Mr. James D. Berger, Director
Energy/Environment Systems Division
Oak Ridge Institute for
Science and Education
Post Office Box 117
Oak Ridge, Tennessee 37831-0117

JUN 14 1993

Dear Mr. Berger:

This letter provides authorization for ORISE to perform the following non-fee recoverable work (subject to acceptable survey plans):

1) Perform a radiological survey at the Alcoa Building 65 in Cleveland, Ohio. as per the enclosed RFTA 93-030.

This work should be performed under the Interagency Agreement entitled "Radiological Evaluation Assistance for Formerly Licensed Sites", FIN A9093. Funding for this task was previously provided via an executed NRC Form 173.

ORISE should perform the following fee recoverable work (subject to acceptable survey plans):

1) Perform a radiological survey at the Westinghouse, Large, Pa. site as per RFTA 93-031.

This work should be performed under the Interagency Agreement entitled "Radiological Safety Inspections and Evaluations, License Fee Recoverable", FIN A9076. Funding for this task was previously provided via an executed NRC Form 173.

I have also enclosed the Survey Plan Approval Form for a survey of ITT Electro-Optical in Roanoke, Va. and for a survey at the lagoons at the Northeast Ohio Regional Sewer District in Cleveland, Oh.

If you have any questions, please give me a call at 301-504-2656.

ORIGINAL SIGNED BY

9403210113 930614
PDR ADOCK 07000997
C PDR

David Tiktinsky, Technical Assistance
Project Manager
Program Management, Policy Development
and Analysis Staff, NMSS

301-504-2656

Enclosures: As stated
cc: RKernard, ORISE (fax)
MLandis, ORISE (fax)
BLance, ORISE (fax)

Distribution:

DTiktinsky	GBeveridge	TMo, FCSS
JHenson, REG 2	TJohnson, LLWM	SNalluswami, LLWM
NMSS r/f	C. Thor Oberg, Reg 1	
FIN A9093, A9076		

OFC	RMB	E	RMB	C	FCSS	E		
NAME	DTiktinsky		GBeveridge		TMo			
DATE	06/ /93		06/14/93		06/ /93			

C = COVER E = COVER & ENCLOSURE N = NO COPY

"OFFICIAL RECORD COPY"

ML 10

REQUEST FOR TECHNICAL ASSISTANCE (RFTA)

INSPECTORS NAME T.C. Johnson TELEPHONE # 301-504-3603

FACILITY NAME AND LOCATION ALCOA, Cleveland, OH

DOCKET 040-00501 DATE OF REQUEST May 10, 1993 RFTA # [illegible]
(LEAVE BLANK)

FEE OR NON-FEE RECOVERABLE Non-Fee Recoverable

DESCRIPTION OF WORK TO BE PERFORMED (INCLUDING SCHEDULE) (USE SEPARATE SHEET IF NEEDED)

Review ALCOA Building 65 final survey data submitted by ALCOA and perform confirmatory survey.

FOR CONFIRMATORY SURVEY REQUESTS PLEASE ANSWER THE FOLLOWING:

1. HAS PRELIMINARY INFORMATION BEEN RECEIVED FROM LICENSEE YES —— NO XX
1A HAS THIS INFORMATION BEEN REVIEWED BY NRC AND IS IT ACCEPTABLE?
Final survey data scheduled to be submitted to NRC on June 11, 1993.

(NOTE: ORAU SHOULD BE PROVIDED 30 DAYS TO REVIEW INFORMATION AND PREPARE FOR SURVEY)

2. IS A PRELIMINARY SITE VISIT NEEDED? No WHEN?
3. DATES SURVEY PLAN NEEDED Two weeks after submittal of final data
4. DATE SURVEY NEEDED Four weeks after submittal of final survey data

AUTHORIZATION

5-10-93 John H. Austin 5/10/93
INSPECTOR DATE BRANCH CHIEF DATE

EMERGENCY AUTHORIZATION (SEE INSPECTION CHAPTER 0312 FOR DEFINITION OF ACCEPTABLE EMERGENCY REQUESTS)

DIVISION DATE

APPROVAL

[illegible] [illegible]
HQ TAPM DATE HQ TECHNICAL MONITOR DATE
[illegible] [illegible]

Exhibit 1

REQUEST FOR TECHNICAL ASSISTANCE (RFTA)

INSPECTOR'S NAME C. Thor [illegible] TELEPHONE # 215-337-5202

FACILITY NAME AND LOCATION Westinghouse Electric Corp., Large, PA site

DOCKET [illegible] DATE OF REQUEST 6/7/93 RFTA # 93.001 (LEAVE BLANK)

FEE OR NON-FEE RECOVERABLE Recoverable TAC U00643

PROVIDE APPLICATION DATE (FROM LICENSEE) 1/11/93

PLEASE CHECK NEW LICENSE ___ AMENDMENT ___ RENEWAL ___ Termination ✓

DESCRIPTION OF WORK TO BE PERFORMED (INCLUDING SCHEDULE) (USE SEPARATE SHEET IF NEEDED)

1. Preliminary evaluation of survey plans and techniques
2. Evaluation of Survey reports
3. ~~Co~~ Confirmatory survey plan and cost estimate
4. ~~3.~~ Confirmatory Survey

FOR CONFIRMATORY SURVEY REQUESTS, PLEASE ANSWER THE FOLLOWING:

1. HAS PRELIMINARY INFORMATION BEEN RECEIVED FROM LICENSEE? YES X NO ___

1A. HAS THIS INFORMATION BEEN REVIEWED BY NRC AND IS IT ACCEPTABLE? YES X NO ___

(NOTE: ORAU SHOULD BE PROVIDED 30 CALENDAR DAYS TO REVIEW INFORMATION AND PREPARE FOR SURVEY).

