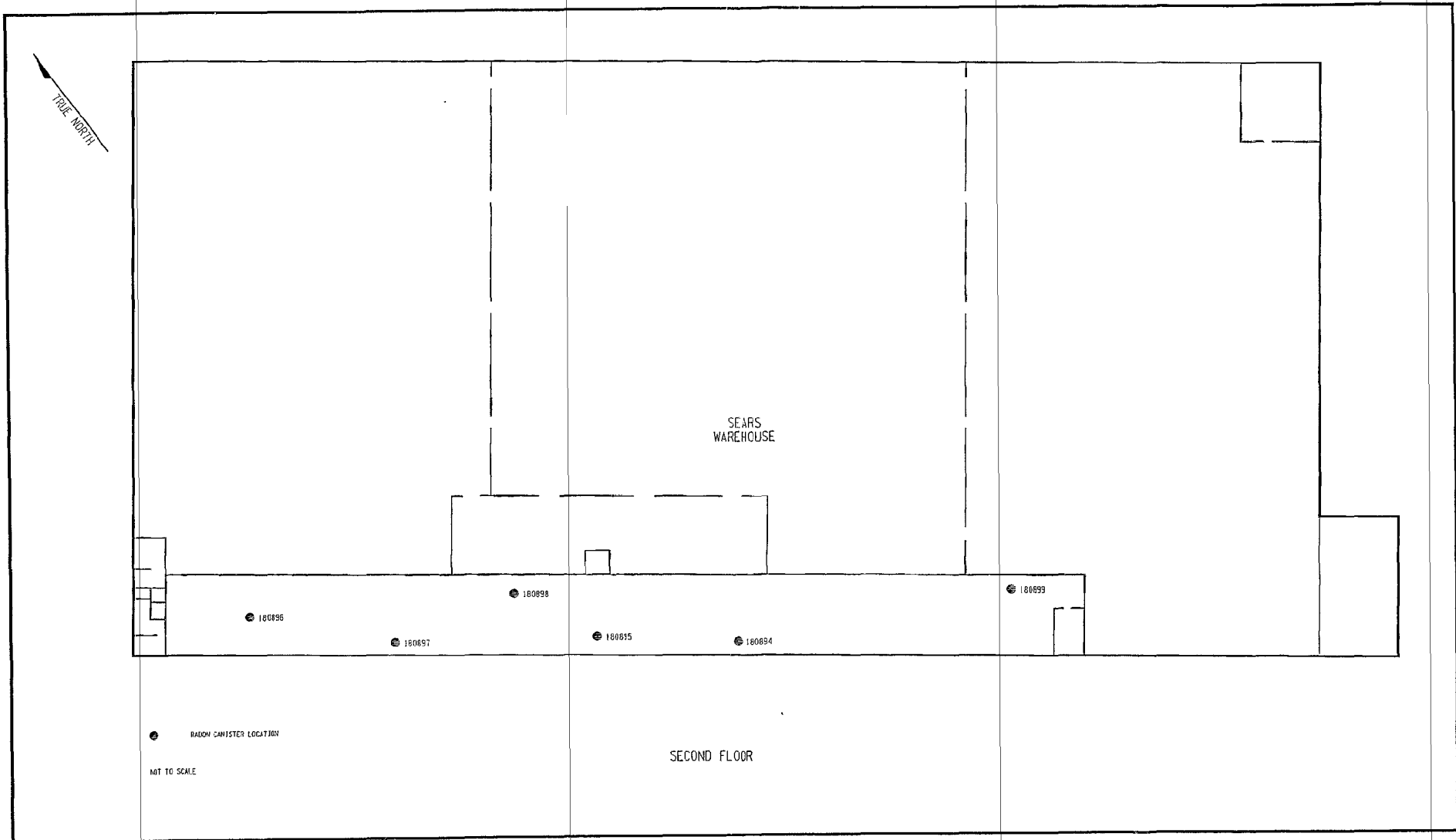
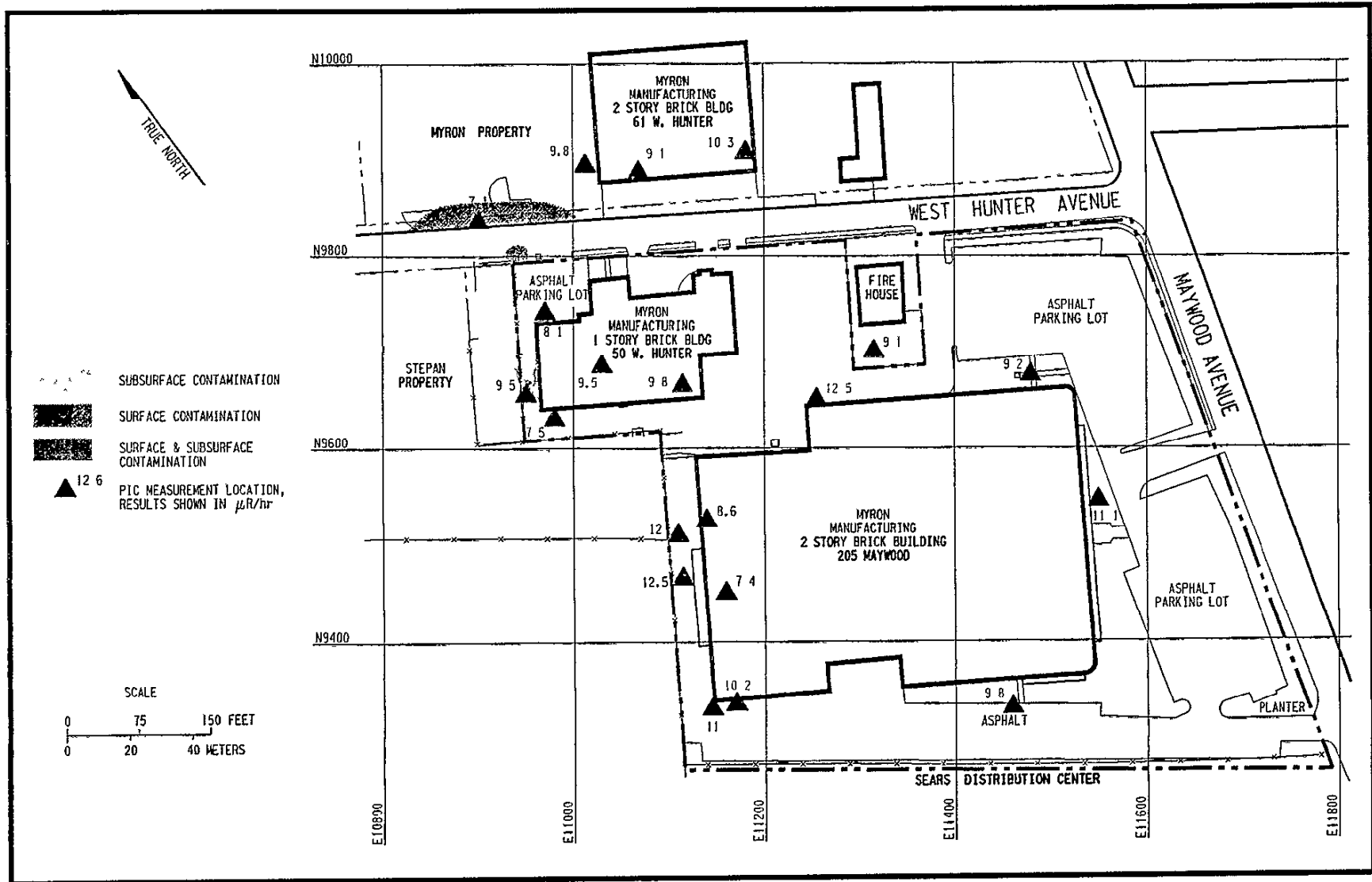


Figure 4-42
Locations of Radon Canisters at the Sears Distribution
Center Property (Ground Floor)
149-151 Maywood Avenue