2. IS A PRELIMINARY SITE VISIT NEEDED? yes WHEN? Spring/Summer 1993
3. DATE SURVEY PLAN NEEDED Early Summer 1993
4. DATE SURVEY NEEDED Summer 1993

Licensee desires final action by 10-1-93

AUTHORIZATION

	3/3/93	Ronald R. Bellamy	March 10, 1993
INSPECTOR	DATE	BRANCH CHIEF	DATE

EMERGENCY AUTHORIZATION (SEE INSPECTION CHAPTER 0312 FOR DEFINITION OF ACCEPTABLE EMERGENCY REQUESTS). EXPLAIN, ON SEPARATE SHEET, THE JUSTIFICATION FOR THE EMERGENCY REQUEST. *NOTE THAT THE REQUEST CANNOT BE PROCESSED WITHOUT THIS JUSTIFICATION.

DIVISION	DATE

APPROVAL

	6/18/93		6/14/93
HQ TAPM	DATE	HQ TM	DATE

ORAU CONFIRMATORY RADIOLOGICAL SURVEY PLAN APPROVAL FORM

1. PLEASE ANSWER THE FOLLOWING QUESTIONS. IF THERE ARE ANY PROBLEMS OR CONCERNS RELATED TO THE SURVEY PLAN PLEASE STATE THEM IN THE AREA DESIGNATED

NAME/LOCATION OF SITE TO BE SURVEYED NE OHIO REGIONAL SEWER DT. SOUTHERLY PLAN, CLEVELAND

INSPECTOR M. SAM NALLUSWAMI REGION III SURVEY DATE(S) JUNE 15-29, 93

	YES	*NO
A) IS THE SCOPE OF THE PROPOSED SURVEY AS PRESENTED IN THE SURVEY PLAN REASONABLE AND ADEQUATE?	X	
B) IS THE SAMPLING PROPOSED BY ORAU REASONABLE AND NECESSARY FOR PERFORMANCE OF THE SURVEY?	X	
C) IS THE AMOUNT OF TIME NEEDED TO PERFORM AS STATED IN THE SURVEY PLAN REASONABLE?	X	
D) IS THE COST ESTIMATE PROVIDED TO PERFORM THE SURVEY REASONABLE?	X	
E) IS THE PROPOSED TIMING OF THE SURVEY SATISFACTORY?	X	

2. PLEASE EXPLAIN THE ANSWERS WHICH ARE MARKED "NO" IN SECTION 1.

3. I CERTIFY THAT I HAVE REVIEWED THE SURVEY PLAN SUBMITTED BY ORAU AND THAT THE PLAN IS (CIRCLE ONE)

[✓ A.] ACCEPTABLE AS SUBMITTED.

B. ACCEPTABLE WITH MODIFICATIONS STATED ABOVE.

C. NOT ACCEPTABLE (ORAU MUST RESUBMIT FOR APPROVAL).

INSPECTOR DATE 6-11-93

SUPERVISOR John H. Austin DATE 6/11/93

4. HEADQUARTERS APPROVAL

TAPM 6/14/93 DATE

TM 6/14/93 DATE

Exhibit 3

ORAU CONFIRMATORY RADIOLOGICAL SURVEY PLAN APPROVAL FORM (SPAF)

1. PLEASE ANSWER THE FOLLOWING QUESTIONS. IF THERE ARE ANY PROBLEMS OR CONCERNS ABOUT THE SURVEY PLAN, PLEASE STATE THEM IN THE AREA DESIGNATED.

NAME/LOCATION OF SITE TO BE SURVEYED ITT ELECTRO-OPTICAL, ROANOKE, VA

INSPECTOR J. Henson REGION II SURVEY DATE(S) June 14-18, 1993

	YES	NO*
A) IS THE SCOPE OF THE PROPOSED SURVEY AS PRESENTED IN THE SURVEY PLAN, REASONABLE AND ADEQUATE?	X	
B) IS THE SAMPLING PROPOSED BY ORAU REASONABLE AND NECESSARY FOR PERFORMANCE OF THE SURVEY?	X	
C) IS THE AMOUNT OF TIME NEEDED TO PERFORM, AS STATED IN THE SURVEY PLAN REASONABLE?	X	
D) IS THE COST ESTIMATE PROVIDED TO PERFORM THE SURVEY REASONABLE?	X	
E) IS THE PROPOSED TIMING OF THE SURVEY SATISFACTORY?	X	

2. *PLEASE EXPLAIN THE ANSWERS THAT ARE MARKED "NO" IN SECTION 1. USE SEPARATE SHEET IF NECESSARY.

N/A

3. I CERTIFY THAT I HAVE REVIEWED THE SURVEY PLAN SUBMITTED BY ORAU AND THAT THE PLAN IS (CIRCLE ONE):

A. ACCEPTABLE AS SUBMITTED.

B. ACCEPTABLE WITH MODIFICATIONS STATED ABOVE.

C. NOT ACCEPTABLE (ORAU MUST RESUBMIT FOR APPROVAL).

J. Henson 6/10/93
INSPECTOR DATE

C. Hosey 6/10/93
SUPERVISOR DATE

4. HEADQUARTERS APPROVAL

D. Tiktinsky, NMSS 6/14/93 [illegible] 6/14/93
TAPM DATE TM DATE

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

SEP 28 1993

License No. SNM-951 Docket No. 070-00997

Oak Ridge Institute For Science and Education
ATTN: Armin J. Ansari, Ph.D.
Project Leader
Environmental Survey and Site Assessment Program
Energy/Environment Systems Division
P. O. Box 117
Oak Ridge, Tennessee 37831-0117

Dear Dr. Ansari:

Subject: WESTINGHOUSE ELECTRIC CORPORATION, LARGE, PENNSYLVANIA ANALYTICAL TECHNIQUES FOR REMEDIAL SAMPLES

Your letter dated July 23, 1993, page -4-, under Item 2., Subitems (c) and (d), in reference to Table 9 of the W, Large site, License Termination Report #009, General Information, requested additional information concerning the analytical techniques used by Westinghouse Electric Corporation (W) for the determination of uranium (U) concentrations by alpha and gamma spectrometry on soil taken from the W, Large, Pennsylvania site. The W procedure for these analyses is enclosed.