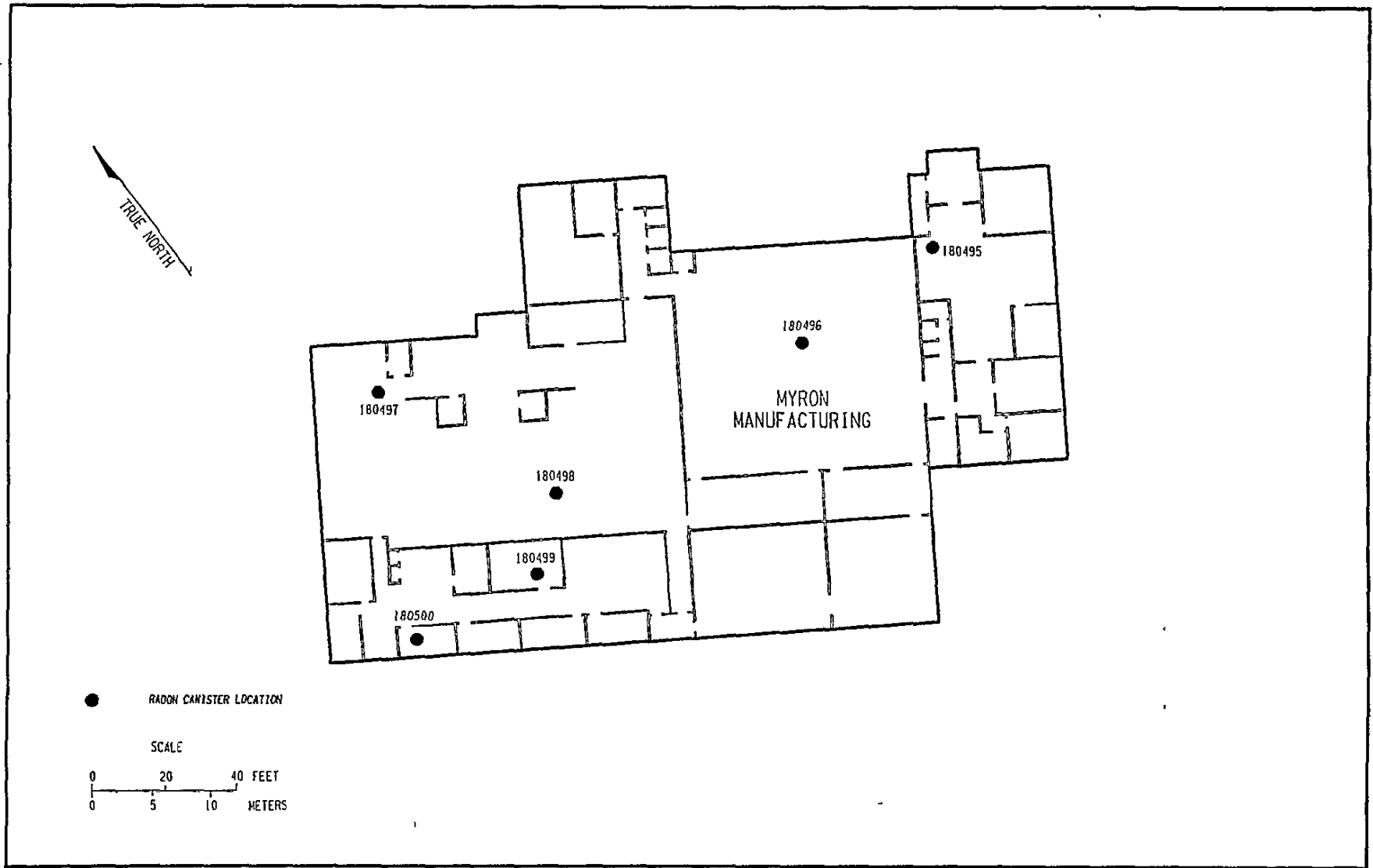
R43'063 DGN

Figure 4-43
 Locations of Radon Canisters at the Sears Distribution
 Center Property (Second Floor)
 149-151 Maywood Avenue



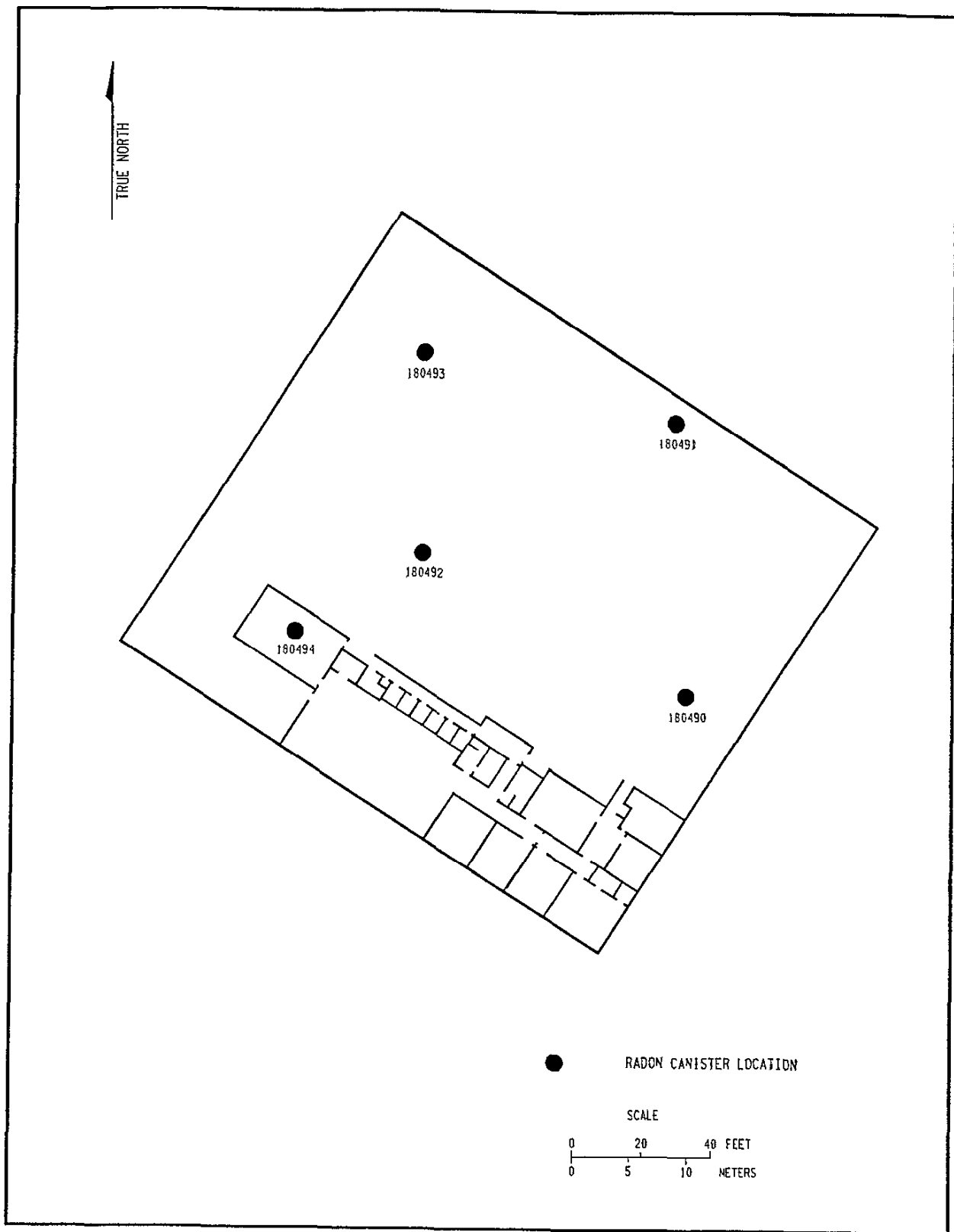
R43F0'5.DGN

Figure 4-44
 PIC Measurement Locations and Areas of Contamination at the Myron Manufacturing Properties
 50 and 61 West Hunter Avenue and 205 Maywood Avenue



R43F081.DGN

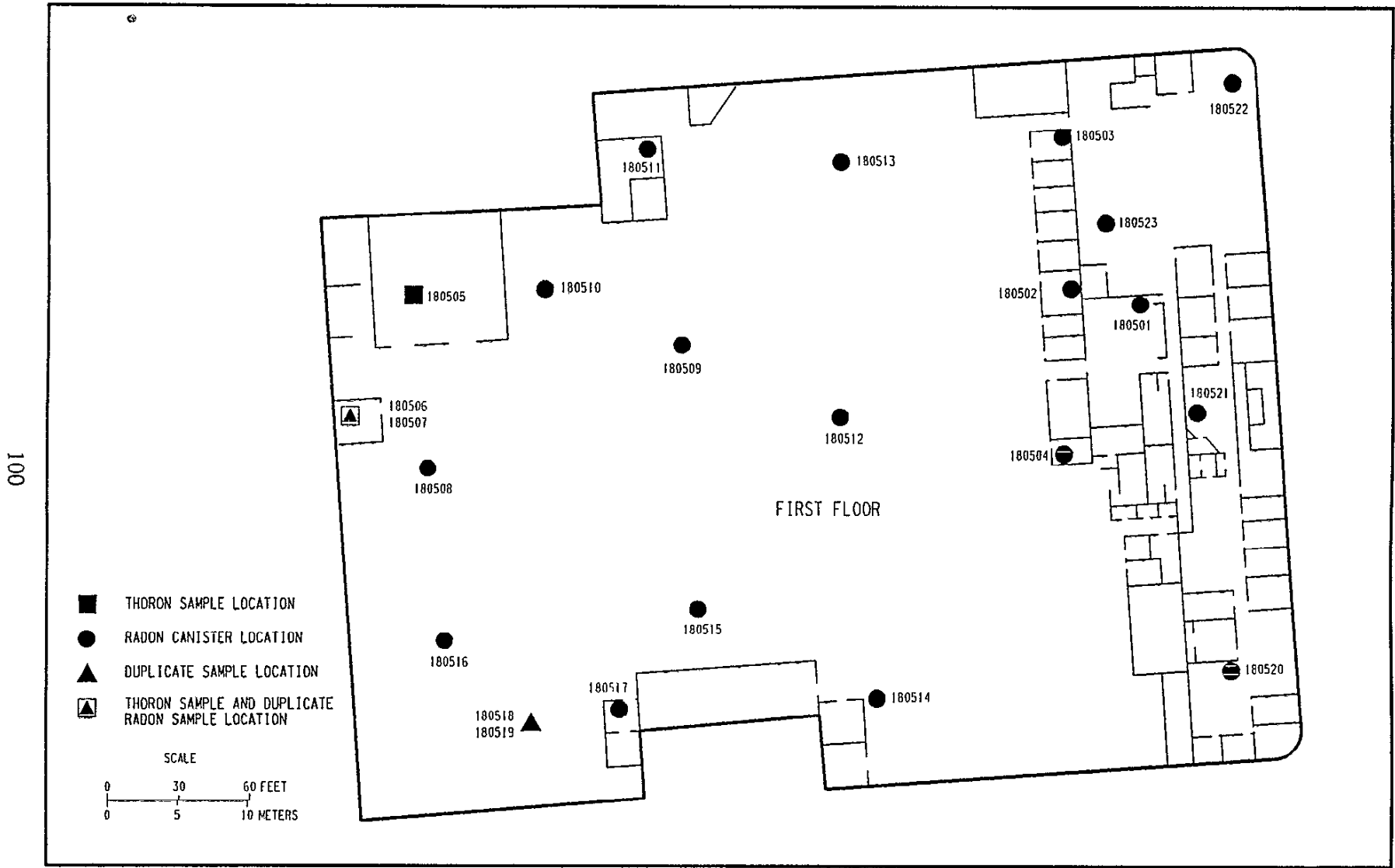
Figure 4-45
Locations of Radon Canisters at Myron Manufacturing
50 West Hunter Avenue



R43F080.DGN

6

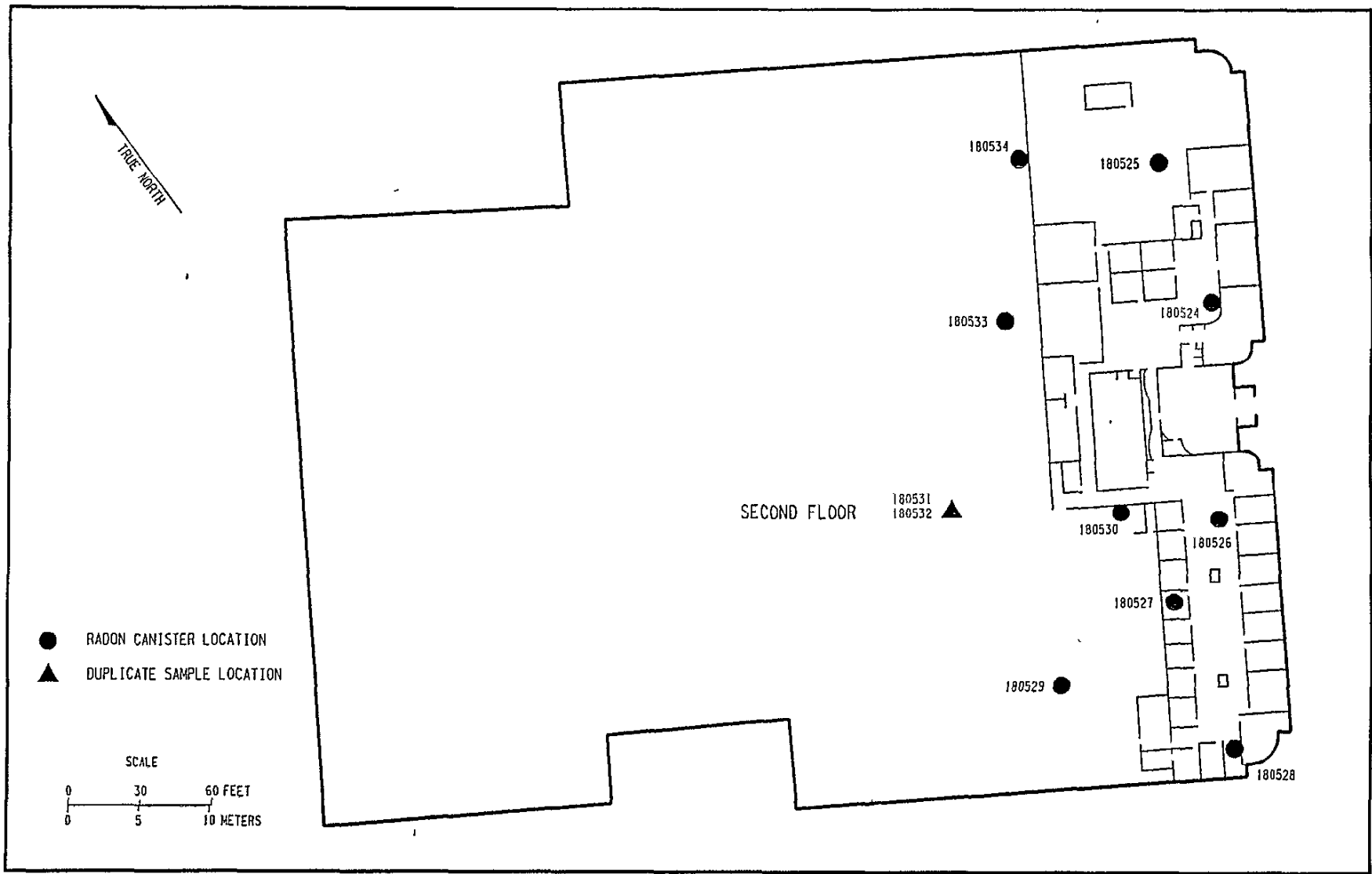
Figure 4-46
 Locations of Radon Canisters at Myron Manufacturing
 61 West Hunter Avenue (First Floor)



R43F002.DGN

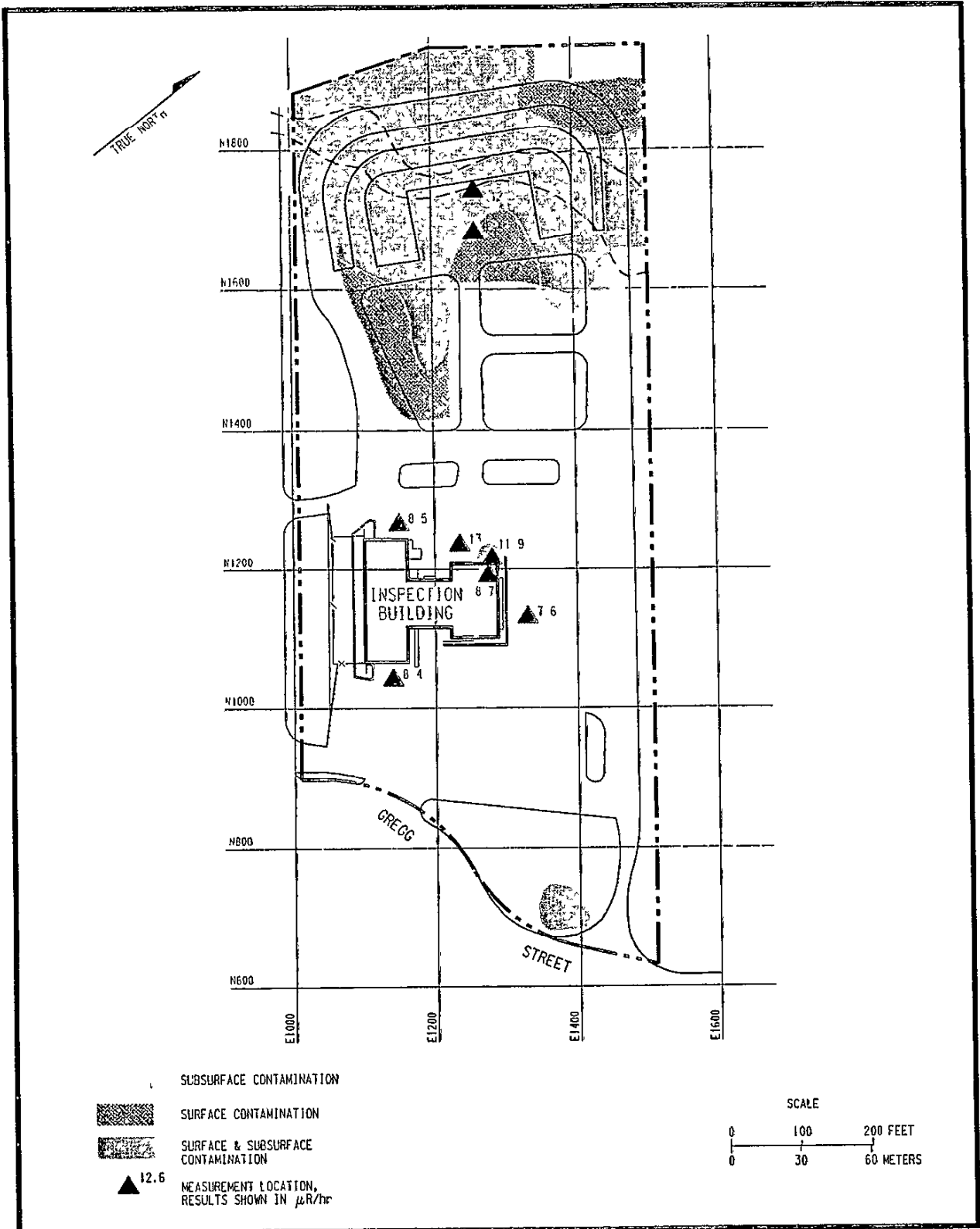
Figure 4-47
 Locations of Radon Canisters at Myron Manufacturing
 205 Maywood Avenue