Your letter dated August 3, 1993, requested clarification of MDA calculations listed in Table 6 of the License Termination Report #009. Information furnished by the additional reports that we sent to you with our letter dated August 3, 1993, plus the information provided on August 9, 1993, during the site visit, should provide the clarification you requested.

Please advise us if you have additional questions or comments.

We appreciate your advice and assistance in this matter.

Sincerely,

John D. Kinneman, Chief
Research, Development, and
Decommissioning Section
Division of Radiation Safety
and Safeguards

ML10

Enclosure:
Westinghouse Electric Corporation
Document RS 93-041

cc: (w/o enclosure)
D. Tiktinsky, NMSS
T. Mo, NMSS

bcc: (w/o enclosure)
Region I Docket Room (w/ enclosure)
J. Kinneman, RI
M. Roberts, RI
T. Oberg, RI

CONVERSATION RECORD

TIME 11:20 a

DATE 7/30/93

TYPE

☐ VISIT ☐ CONFERENCE ☒ TELEPHONE

☐ INCOMING

☒ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU A. Joe Nardi Mgr, Regulatory ~~Regulatory~~ Services

ORGANIZATION (Office, dept., bureau, etc.) W El. Corp, Pgh PA Re Large PA

TELEPHONE NO: 412-374-4652

SUBJECT Gen. Info per Decommissioning of Site

SUMMARY

1. A. J. Nardi will be on vacation for next 3 Weeks (first 3 of August). Any questions on Large, PA site, MDAs in particular, Call/talk to Jim Flanigan (412-374-4651)

2. Info on analytical procedures for soils from Waltz Mill will be in mail today, Address personally to CTO because don't necessarily want it to go into PDR

3. Mr. Bere Mike is Eugene J. Miles, Director, Fuel Cycle Materials and Services.

4. Will not attend Meeting on 8/17/93

Advised him (Nardi) that we are trying to get ORISE to Large for visit early in Aug.

(OVER)

ACTION REQUIRED

Await info from AJ Nardi

NAME OF PERSON DOCUMENTING CONVERSATION Oberg

SIGNATURE Oberg

DATE 7/30/93

ACTION TAKEN

SIGNATURE

TITLE

DATE

50271-101

U.S. G.P.O. 1983-381-526/8346

CONVERSATION RECORD

OPTIONAL FORM 271 (12-76)
DEPARTMENT OF DEFENSE

CONVERSATION RECORD

TIME ~~[illegible]~~ am

DATE 8/3/93 ~~7/31~~ 93

TYPE ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE

☐ INCOMING

☒ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: Jim Flanigan Sr. Engr

ORGANIZATION (Office, dept., bureau, etc.): W El. Corp. PGPA Re. Large PA. Site

TELEPHONE NO: 412-374 4651

SUBJECT: Planned Site Review Visit /ORISE @ Large PA
070-00997, SNM-951, TAC L20643, 22110, AZ

SUMMARY:
① Advised W of Site Visit by ORISE
& NRC Inspector, Possibly only One day,
Option Aug 9, 10, or 11, 1993

Fine, just let W (Jim Flanagan) know & Will be available

(Monday 8/9/93 Armin Ansari
630 Flight U.S. Air Lv. 6:30 Ar Pgh. 7:32 calls

(Remediate, not decommissioned)

(OVER)

ACTION REQUIRED

NAME OF PERSON DOCUMENTING CONVERSATION | SIGNATURE | DATE

ACTION TAKEN

SIGNATURE | TITLE | DATE

50271-101 ✪U.S. G.P.O. 1983-381-526/8346

CONVERSATION RECORD

OPTIONAL FORM 271 (12-76)
DEPARTMENT OF DEFENSE

Exhibit 3

ORAU CONFIRMATORY RADIOLOGICAL SURVEY PLAN APPROVAL FORM (SPAF)

1. PLEASE ANSWER THE FOLLOWING QUESTIONS. IF THERE ARE ANY PROBLEMS OR CONCERNS ABOUT THE SURVEY PLAN, PLEASE STATE THEM IN THE AREA DESIGNATED.

NAME/LOCATION OF SITE TO BE SURVEYED WESTING HOUSE - LARGE, PA

INSPECTOR(S) MARK ROBERTS
C. THOR OBERG

REGION I SURVEY DATE(S) 8-23/8-26

	YES	NO*
A) IS THE SCOPE OF THE PROPOSED SURVEY AS PRESENTED IN THE SURVEY PLAN, REASONABLE AND ADEQUATE?	X	
B) IS THE SAMPLING PROPOSED BY ORAU REASONABLE AND NECESSARY FOR PERFORMANCE OF THE SURVEY?	X	
C) IS THE AMOUNT OF TIME NEEDED TO PERFORM, AS STATED IN THE SURVEY PLAN REASONABLE?	X	
D) IS THE COST ESTIMATE PROVIDED TO PERFORM THE SURVEY REASONABLE?	X	
E) IS THE PROPOSED TIMING OF THE SURVEY SATISFACTORY?	X	

2. *PLEASE EXPLAIN THE ANSWERS THAT ARE MARKED "NO" IN SECTION 1. USE SEPARATE SHEET IF NECESSARY.

3. I CERTIFY THAT I HAVE REVIEWED THE SURVEY PLAN SUBMITTED BY ORAU AND THAT THE PLAN IS (CIRCLE ONE):

[✓ A.] ACCEPTABLE AS SUBMITTED. ACCEPTANCE SENT VIA LETTER.