101



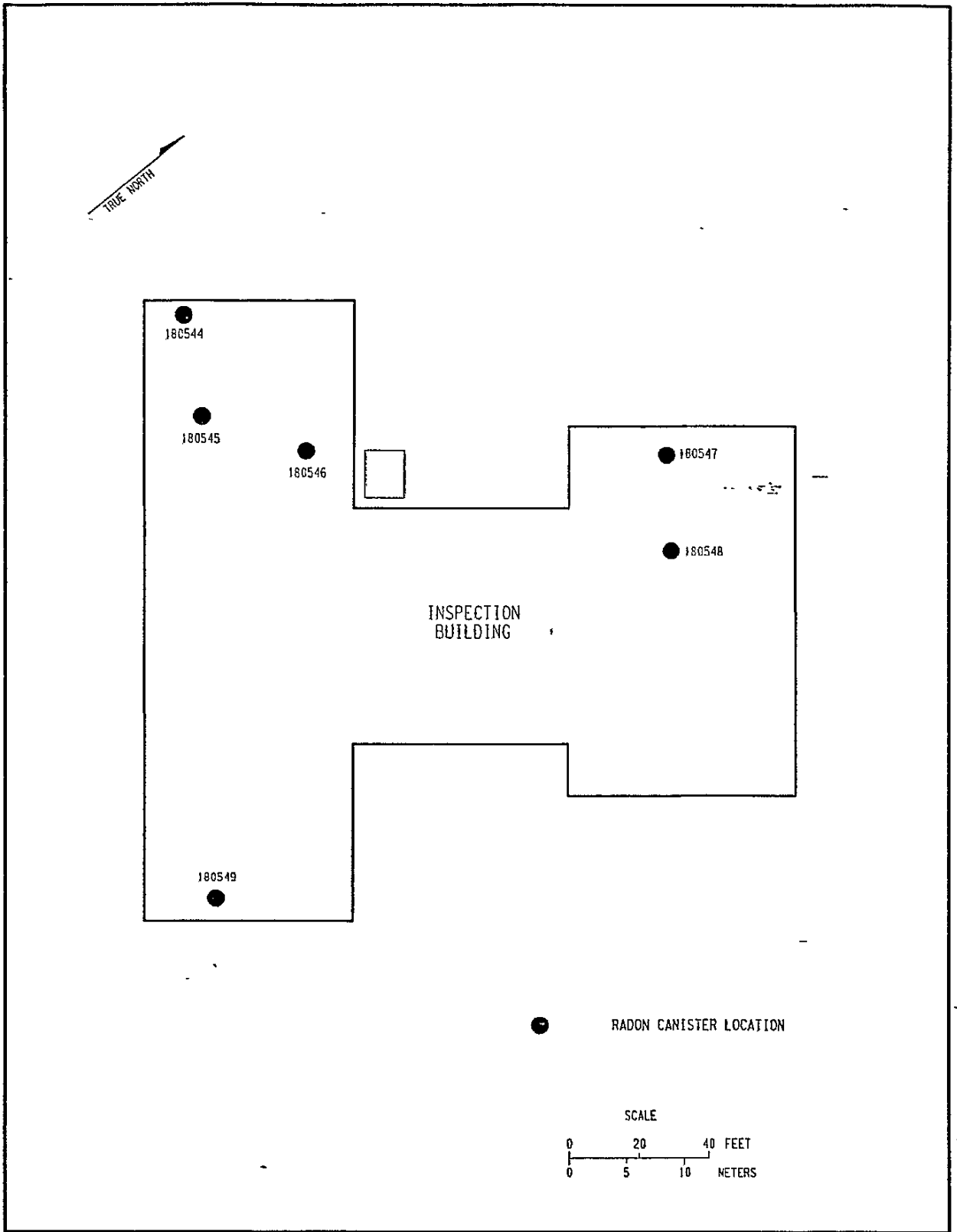
R43F075.DGN

Figure 4-48
Locations of Radon Canisters at Myron Manufacturing
205 Maywood Avenue
(Second Floor)



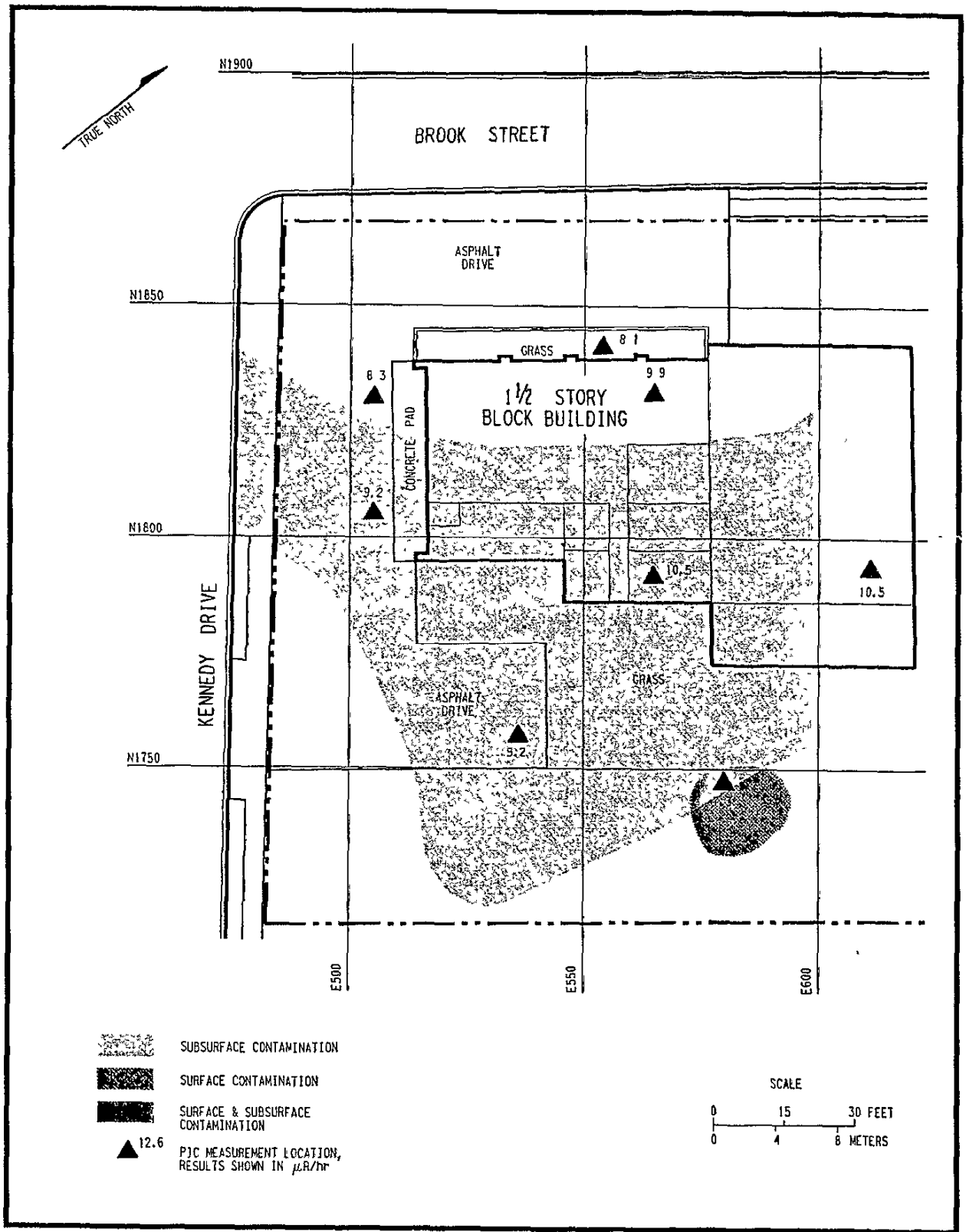
R43F 01) DGN

Figure 4-49
 PIC Measurement Locations and Areas of Contamination
 at the New Jersey Vehicle Inspection Station Property
 8 Mill Street



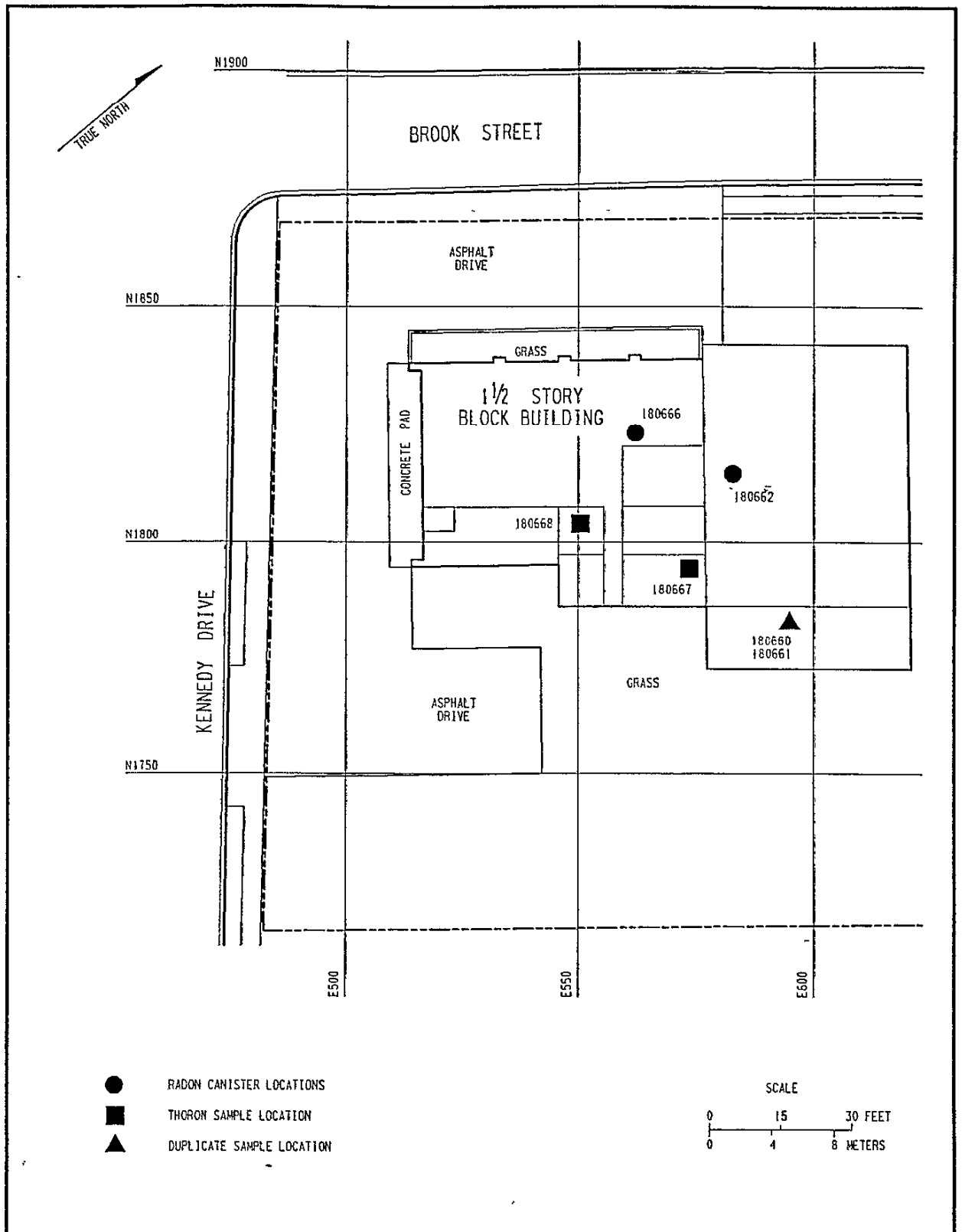
R43F071.DGN

Figure 4-50
 Locations of Radon Canisters at the New Jersey Vehicle Inspection Station
 8 Mill Street



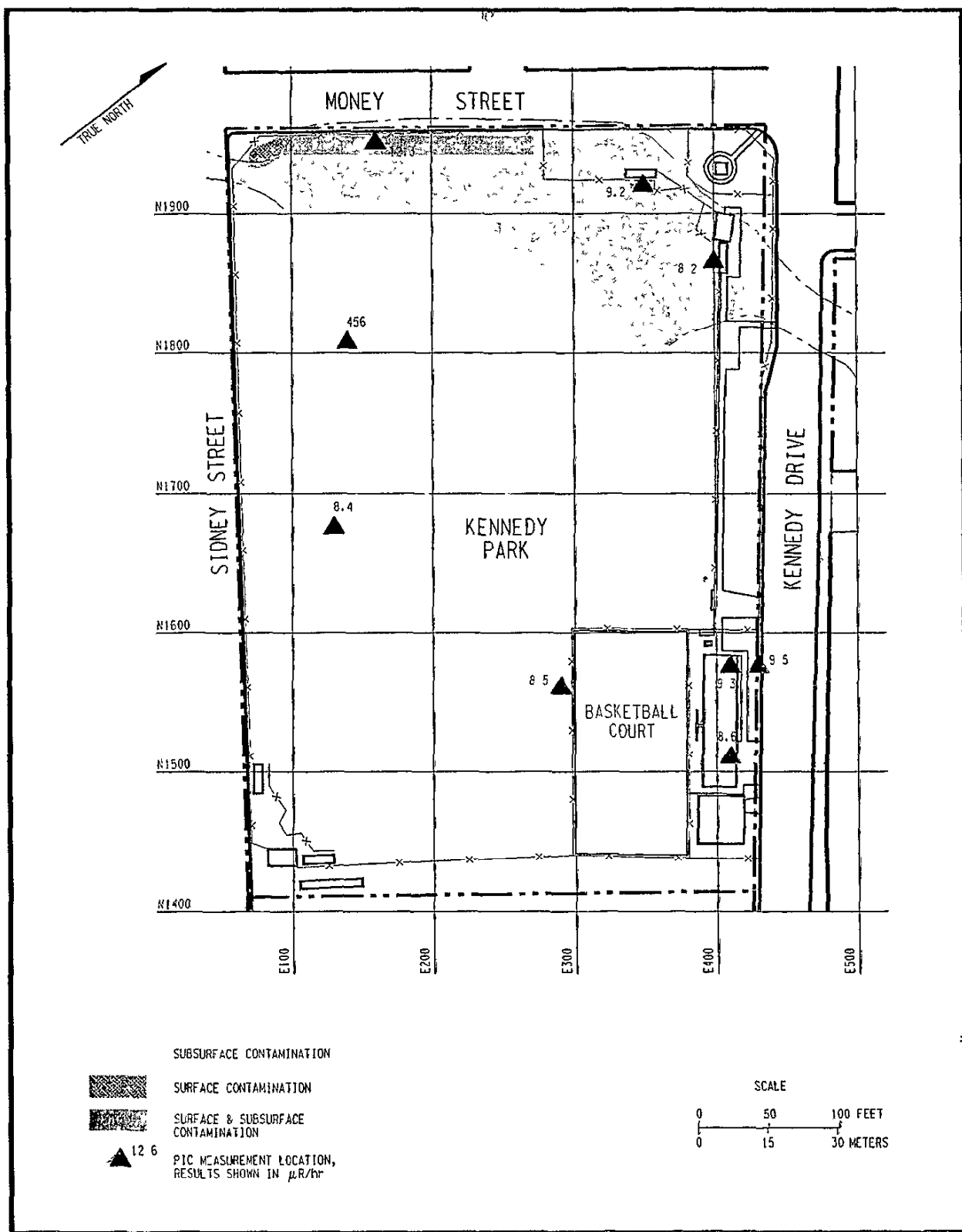
R43F019.DGN

Figure 4-51
PIC Measurement Locations and Areas of Contamination at the
Fire Station No. 2 Property Kennedy Drive and Brook Street



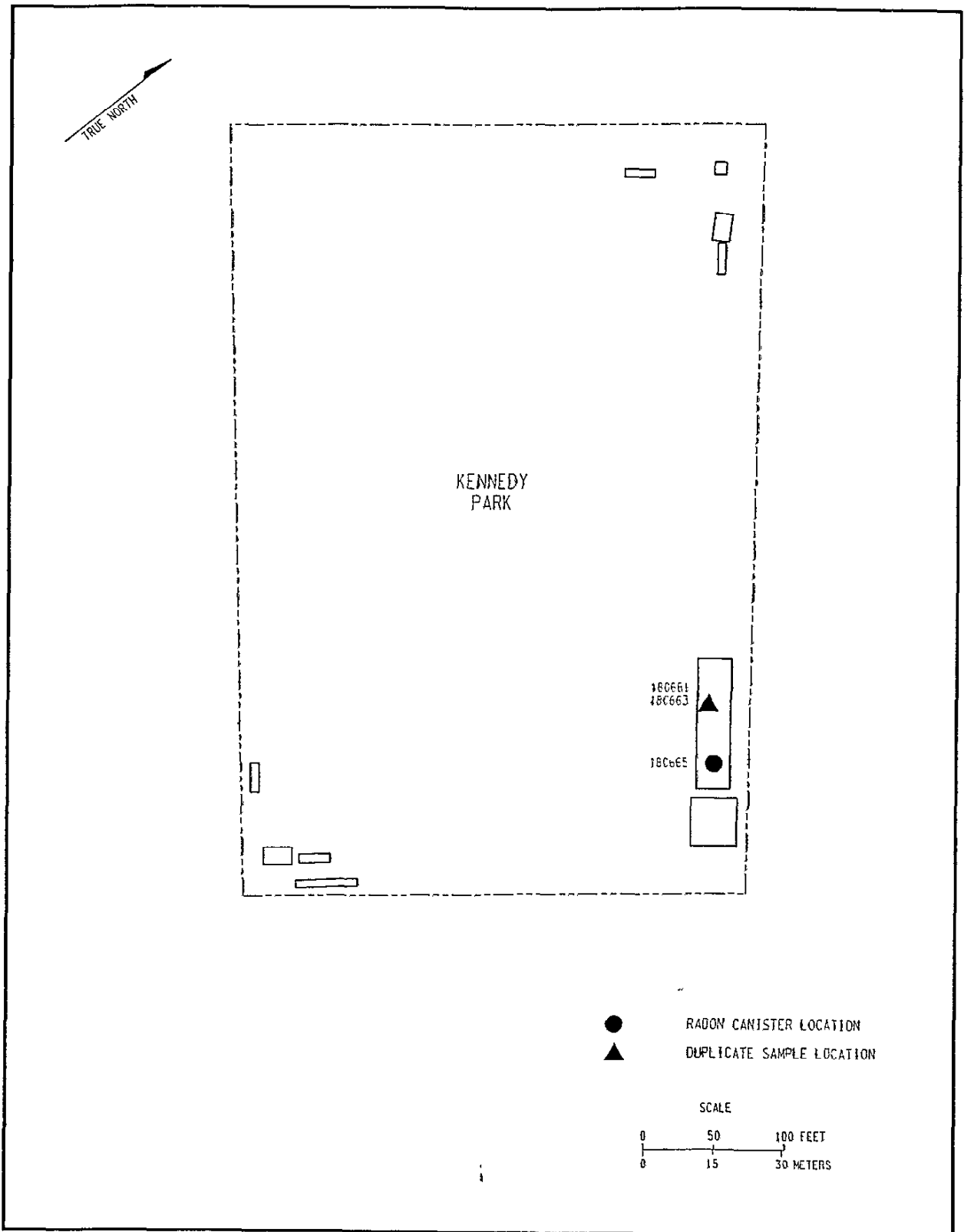
R43F096 DGN

Figure 4-52
 Locations of Radon Canisters at Fire Station No. 2
 Kennedy Drive and Brook Street



R43F018 DGN 1/14/94

Figure 4-53
 PIC Measurement Locations and Areas of Contamination
 at John F. Kennedy Park
 Kennedy Drive and Money Street



R43F078 DGN

Figure 4-54
Locations of Radon Canisters at John F. Kennedy Park
Kennedy Drive and Money Street

TABLES FOR SECTION 4.0

Table 4-1
Concentrations of Radon
at the National Community Bank Property,
174 Essex Street, Lodi

Sample Number	Radon (pCi/L) ^a
180573	<0.3
180574	<0.2
180575	<0.3
180576	0.3
180630	0.3
180631	<0.2

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

Table 4-2
Concentrations of Radon and Thoron
at the National Community Bank,
113 Essex Street, Maywood

Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180561	0.6	< 1.0
180562 ^b	0.6	< 1.0 ^c
180563	< 0.3	____ ^c
180564	< 0.2	____ ^c
180565	< 0.2	____ ^c
180566	< 0.2	< 1.0
180567	0.3	____ ^c
180568	< 0.3	____ ^c
180569	< 0.3	____ ^c
180570	< 0.3	____ ^c
180571	< 0.3	____ ^c
180572	< 0.3	____ ^c

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bDuplicate sample.