B. ACCEPTABLE WITH MODIFICATIONS STATED ABOVE.

C. NOT ACCEPTABLE (ORAU MUST RESUBMIT FOR APPROVAL).

Mark Roberts 9-20-93
INSPECTOR DATE

9-20-93
SUPERVISOR DATE

4. HEADQUARTERS APPROVAL

TAPM DATE TM DATE

CONVERSATION RECORD

TIME 3:15 PM
DATE 10/18/93

TYPE
☐ VISIT
☐ CONFERENCE
☒ TELEPHONE
☐ INCOMING
☒ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU Joe Nardi

ORGANIZATION (Office, dept., bureau, etc.) Westinghouse, Large, PA Site

TELEPHONE NO: 412-374-4652

SUBJECT Confirmatory Report from ORISE

SUMMARY Returned call of 10/15/93 / FMif

Inquired into the status of the Confirmatory Survey Report from ORISE

Explained that ~~[illegible]~~ we have not received anything from ORISE as yet but understood from Morte Roberts that ~~they~~ OR anticipated they would have something to ~~they~~ RI during the week of 10/18/93.

Mr. Nardi requested that we inform him of any info from OR. Stated we would.

(OVER)

ACTION REQUIRED
Await ~~con~~ confirmatory Report from ORISE

NAME OF PERSON DOCUMENTING CONVERSATION Oberg

SIGNATURE Oberg

DATE 10/18/93

ACTION TAKEN

SIGNATURE

TITLE

DATE

SECTION COPY

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

November 2, 1993

John D. Kinneman, Chief
Research Development and Decommissioning Section
Division of Radiation Safety and Safeguards
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

SUBJECT: **DRAFT REPORT—CONFIRMATORY SURVEY OF BUILDINGS 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, AND 12, WESTINGHOUSE ELECTRIC CORPORATION, LARGE, PA [DOCKET NO. 70-997]**

Dear Mr. Kinneman:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education performed confirmatory surveys at the Westinghouse Large site during the period of August 30 through September 2, 1993. Enclosed are copies of the subject document for your review and comment. Any comments you may have will be incorporated into the final report.

Please direct any questions regarding the survey report to me at (615) 576-3740 or Michele Landis at (615) 576-2908.

Sincerely,

Eric W. Abelquist

Eric W. Abelquist
Project Leader
Environmental Survey and
Site Assessment Program

EA:rde

Enclosure

cc: T. Mo, NRC,NMSS 4E4
D. Tiktinsky, NRC/NMSS, 6E6
J. Swift, NRC/NMSS, 6H3
M. Roberts, NRC/Region I
M. Landis, ORISE/ESSAP
J. Berger, ORISE/ESSAP
PMDA
File/233

P.O. BOX 117, OAK RIDGE, TENNESSEE 37831-0117

Managed and operated by Oak Ridge Associated Universities for the U.S. Department of Energy

Region I FORM 303
(6-88)

U.S. NUCLEAR REGULATORY COMMISSION

REQUEST FOR ANALYSIS

Region I Laboratory

LABORATORY USE ONLY

CONTROL NUMBER 301525

SAMPLE LOCATION (LICENSEE) Westinghouse El. Corp., Advanced Energy Syst. Large, PA

LICENSE NO. SNM-951

DOCKET NO. 070-00997

SAMPLES SUBMITTED

#(TOTAL)	TYPE	VOLUME	WEIGHT
1	Soil	500cc	

DATE SAMPLES SUBMITTED

PRIORITY
ROUTINE ✓
URGENT ***

SAMPLE COLLECTION INTERVAL

	MONTH	DAY	YEAR	TIME
START	9	15	92	~10:30 am
STOP	9	15	92	~10:45 a.m

INSPECTOR RESPONSIBLE C. T. Oberg

PHONE EXT. 5202

	ANALYSIS TO BE PERFORMED	LIST DESIRED LLD *(Optional)*		OTHER TYPE OF ANALYSIS *(Specify)*	LIST DESIRED LLD *(Optional)*
	GROSS ALPHA		X	^{235}U	
	GROSS BETA		X	^{234}U	
✓	[✓ GAMMA SPEC]	✓ [illegible]	X	^{60}Co	
	TRITIUM				
	CARBON-14				
	IODINE-125				

REMARKS This is a split sample taken from area below "slop" sink at [illegible] pipe section 5. Licensee's identification number is 432-5-24 (#432 at pipe section 5, approximately 24 feet south from the outside of Building 5). This site is in process of cleanup for decommissioning. The sample is from an open trench where traces of ^{E}U were found in soil (Sample #85, 1.26E0 ± 6E-1 pCi ^{235}U/g soil & ~38 PCi ^{234}U/g soil). Historically, ^{235}U (^{E}U) was [illegible] used at site for fuel processing/anal. Subsequently, site was used for reactor component/equipment cleanup/decontamination.

NOTE: Samples will be discarded after analysis unless reasons are noted above in Remarks.

*** **FOR URGENT USE ONLY**– Signature Blocks below must be filled out by the Inspector's appropriate Section Chief and by the Chief, Effluents Radiation Protection Section BEFORE submitting this form to the Region I Laboratory.

SIGNATURE – APPROPRIATE NUCLEAR MATERIALS SAFETY SECTION CHIEF

DATE

SIGNATURE – CHIEF, EFFLUENTS RADIATION PROTECTION SECTION

DATE

(pink) 2. INSPECTOR

ID F-5484.1A
(Rev. 12-88)
Ref. ID 5484.1 RESL

NRC Docket # [illegible]

Routine ____ Inplant ____ Urgent ____

NRC Mod # ________ Environ ________

Non Routine ____ Date Needed ________

UNITED STATES DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE
RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY

SAMPLE RECORD SHEET

(not for NRC use)

Onsite ________

Offsite ________

Serial No. ________

Sample From: [illegible]

Collected By [illegible] Date Sent [illegible]

Organization [illegible]

Samples Received: [illegible]

Analysis Completed: ________

Notified: ________ Date: ________

Analyzed By: ________

Approved By: ________

Sample			Sample Description	Anal. for	Inst. used	Quant. used	Date cntd.	Count time	Gross count	Bkgd.	Net count		Result ± 1 σ*
No.	Date	Hour											
1			[illegible]	[illegible]									

Total dry weight = 585.06 grams
Total < 35 mesh = 123.15 grams
Total > 35 mesh = 461.91 grams

Total analyzed by γ-SPEC = 82.41 grams

copy to FNH 12-15-92

---

*Random uncertainties reported are 1 standard deviation, 1σ. small negative and other results ≤ 2σ are interpreted by RESL as including "zero" or as not detected. If appropriate, estimates of possible systematic errors are reported in parentheses.