^cCanister was not analyzed for thoron.

Table 4-3
 Concentrations of Radon
 at Meta-Lite Property,
 85-99 Route 17 North, Maywood

Sample Number	Radon (pCi/L) ^a
180577	<0.3
180578	<0.2
180579	<0.2
180580 ^b	<0.3
180581	<0.2
180582	<0.2
180583	<0.3
180584	<0.3
180587	<0.3
180588	<0.3
180589	<0.3
180590	<0.3
180591	<0.3
180592	<0.3

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bCanister found upside down or disturbed upon retrieval.

Table 4-4
Concentrations of Radon
at the Mark Correctional Property,
85-99 Route 17, Maywood

Sample Number	Radon (pCi/L) ^a
180593	< 0.3
180594	< 0.4
180595	< 0.2
180596	< 0.3
180597	< 0.2
180598	< 0.2
180599	< 0.3
180600	< 0.3
180601 ^b	< 0.3
180602	< 0.3
180604	< 0.3
180605	< 0.3
180606	< 0.3
180607	0.3
180608	< 0.3

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bCanister was found upside down or disturbed at the time of retrieval.

Table 4-5
Concentrations of Radon
at the PC Warehouse Property,
85-99 Route 17 North, Maywood

Sample Number	Radon (pCi/L) ^a
180609	< 0.3
180611	0.4
180613	< 0.2
180614	< 0.2
180615	< 0.2
180616	< 0.2
180618	< 0.3
180619	< 0.3
180621	< 0.2
180623	< 0.3
180624	< 0.2
180625	< 0.3
180626	< 0.3
180627	< 0.3
180628	< 0.3
180629	< 0.3

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

Table 4-6
Concentrations of Radon and Thoron
at the Gulf Station Property,
239 Route 17 North, Maywood

Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180585	1.0	— ^b
180586	1.3	<2.0

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bCanister was not analyzed for thoron.

Table 4-7
Concentrations of Radon and Thoron
at the Stepan Company Property,
100 West Hunter Avenue, Maywood

Page 1 of 4

Building Number	Number of Employees	Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
20	0 ^b	180680	0.5	— ^c
78	4	180681	<0.3	— ^c
		180682	0.4	— ^c
		180683	<0.3	— ^c
		180684	<0.3	— ^c
		180685	0.4	<2.0
86	0 ^b	180686	0.7	<1.0
1	1	180687	<0.3	— ^c
		180688	<0.3	— ^c
2	20	180689	<0.3	— ^c
		180690	0.3	— ^c
		180691	<0.3	— ^c
		180692	<0.3	— ^c
		180693	<0.3	— ^c
		180694 ^d	<0.3	— ^c
		180695	<0.3	— ^c
180696	<0.2	— ^c		
3	0 ^b	180697	0.8	— ^c
		180698 ^e	0.7	<1.0
		180699	1.2	— ^c
		180700	0.5	— ^c

Table 4-7
(continued)

Page 2 of 4

Building Number	Number of Employees	Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
		180701	1.6	— ^c
		180702 ^e	1.5	— ^c
3	0 ^b	180703	2.1	— ^c
		180704	2.0	< 1.0
		180705	1.8	— ^c
		180706	2.3	— ^c
		180707	1.3	— ^c
		180708	1.0	— ^c
		180709	1.5	< 1.0
		180710	0.9	— ^c
		180711 ^e	0.8	— ^c
		180712	3.0	— ^c
		180713	2.5	— ^c
		180714	2.8	< 1.0
		180715	2.4	— ^c
		180716	3.4	— ^c
15	23	180717	0.3	— ^c
		180718	0.4	— ^c
		180719	0.4	— ^c
		180720	< 0.3	— ^c
		180721	< 0.3	— ^c
		180722	< 0.3	— ^c
		180723	0.4	— ^c
		180724	0.3	— ^c
		180725	< 0.3	— ^c
		180726	< 0.3	— ^c

Table 4-7
(continued)

Page 3 of 4

Building Number	Number of Employees	Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
15	23	180727 ^d	< 0.2	— ^c
		180728	< 0.3	— ^c
		180729	< 0.3	— ^c
		180670	0.4	— ^c
		180671 ^e	0.4	— ^c
13	11	180672	< 0.3	— ^c
		180673	< 0.3	— ^c
		180674	< 0.3	— ^c
		180675	< 0.3	— ^c
		180676 ^e	< 0.3	— ^c
		180677	< 0.3	— ^c
		180678	< 0.2	— ^c
		180679	< 0.3	— ^c
10	8	180730	< 0.3	— ^c
4	4	180731	< 0.3	— ^c
		180732	< 0.3	— ^c
		180733	< 0.3	— ^c
10H	7	180734	< 0.3	— ^c
		180735	< 0.3	— ^c
		180736	< 0.3	— ^c
		180737	< 0.3	— ^c
67	0 ^b	180738	< 0.3	< 1.0
		180739	< 0.3	— ^c

Table 4-7
(continued)

Page 4 of 4

Building Number	Number of Employees	Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
		180740 ^c	< 0.3	— ^c
52	0 ^b	180741	< 0.3	— ^c
		180742	< 0.3	— ^c
Guard House	2	180743	< 0.3	— ^c
14	4	180744	< 0.3	— ^c
		180745	< 0.2	— ^c

^aBackground has not been subtracted Background for the Maywood site is 1.0 pCi/L.

^bNo full-time employees. Employees enter the building as needed.

^cCanister was not analyzed for thoron (Rn-220).

^dCanister found upside down or disturbed upon retrieval.

^eDuplicate sample.

Table 4-8
**Concentrations of Radon and Thoron
 at the Sunoco Station Property,
 167 Route 17 North, Maywood**

Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180617	< 0.2	— ^b
180622	< 0.3	< 1.0

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bCanister was not analyzed for thoron.

Table 4-9
Concentrations of Radon
at the Uniform Fashions Property
(former Federal Express),
137 Route 17 North, Maywood

Sample Number	Radon (pCi/L) ^a
180603	< 0.2
180610	< 0.2
180612	0.3
180620	< 0.3
180644	< 0.3
180646	< 0.2
180654	< 0.2
180657	< 0.2
180662	0.3
180664	< 0.2
180669	0.3

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

Table 4-10
 Concentrations of Radon and Thoron
 at the Flint Ink Property,
 80 Industrial Road, Lodi

Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180794	< 0.3	_____ b
180799	0.5	_____ b
180801	< 0.3	_____ b
180802	< 0.3	_____ b
180803	< 0.3	< 1.0
180806	< 0.6	_____ b
180811	0.4	_____ b
180816	< 0.3	< 1.0
180900	0.4	_____ b
180901	0.5	_____ b
180902	< 0.3	_____ b
180903	< 0.3	_____ b
180904	< 0.4	_____ b

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bCanister was not analyzed for thoron.

Table 4-11
Concentrations of Radon
at Bergen Cable,
170 Gregg Street, Lodi

Sample Number	Radon (pCi/L) ^a
180632	<0.3
180633	<0.2
180634	<0.2
180635	<0.2
180636	<0.2
180637	<0.2
180638	<0.2
180639	<0.2
180640	<0.2
180641	<0.2
180642	<0.2
180643	0.3
180645	0.3
180647	<0.2
180648	<0.3
180649	0.4
180650	<0.2
180651	<0.2
180652	<0.3
180653	<0.2
180655	<0.2
180656	<0.2
180658	<0.2
180659	<0.2
180660	<0.2

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

Table 4-12
 Concentrations of Radon and Thoron
 at the Airco Property,
 80 Hancock Street, Lodi

Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180550	0.4	— ^b
180551	<0.2	— ^b
180552	0.4	<2.0
180553	<0.3	— ^b
180554	<0.3	— ^b
180555	<0.3	— ^b
180556	0.4	— ^b
180557	0.4	— ^b
180558 ^c	0.3	— ^b
180559	<0.3	— ^b
180560	<0.2	<0.9

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bCanister was not analyzed for thoron.

^cDuplicate sample.

Table 4-13
 Concentrations of Radon and Thoron
 at the Heather Hill Property (formerly Appleton Electric),
 100 Hancock Street, Lodi

Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180746	<0.4	_____ b
180747	<0.4	_____ b
180748	<0.4	_____ b
180749	<0.4	_____ b
180750	<0.4	<1.0
180751 ^c	<0.4	<1.0
180752	0.5	_____ b
180753 ^c	<0.4	_____ b
180754	0.5	_____ b
180755	<0.4	<1.0

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bCanister was not analyzed for thoron.

^cDuplicate sample.

Table 4-14
 Concentrations of Radon and Thoron
 at the DeSaussure Property,
 23 West Howcroft Avenue, Maywood

Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180477	<0.3	<0.8
180478	<0.3	_____ b
180479	<0.3	_____ b
180480	<0.3	_____ b
180481	0.3	<0.6
180482 ^c	0.4	_____ b
180483	<0.3	_____ b
180484	<0.2	_____ b
180485	<0.2	_____ b
180486	<0.2	_____ b
180487	<0.3	_____ b
180488	0.4	_____ b
180489	0.4	_____ b

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bCanister was not analyzed for thoron.

^cDuplicate sample.

Table 4-15
 Concentrations of Radon and Thoron
 at the Joseph Muscarelle Property,
 Route 17 and Essex Street, Maywood

Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180535	< 0.3	_____ b
180536	< 0.3	_____ b
180537	< 0.3	_____ b
180538	0.4	_____ b
180539	< 0.3	< 1.0
180540	< 0.3	_____ b
180541	< 0.3	_____ b
180542 ^c	< 0.3	_____ b
180543 ^{c,d}	< 0.3	_____ b

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bCanister was not analyzed for thoron.

^cCanister was found upside down or disturbed at the time of retrieval.

^dDuplicate sample.

Table 4-16
Concentrations of Radon
at the Sears Repair Center,
200 Route 17 South, Maywood

Sample Number	Radon (pCi/L) ^a
180756	<0.4
180757	<0.4
180758	<0.4
180759	<0.4
180763	<0.4
180764	<0.4
180765	<0.4
180766	<0.4
180767	<0.4
180768	<0.4
180769	<0.4
180770 ^b	<0.4

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bDuplicate sample.

Table 4-17
Concentrations of Radon and Thoron
at the Sears Distribution Center Property,
149-151 Maywood Avenue, Maywood

Page 1 of 3

Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180771	<0.4	<2.0
180772	<0.4	_____b
180773 ^c	<0.4	_____b
180774	<0.4	_____b
180775	<0.4	_____b
180776	<0.4	_____b
180830	<0.5	_____b
180831	<0.4	_____b
180832	0.5	_____b
180833	<0.4	_____b
180834	<0.4	_____b
180835	<0.4	<1.0
180836	<0.4	_____b
180837	<0.4	_____b
180838 ^d	<0.5	_____b
180839	<0.4	_____b
180840	<0.4	_____b
180841	<0.4	_____b
180842	<0.5	_____b
180843 ^c	0.5	_____b
180844	<0.5	_____b
180845 ^d	<0.4	_____b
180846	<0.4	_____b
180847 ^c	<0.4	_____b
180848	<0.4	_____b
180849 ^c	<0.4	_____b

Table 4-17
(continued)

Page 2 of 3

Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180850	<0.4	b
180851	<0.4	<1.0
180852	<0.5	b
180853	<0.4	b
180854 ^c	<0.4	b
180855	<0.4	<0.2
180856	<0.5	b
180857	<0.5	b
180858	<0.5	b
180859	0.5	b
180860	0.6	b
180861	<0.4	<1.0
180862	<0.4	b
180863	<0.4	b
180864	<0.4	b
180865 ^d	<0.4	b
180866	<0.5	b
180867	0.5	b
180868	<0.4	b
180869	0.6	b
180870	<0.5	b
180871	<0.5	b
180872	<0.5	<1.0
180873	<0.4	b
180874	<0.4	b
180875	0.5	b
180876	<0.5	b
180877 ^c	0.6	b
180878 ^c	0.6	b

Table 4-17
(continued)

Page 3 of 3

Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180879	0.5	— ^b
180880	<0.5	— ^b
180881	0.5	— ^b
180882	<0.4	— ^b
180883	0.5	— ^b
180884	<0.5	— ^b
180885	<0.5	— ^b
180886 ^d	<0.5	— ^b
180887	0.5	— ^b
180888	1.0	— ^b
180889	<0.4	— ^b
180890	<0.5	<1.0
180891	1.7	— ^b
180992	0.5	<1.0
180893	0.8	— ^b
180894	<0.5	— ^b
180895	<0.4	— ^b
180896	<0.4	— ^b
180897	<0.4	— ^b
180898	<0.5	— ^b
180899	<0.5	— ^b

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bCanister was not analyzed for thoron.

^cCanister found upside down or disturbed upon retrieval.

^dDuplicate sample.

Table 4-18
 Concentrations of Radon and Thoron
 at the Myron Manufacturing Properties,
 50 and 61 West Hunter Avenue and 205 Maywood Avenue, Maywood

Page 1 of 2

Sample Number	Location	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180490	61 West Hunter Avenue	<0.3	_____ b
180491	61 West Hunter Avenue	0.3	_____ b
180492	61 West Hunter Avenue	<0.3	_____ b
180493	61 West Hunter Avenue	<0.3	_____ b
180494	61 West Hunter Avenue	<0.3	_____ b
180495	50 West Hunter Avenue	0.4	_____ b
180496	50 West Hunter Avenue	<0.3	_____ b
180497	50 West Hunter Avenue	0.3	_____ b
180498	50 West Hunter Avenue	0.5	_____ b
180499	50 West Hunter Avenue	<0.2	_____ b
180500	50 West Hunter Avenue	<0.3	_____ b
180501	205 Maywood Avenue	<0.2	_____ b
180502	205 Maywood Avenue	<0.2	_____ b
180503	205 Maywood Avenue	<0.3	_____ b
180504	205 Maywood Avenue	<0.4	_____ b
180505	205 Maywood Avenue	<0.3	<0.6
180506 ^c	205 Maywood Avenue	<0.3	<0.7
180507	205 Maywood Avenue	<0.3	<0.7
180508	205 Maywood Avenue	<0.3	_____ b
180509	205 Maywood Avenue	<0.3	_____ b
180510	205 Maywood Avenue	<0.3	_____ b
180511	205 Maywood Avenue	<0.2	_____ b
180512	205 Maywood Avenue	<0.2	_____ b
180513	205 Maywood Avenue	<0.2	_____ b
180514	205 Maywood Avenue	<0.3	_____ b
180515 ^d	205 Maywood Avenue	<0.2	_____ b

Table 4-18

(continued)

Page 2 of 2

Sample Number	Location	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180516	205 Maywood Avenue	<0.2	— ^b
180517 ^d	205 Maywood Avenue	<0.3	— ^b
180518	205 Maywood Avenue	<0.3	— ^b
180519	205 Maywood Avenue	<0.3	— ^b
180520	205 Maywood Avenue	<0.3	— ^b
180521	205 Maywood Avenue	<0.3	— ^b
180522	205 Maywood Avenue	<0.3	— ^b
180523	205 Maywood Avenue	<0.3	— ^b
180524	205 Maywood Avenue	<0.3	— ^b
180525	205 Maywood Avenue	<0.2	— ^b
180526	205 Maywood Avenue	<0.2	— ^b
180527	205 Maywood Avenue	<0.2	— ^b
180528	205 Maywood Avenue	<0.3	— ^b
180529	205 Maywood Avenue	<0.2	— ^b
180530	205 Maywood Avenue	<0.2	— ^b
180531	205 Maywood Avenue	<0.3	— ^b
180532 ^c	205 Maywood Avenue	<0.3	— ^b
180533	205 Maywood Avenue	<0.3	— ^b
180534	205 Maywood Avenue	<0.3	— ^b

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bCanister was not analyzed for thoron.

^cDuplicate sample.

^dCanister found upside down or disturbed upon retrieval.

Table 4-19
Concentrations of Radon
at the New Jersey Vehicle Inspection Station,
8 Mill Street, Lodi

Sample Number	Radon (pCi/L) ^a
180544	0.5
180545	0.6
180546	0.4
180547	0.5
180548	0.5
180549	<0.3

^aBackground has not been subtracted Background
for the Maywood site is 1.0 pCi/L.

Table 4-20
**Concentrations of Radon and Thoron
at the Fire Station No. 2 Property,
Kennedy Drive and Brook Street, Lodi**

Sample Number	Radon (pCi/L) ^a	Thoron (pCi/L) ^a
180666	0.8	— ^b
180667	0.7	<2.0
180668	0.7	<1.0
180760	0.7	— ^b
180761 ^c	<0.4	— ^b
180762	0.7	— ^b

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bCanister was not analyzed for thoron.

^cDuplicate sample.

Table 4-21
Concentrations of Radon
at John F. Kennedy Park,
Kennedy Drive and Money Street, Lodi

Sample Number	Radon (pCi/L) ^a
180661	1.1
180663 ^b	0.7
180665	0.6

^aBackground has not been subtracted. Background for the Maywood site is 1.0 pCi/L.

^bDuplicate sample.

5.0 CONCLUSIONS AND FUTURE ACTIONS

Gamma exposure rate data indicate that the highest exposure measurements, both interior and exterior, are located on the Stepan Company property in areas that are not occupied on a full-time basis by Stepan employees. Both areas are adjacent to the site of the former thorium processing buildings, where contaminated soils are known to be present. The area is covered by grass, and because the thorium compound contained in the soils is not highly soluble in water, contaminant migration is not likely via surface water runoff. In addition, institutional controls such as posting of the area as radioactively contaminated and demarcation with rope are in place to identify the area to potential trespassers as a contamination area and to aid in limiting access. Tables 5-1, 5-2, and 5-3 present summaries of the analytical data.