Region I FORM 303
(8-88)

U.S. NUCLEAR REGULATORY COMMISSION

REQUEST FOR ANALYSIS

Region I Laboratory

LABORATORY USE ONLY

CONTROL NUMBER: 301525

SAMPLE LOCATION (LICENSEE): Westinghouse El. Corp., Advanced Energy Syst. Large, PA

LICENSE NO.: SNM-951

DOCKET NO.: 070-00997

SAMPLES SUBMITTED

#(TOTAL)	TYPE	VOLUME	WEIGHT
1	Soil	500cc	

DATE SAMPLES SUBMITTED:

PRIORITY
ROUTINE ✓
URGENT ***

SAMPLE COLLECTION INTERVAL

	MONTH	DAY	YEAR	TIME
START	9	15	92	~10:30am
STOP	9	15	92	~10:45am

INSPECTOR RESPONSIBLE: C. T. Oberg

PHONE EXT.: 5202

ANALYSIS TO BE PERFORMED	LIST DESIRED LLD *(Optional)*	OTHER TYPE OF ANALYSIS *(Specify)*	LIST DESIRED LLD *(Optional)*
GROSS ALPHA		X ^{235}U	
GROSS BETA		X ^{234}U	
GAMMA SPEC		X ^{60}Co	
TRITIUM			
CARBON-14			
IODINE-125			

REMARKS

This is a split sample taken from an area below "stop" sink at ~~[illegible]~~ pipe section 5. Licensee's identification number is 432-5-24 (#432 at pipe section 5, approximately 24 feet south from the outside of Building 5). This site is in process of cleaning for decommissioning. The sample is from an open trench where traces of ^{E}U were found in soil (Sample # [illegible], 1.26E0 ± 6E-1 pCi ^{235}U/g soil & ~.38 pCi ^{234}U/g soil). Historically, ^{235}U (^{E}U) was ~~processed~~ used at site for fuel processing [illegible]. Subsequently, site was used for [illegible] component/equipment cleaning / decontamination.

NOTE: Samples will be discarded after analysis unless reasons are noted above in Remarks.

*** **FOR URGENT USE ONLY**– Signature Blocks below must be filled out by the Inspector's appropriate Section Chief and by the Chief, Effluents Radiation Protection Section BEFORE submitting this form to the Region I Laboratory.

SIGNATURE – APPROPRIATE NUCLEAR MATERIALS SAFETY SECTION CHIEF | DATE

SIGNATURE – CHIEF, EFFLUENTS RADIATION PROTECTION SECTION | DATE

(pink) 2. INSPECTOR

ID F-5484.1A
(Rev. 12-88)
Ref. ID 5484.1 RESL

NRC Docket # [illegible]

Routine X Inplant ___ Urgent ___

NRC Mod # ___ Environ. ___

Non Routine ___ Date Needed ___

(not for NRC use)

Onsite ___

Offsite ___

UNITED STATES DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE
RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY

SAMPLE RECORD SHEET

Serial No. [illegible]

Sample From: [illegible]

Collected By [illegible] Date Sent [illegible]

Organization NRC - RI

Samples Received: ___

Analysis Completed: ___

Notified: ___ Date: ___

Analyzed By: [illegible]

Approved By: [illegible]

Sample			Sample Description	Anal. for	Inst. used	Quant. used	Date cntd.	Count time	Gross count	Bkgd.	Net count		Result ±1 σ*
No.	Date	Hour											
1	9/[illegible]	[illegible]	1 soil sample	[illegible]									
			(SC attached)										
				[illegible]			[illegible]						
			Total dry weight = 585.06 grams										
			Total < 35 mesh = 123.15 grams										
			Total ≥35 mesh = 461.91 grams										
			Total analyzed by γ-SPEC = 82.41 grams										
			copy to FBH 12-15-92										

*Random uncertainties reported are 1 standard deviation, 1σ, small negative and other results ≤ 2σ are interpreted by RESL as including "zero" or as not detected. If appropriate, estimates of possible systematic errors are reported in parentheses.

Replaces ID F-104

```
                    UNITED STATES DEPARTMENT OF ENERGY
                         IDAHO OPERATIONS OFFICE
             RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY

                           SAMPLE RECORD SHEET                   SERIAL NO.   15453A

         NRC1
**************************
* NRC MOD NO.            *
* ENVIRONMENTAL          *
**************************                ROUTINE

  SAMPLE DATE  15-SEP-1992    SAMPLE SENT  06-OCT-1992          ANALYZED BY: FDH,RLW,
  SAMPLE HOUR  1030 MST       SAMPLE RECEIVED  14-OCT-1992
  ORGANIZATION  NRC1       HARDCOPY PRINTOUT    8-FEB-1993   ELECTRONICALLY APPROVED BY: R.L. WILLIAMS

  COMMENTS:
  NRC1, COLLECTED BY TO, SOIL SAMPLE FROM WESTINGHOUSE, LARGE, PA
  #1, SOIL SAMPLE

   ISO     INST   QUANT       DATE      MIN    COUNTS  D BKG   R BLK       RESULTS +/- 1S;O*        UNITS

U234/233    24  1.00E+00  26-JAN-1993   932     2817     16       4   ( 5.7 +/- 0.2;0.2 )E -6 UCI/G

U235        24  1.00E+00  26-JAN-1993   932      169      2       1   ( 3.4 +/- 0.3;1.7 )E -7 UCI/G

U238        24  1.00E+00  26-JAN-1993   932      423     11       1   ( 8.4 +/- 0.5;0.5 )E -7 UCI/G
```