Analytical data for radon indicate that indoor radon concentrations at the 19 properties investigated do not exceed the DOE guideline of 3.0 pCi/L above background or the EPA and NJDEP action level of 4.0 pCi/L, including background. At 4.0 pCi/L, including background, both EPA and the state recommend that further action need not be taken and that follow-up is probably not needed and should be evaluated on a case-by-case basis. The highest concentration of radon measured was 3.4 pCi/L, including background, inside Building 3 on the Stepan Company property. This building was constructed above a known burial area containing thorium process wastes and residues and is not occupied on a full-time basis by Stepan employees.

There is no currently established guideline or action level for thoron; however, analytical results from measurements obtained at 12 of the 19 properties indicated the maximum concentration of thoron to be 2.0 pCi/L, which is well below the guidelines and action levels established for radon.

Review of the data collected during this investigation indicate the following:

- Gamma exposure rate measurements taken during this investigation are comparable to gamma radiation measurements recorded during previous surveys at many of

these properties. No significant changes were noted between the data collected in March 1994 and the results of earlier surveys.

- Elevated gamma exposure rate measurements were recorded on the Stepan Company property adjacent to an area of the DOE-owned MISS where thorium processing buildings were once located. These elevated readings on the Stepan property appear to be the result of this highly contaminated area on MISS. DOE will continue the institutional controls to restrict access to this area, maintain appropriate radiation postings, and perform routine environmental monitoring. In addition, actions to reduce radiation levels in this area will be considered (such as shielding with clean soil, concrete, etc.), and efforts to reduce potential exposure to workers will be coordinated with Stepan.
- None of the radon or thoron concentrations measured on the 19 commercial and governmental properties exceeds the DOE guideline of 3.0 pCi/L above background or the EPA and NJDEP action level of 4.0 pCi/L including background (background is 1.0 pCi/L). The concentrations measured do not pose an imminent health hazard to occupants of these properties.
- Although radon concentrations measured in Building 3 on the Stepan property were below DOE, EPA, and NJDEP guidelines, DOE will inform Stepan that the concentrations measured in Building 3 were higher than concentrations measured in other buildings on the property and could increase or decrease depending upon building use. For example, because the building was constructed above a known burial area for thorium waste and can develop cracks in the floor over time, radon concentrations could increase under the current use scenario (building not occupied full-time and access limited to inspection and retrieval of supplies). If the building were to be accessed more frequently or its use were to change so that the building would be opened for longer periods of time, radon concentrations would decrease because of the increased ventilation to the interior of the building.

TABLES FOR SECTION 5.0

Table 5-1
Summary of Gamma Exposure Rate Measurement Data
for Commercial and Governmental Properties at the Maywood Site

Page 1 of 2

Location	Number Interior	Results (μ R/h)	Number Exterior	Results (μ R/h)
Stepan Company 100 W Hunter Ave , Maywood	28	8.5 - 27.7	28	7.5 - 54.4
Myron Manufacturing 205 Maywood Ave , Maywood	6	7.4 - 10.3	14	7.1 - 12.5
Bergen Cable 170 Gregg St , Lodi	2	8.8 - 9.1	3	8.0 - 10.0
Airco Medical 80 Hancock St , Lodi	7	7.0 - 11.4	7	6.5 - 9.3
Heather Hill (Appleton Elec) 100 Hancock St , Lodi	4	9.0 - 10.2	4	7.8 - 13.6
Flint Ink 80 Industrial Rd , Lodi	8	10.8 - 12.9	3	8.0 - 10.0
New Jersey Vehicle Inspection Station 8 Mill St , Lodi	1	8.7	7	8.4 - 13.0
Fire Station No. 2 Kennedy Drive, Lodi	3	9.9 - 10.5	5	7.3 - 9.2
J. F. Kennedy Park Money & Sidney Sts., Lodi	2	8.6 - 9.3	7	8.2 - 12.3
National Community Bank 174 Essex St., Lodi	3	8.8 ^a	6	7.1 - 9.5
National Community Bank 113 Essex St , Maywood	12	8.6 - 13.6	3	9.2 - 12.0

Table 5-1
(continued)

Page 2 of 2

Location	Number Interior	Results ($\mu\text{R/h}$)	Number Exterior	Results ($\mu\text{R/h}$)
Joseph Muscarelle Rt 17 and Essex St , Maywood	3	8.9 - 10.6	4	9.9 - 16.5
Sears Repair Center 200 Rt 17 South, Maywood	3	9.6 - 10.1	4	7.5 - 8.2
Sears Distribution Center 149-151 Maywood Ave., Maywood	17	9.6 - 13.9	6	8.0 - 13.9
DeSaussure 23 W Howcroft Ave , Maywood	6	6.6 - 8.5	5	7.6 - 27.4
Meta-Lite ^b (Hunter Douglas) 85-99 Rt. 17 North, Maywood	7	7.9 - 11.7	6	8.6 - 15.6
Mark Correctional ^b (Hunter Douglas) 85-99 Rt 17 North, Maywood	6	7.9 - 10.1	6	8.6 - 15.6
PC Warehouse ^b (Hunter Douglas) 85-99 Rt 17 North, Maywood	9	9.2 - 12.1	6	8.6 - 15.6
Uniform Fashions (former Federal Express) 137 Rt. 17 North, Maywood	5	8.7 - 10.0	6	8.6 - 19.6
Gulf Station 239 Rt. 17 North, Maywood	1	10.9	3	9.6 - 14.4
Sunoco Station 167 Rt. 17 North, Maywood	1	9.6	4	7.7 - 8.5

^aAll measurements were the same.

^bOne of three companies housed in the former Hunter Douglas building; all exterior readings will be the same.

Table 5-2
Summary of Radon Data
for Commercial and Governmental Properties at the Maywood Site

Page 1 of 2

Location	Number of Radon Samples	Range of Results (pCi/L)
Stepan Company 100 W Hunter Ave , Maywood	76	<0.2 - 3.4
Myron Manufacturing 205 Maywood Ave , Maywood	45	<0.2 - 0.5
Bergen Cable 170 Gregg St , Lodi	25	<0.2 - 0.4
Airco Medical 80 Hancock St., Lodi	11	<0.2 - 0.4
Heather Hill (Appleton Elec) 100 Hancock St , Lodi	10	<0.4 - 0.5
Flint Ink 80 Industrial Rd , Lodi	13	<0.3 - 0.5
New Jersey Vehicle Inspection Station 8 Mill St., Lodi	6	<0.3 - 0.6
Fire Station No. 2 Kennedy Drive, Lodi	6	<0.4 - 0.8
J. F. Kennedy Park Money & Sidney Sts , Lodi	3	0.6 - 1.1
National Community Bank 174 Essex St., Lodi	6	<0.2 - 0.3
National Community Bank 113 Essex St., Maywood	12	<0.2 - 0.6

Table 5-2
(continued)

Page 2 of 2

Location	Number of Radon Samples	Range of Results (pCi/L)
Joseph Muscarelle Rt. 17 and Essex St., Maywood	9	<0.3 - 0.4
Sears Repair Center 200 Rt. 17 South, Maywood	12	<0.4 ^a
Sears Distribution Center 149-151 Maywood Ave., Maywood	76	<0.4 - 1.7
DeSaussure 23 W Howcroft Ave., Maywood	13	<0.2 - 0.4
Meta-Lite ^b (Hunter Douglas) 85-99 Rt. 17 North, Maywood	14	<0.2 - <0.3
Mark Correctional ^b (Hunter Douglas) 85-99 Rt. 17 North, Maywood	15	<0.2 - 0.3
PC Warehouse ^b (Hunter Douglas) 85-99 Rt. 17 North, Maywood	16	<0.2 - 0.4
Uniform Fashions (former Federal Express) 137 Rt. 17 North, Maywood	11	<0.2 - 0.3
Gulf Station 239 Rt. 17 North, Maywood	2	1.0 - 1.3
Sunoco Station 167 Rt. 17 North, Maywood	2	<0.2 - <0.3

^aAll concentrations measured were the same.

^bOne of three companies housed in the former Hunter Douglas building.

Table 5-3
Summary of Thoron Data
for Commercial and Governmental Properties at the Maywood Site

Page 1 of 2

Location	Number of Radon Samples	Range of Results (pCi/L)	
		Minimum	Maximum
Stepan Company 100 W. Hunter Ave., Maywood	7	<1.0	<2.0
Myron Manufacturing 205 Maywood Ave., Maywood	3	<0.6	<0.7
Airco Medical 80 Hancock St., Lodi	2	<0.9	<2.0
Heather Hill (Appleton Elec) 100 Hancock St , Lodi	3	<1.0	<1.0
Flint Ink 80 Industrial Rd , Lodi	2	<1.0	<1.0
Fire Station No. 2 Kennedy Drive, Lodi	2	<1.0	<2.0
National Community Bank 113 Essex St., Maywood	3	<0.9	<1.0
Joseph Muscarelle Rt 17 and Essex St., Maywood	1	--	<1.0
Sears Distribution Center 149-151 Maywood Ave., Maywood	8	<1.0	<2.0
DeSaussure 23 W. Howcroft Ave , Maywood	2	<0.6	<0.8

Table 5-3
(continued)

Page 2 of 2

Location	Number of Radon Samples	Range of Results (pCi/L)	
		Minimum	Maximum
Gulf Station 239 Rt 17 North, Maywood	1	--	<2.0
Sunoco Station 167 Rt. 17 North, Maywood	1	--	<1.0

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