* ESTIMATED RANDOM UNCERTAINTY REPORTED IS ONE STANDARD DEVIATION, 1S. SMALL NEGATIVE AND OTHER RESULTS LESS THAN OR EQUAL TO 2S ARE INTERPRETED BY RESL AS INCLUDING "ZERO" OR AS NOT DETECTED. FOR RESULTS GREATER THAN 2S BUT LESS THAN OR EQUAL TO 3S, DETECTION IS QUESTIONABLE. RESULTS GREATER THAN 3S INDICATE DETECTION. O IS THE ESTIMATED OVERALL UNCERTAINTY.

```
                         UNITED STATES DEPARTMENT OF ENERGY
                              IDAHO OPERATIONS OFFICE
                  RADIOLOGICAL AND ENVIRONMENTAL SCIENCES LABORATORY

                               SAMPLE RECORD SHEET                  SERIAL NO.   15453A

     NRC1
**************************
* NRC MOD NO.            *
* ENVIRONMENTAL          *
**************************                   ROUTINE

  SAMPLE DATE  15-SEP-1992    SAMPLE SENT  06-OCT-1992          ANALYZED BY: G.MARLETTE, S.GIMPEL
  SAMPLE HOUR  1030 MST       SAMPLE RECEIVED  14-OCT-1992
  ORGANIZATION  NRC1       HARDCOPY PRINTOUT    8-FEB-1993   ELECTRONICALLY APPROVED BY: R.L. WILLIAMS

  COMMENTS:
  NRC1, COLLECTED BY TO, SOIL SAMPLE FROM WESTINGHOUSE, LARGE, PA
  #1, SOIL SAMPLE

  COLLECTION DATE:  15-SEP-1992  ANALYSIS DATE:  04-NOV-1992  DECAY TIME   50.2 DAYS*
  COUNT TIME  406 MIN.     DETECTOR NUMBER  1     SAMPLE SIZE  8.24E+01 g

      TOTAL   GROSS    BKGD   MINOR    NET      ISOTOPE           RESULTS +/- 1S;O**
      COUNT   COUNT   COUNT   COUNT   COUNT
               C/M     C/M     C/M     C/M                               uCi/g

         69    0.17                    0.17     CsD137       (  9 +/-   3;  3 )E -8

        512    1.26    0.60            0.66     K 40         ( 5.6 +/- 0.6;0.6 )E -6
```

```
 * DECAY CORRECTION OF NATURAL CHAIN DAUGHTERS PER LONGEST LIVED PARENT
** ESTIMATED RANDOM UNCERTAINTY REPORTED IS ONE STANDARD DEVIATION, 1S.  SMALL NEGATIVE AND OTHER
   RESULTS LESS THAN OR EQUAL TO 2S ARE INTERPRETED BY RESL AS INCLUDING "ZERO" OR AS NOT DETECTED.
   FOR RESULTS GREATER THAN 2S BUT LESS THAN OR EQUAL TO 3S, DETECTION IS QUESTIONABLE.  RESULTS
   GREATER THAN 3S INDICATE DETECTION.  O IS THE ESTIMATED OVERALL UNCERTAINTY.
```

Uranium Concentration in Soil, pCi/gm

	NRC/RESL-IOO	W/Waltz Mill Lab.	
Sample No.	432-5-24	432-5-24	085-5-24 by Alpha Spec Anal
U-2[illegible]	(3.4 +/- 0.3)E -1	(2.78 +/- 1.1)E -1	(3.00 +/- 0.6)E -1
U-238	(8.4 +/- 0.5)E -1		(8.64 +/- 0.8)E -1
U-234/233	(5.7 +/- 0.2)E +0		
U-234			(7.60 +/- 0.26)E+0
U-233			(<1.4 E -2)

Uranium Concentration in Soil, pCi/gm

	NRC/RESL-IOO	W/Waltz Mill Lab.	
Sample No.	432-5-24	432-5-24	085-5-24 by Alpha Spec Anal
U-235	(3.4 +/- 0.3)E -1	(2.78 +/- 1.1)E -1	(3.00 +/- 0.6)E -1
U-238	(8.4 +/- 0.5)E -1		(8.64 +/- 0.8)E -1
U-234/233	(5.7 +/- 0.2)E +0		
U-234			(7.60 +/- 0.26)E+0
U-233			(<1.4 E -2)

Uranium Concentration in Soil, pCi/gm

	NRC/RESL-IOO	W/Waltz Mill Lab.	
Sample No.	432-5-24	432-5-24	085-5-24 by Alpha Spec Anal
U-235	(3.4 +/- 0.3)E -1	(2.78 +/- 1.1)E -1	(3.00 +/- 0.6)E -1
U-238	(8.4 +/- 0.5)E -1		(8.64 +/- 0.8)E -1
U-234/233	(5.7 +/- 0.2)E +0		
U-234			(7.60 +/- 0.26)E+0
U-233			(<1.4 E -2)

CONVERSATION RECORD

TIME 1:30 PM

DATE 2/8/93

TYPE ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE
☒ INCOMING
☐ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT
@ Monroeville	PP
Large PA	

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU J. Nardi

ORGANIZATION (Office, dept., bureau, etc.) W Pgh. PA re Large, PA site

TELEPHONE NO: 412-374-4652 — @ Monroeville
412-382-7553 — Large PA

SUBJECT Change in availability for meeting w/ RI personnel

SUMMARY Because of the need to attend a public meeting on Decommissioning on Wed and Thurs, Feb 17 and 18, 1993, he, J. Nardi, will not be able to meet w/ the RI, RDaDSelm, DRSS, personnel on those days. Friday 2/19/93 is acceptable as well as early the following weeks.

Need to set up, including Bloomfield personnel, how about Tuesday 2/23/93?

Re Docket 70-957 SNM 957 Termination

ACTION REQUIRED Set time and date for meeting

NAME OF PERSON DOCUMENTING CONVERSATION Chang

SIGNATURE Chang

DATE 2/8/93

ACTION TAKEN Reviewed w/ J. Kinneman & M Roberts, Set for 2/25/93 2/12/93 @ 10:15 (?)
after 930 — Call & check w/ J Nardi - at his convenience

SIGNATURE Chang

TITLE

DATE

50271-101 ☆U.S. G.P.O. 1983-381-526/8346 CONVERSATION RECORD OPTIONAL FORM 271 (12-76) DEPARTMENT OF DEFENSE

Set up Meeting Notice

10:50 2/12/93

Ok 9:30 2/25/93 Meeting

Meeting Notes
LICMJGNO

FEB 1 8 1993

MN No. 93-21

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

NOTICE OF LICENSEE MEETING

Name of Licensee: Westinghouse Electric Corporation

Docket No.: 070-00997

Time and Date of Meeting: 9:30 a.m., February 25, 1993

Location of Meeting: Region I Office

Purpose of Meeting: Review Status of Decommissioning of Site at Large, Pennsylvania

NRC Attendees:
John D. Kinneman, Section Chief
Mark C. Roberts, Sr. Health Physicist
C. Thor Oberg, Health Physicist

Licensee Attendees:
A. Joseph Nardi, Manager, Regulatory Services
Roy G. Kitzer, Radiation Safety Officer

Note: This meeting is open to observation by the public. Attendance by NRC personnel at this meeting should be made known by 4:30 p.m., on February 24, 1993.

Prepared By: C. Thor Oberg
C. Thor Oberg
Health Physicist

Approved By: C. T. Oberg
for John D. Kinneman, Chief
Research, Development, and
Decommissioning Section
Nuclear Materials Safety Branch

Distribution:
James M. Taylor, Executive Director for Operations
Hugh L. Thompson, Jr., Deputy Executive Director for Nuclear Materials Safety, Safeguards and Operations Support
James Lieberman, Director, Office of Enforcement
Robert M. Bernero, Director, Office of Nuclear Material Safety and Safeguards
Victor McCree, Regional Coordinator, EDO
Richard E. Cunningham, Director, Division of Industrial and Medical Nuclear Safety, NMSS
John E. Glenn, Chief, Medical, Academic, and Commercial Use Safety Branch, NMSS
Stephen H. Lewis, Sr. Supervisory Enforcement Attorney, OGC
Public Document Room (PDR)
State of Pennsylvania

bcc:
RI Docket Room (w/concurrences)
Regional Administrator
Deputy Regional Administrator
Division Directors
Branch Chiefs
Section Chiefs
SLO
Region I Receptionist
PAO
DRMA Files
DRSS Files
Constance Yusko, DRSS
Mark C. Roberts, DRSS
C. Thor Oberg, DRSS
Roselyn Levin, DRMA

CONVERSATION RECORD

TIME 1037a

DATE 5/28/93

TYPE ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE

☒ INCOMING

☐ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: Sol Nordi, Mgr, Safety.

ORGANIZATION (Office, dept., bureau, etc.): W Large PA 070-

TELEPHONE NO:

SUBJECT: Meet & Review Status of Decommissioning 070-00997, SNM-957

SUMMARY

Would like to meet w/ us again to review Status & plans to finalize.

Please call sometime early next week, (week of 5/30/93).

ACTION REQUIRED

Call & possibly set up meeting

NAME OF PERSON DOCUMENTING CONVERSATION: Chang

SIGNATURE: Chang

DATE: 6/1/93

ACTION TAKEN

SIGNATURE

TITLE

DATE

CONVERSATION RECORD

TIME 9:50

DATE 6/2/93

TYPE ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE

☐ INCOMING

☒ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU A Joe Nardi, Mgr.

ORGANIZATION (Office, dept., bureau, etc.) W. El. Corp. Pgh. PA Re. Large PA

TELEPHONE NO. 412-374-4652

SUBJECT Returning Call of 5/28/93

SNM 951 ~~070-995~~ 070-997

SUMMARY

Not avail - left message to call 412-382-7553 - At Large PA

Called back in p.m. ~~[illegible]~~ advised him that we're still tied up but will attempt to get back to him by end of the week.

6/4/93 - @ 3:00 pm

Called again. He had left for the day. Left a message advising him that we are waiting to set ~~up~~ up a meeting in the future. Will be out of town next week, will call if I get back early

ACTION REQUIRED Check date

NAME OF PERSON DOCUMENTING CONVERSATION Oberg

SIGNATURE Oberg

DATE 6/2/93

ACTION TAKEN Check date again

SIGNATURE Oberg

TITLE Oberg

DATE 6/4/93

CONVERSATION RECORD

TIME: 1048am

DATE: 6/17/93

TYPE

☐ VISIT ☐ CONFERENCE ☑ TELEPHONE

☑ INCOMING

☐ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: Joe Nardi - Mgr. Regulatory Service

ORGANIZATION (Office, dept., bureau, etc.): W El Corp Pgh. PA

TELEPHONE NO: 412-374 9652

SUBJECT: Large, PA Facility, Cleanup Status SNM-951, Docket 070-00997

SUMMARY

All reports complete except for alpha Spec. anal. results that should be finished within 2 weeks

Is 3/4 through completion of Summary report, fin in 3 weeks

Will complete Form NRC 314 for all stuff shipped off/disposition of MR

Question whether or not they have to back fill pits

Shouldn't have the problem w/ MDAs as with Bloomfield site

Will be more than happy to come to RI & Review the reports w/ personnel. Also the same for Oak Ridge. Asked about OR surveys – Said we were working to get this setup.

ACTION REQUIRED

Await final reports

NAME OF PERSON DOCUMENTING CONVERSATION: Oberg

SIGNATURE: Oberg

DATE: 6/18/93

ACTION TAKEN

SIGNATURE

TITLE

DATE

SPECIFICATIONS

REMOVAL OF MONITORED DRAIN LINE SYSTEM
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PA

1.01 Scope of Work

The contractor shall provide the necessary manpower, materials, and equipment to remove a radioactively contaminated drain line and associated tanks located on the Westinghouse Site in Large, Pennsylvania. It is the intention of Westinghouse that this job commence as soon as possible after issuance of a contract and be completed by August 31, 1992. The available information concerning the location of the drain line and the tanks is shown on the drawings. A portion of the drain line is located beneath the flooring within Buildings 5, 6A, 6, 8A and 9; a portion is exposed in Building 6A; a portion is beneath an asphalt roadway or sidewalk; and a portion is beneath sod and soil. A series of three tanks and associated piping are located in the basement of Building 9 and an additional tank is contained in a concrete pit within a corrugated metal structure located behind Building 5.

Due to the differing nature of the work, the contractor shall bid on one or more of the following three options:

> Option 1 - Removal and packaging of all piping associated with the drain line system except that identified in Option 2. For the tanks in Building 9, this includes all piping connected to the tanks. The tanks themselves would have all openings covered in preparation for transportation.
>
> Option 2 - Removal and packaging of all piping associated with the drain line system within Buildings 5, 6 and 6A. The lines would be removed up to the inlet into the tank in the

9/15/92

SECTION COPY

2

shed behind Building 5. Also, a small section of line (approximately 40 ft.) inside Building 6 would be included under Option 2. This option is intended to cover work which will not be performed with a backhoe.

Option 3 - Provide all rigging operations to remove the floor covering above the tanks in Building 9, remove the tanks, place and secure the tanks on a Westinghouse supplied transport vehicle, and replace the floor coverings.

Westinghouse will consider issuing separate contracts for these three options if appropriate and in the best interest of all parties.

The radioactive contamination is entirely due to isotopes of uranium and the radiation levels associated with this work are undetectable on the outside of the line and tanks where tested. Westinghouse will provide all required radiological safety coverage to contractor employees including contamination and radiation surveys, dosimetry, protective clothing and any protective equipment that is unique to working with radioactive materials. All contractor personnel will be required to survey themselves for radioactive contamination prior to leaving the work area. No equipment will be permitted to be removed from the work area until surveyed and released by Westinghouse.

Contractor personnel will be required to have passed a medical examination, acceptable to Westinghouse, within the past year. All contractor personnel will receive radiological safety training provided by Westinghouse, and will be required to demonstrate understanding and proficiency by an examination given at the end of the training session.

The piping, tanks and any contaminated soil removed under this contract will be packaged under the direction of Westinghouse personnel. The ultimate transportation and disposal of this material will be the responsibility of Westinghouse.

During the conduct of this work, the contractor will be required to permit pedestrian and vehicular access to buildings and roadways to the greatest extent practical. Although every effort will be made to minimize any delays due to the need for Westinghouse to perform radiological surveys and determine the condition of completed work in a specific area, the contractor should be prepared for such delays to occur.

Westinghouse will pay the fair market value for any contractor equipment that cannot be released due to radiological contamination. It is, however, extremely unlikely that such a condition will occur.

Westinghouse requests that the contractor provide the following information in response to this request for proposal:

1. A general description of how the drain line and/or tank removal would be performed.
2. An estimated schedule (assuming no Westinghouse imposed sequencing or delays) and the estimated manpower levels assigned to the work over time. The schedule should also identify any instances where the contractor plans on using multiple work crews during the work.
3. The hourly labor rate for each class of employee to be used.
4. Rates for the equipment to be used.
5. Availability of work group on site (date).
6. A cost estimate for the option(s) being bid on.

All equipment and other obstructions will be removed from the work area prior to start of work. Such removal will have been done under a separate contract. Laydown space and an area for the storage of contractor tools and equipment will be provided by Westinghouse.

1.02 Contract Drawings

Unless specifically stated otherwise, all references to drawings or statements reading "as indicated", "as shown", or "as detailed" shall be understood to refer to the following drawings:

Job No.	Dwg. No.	Rev.	Date	Title
021	M-1	3	2-20-92	Large Site - Contaminated Waste Line
021	M-2	0	2-20-92	Large Site - Bldg. 5 & 9 Tank Details

1.03 Codes, Standards and Regulations

All work shall be in strict accordance with the applicable portions of the following in effect as of the date of these specifications.

A. Code of Federal Regulations

Title 29 - Labor, Chapter XVII - Occupational Safety and Health Administration, Department of Labor

Part 1910 - Occupational Safety and Health Standards

Part 1926 - Safety and Health Regulations for Construction

B. Code of Federal Regulations

Title 10 - Energy, Chapter I - United States Nuclear Regulatory Commission

Part 19 - Notices, Instructions and Reports to Workers; Inspection

Part 20 - Standards for Protection Against Radiation

C. Westinghouse Rules and Practices

Westinghouse will provide the successful contractor(s) with specific Westinghouse rules and procedures for working on the Large site.

1.04 Materials and Services Furnished by Westinghouse

Westinghouse will provide the following materials and services for the duration of this job:

1) Radiological protection personnel who will monitor the job and provide direction to contractor personnel to assure radiation safety,
2) Protective clothing to be worn by contractor personnel during operations where radiological contamination may occur,
3) All radiation surveys and measurements necessary to assure a safe working environment,
4) Protective equipment that is unique to working with radioactive material, including portable ventilation systems,
5) All containers necessary to package any contaminated materials, and
6) All transportation of packaged waste materials and tanks.

All other materials, services and equipment required shall be furnished by the contractor.

1.05 Barriers

The contractor shall be required to provide barriers to prevent unauthorized entry to excavation areas.

1.06 Excavation Under Pavements and Floors

A. The contractor shall be required to saw cut surfaces to prevent jagged or rough edges along excavated areas. Excavate trenches to uniform width. Keep trench widths to the minimum required for the removal of the pipe unless otherwide directed by Westinghouse.

B. In all paved or bricked areas, the contractor shall protect all adjacent floor, roadway or walking areas from damage during digging operations. In particular, the contractor shall be especially careful in the bricked floor are of Building where Westinghouse wants to minimize floor restoration work.

1.07 Storage of Excavated Materials

Stockpile excavated materials acceptable for backfill where directed by Westinghouse. Place, grade, shape, segregate and cover stockpiles as directed by Westinghouse.

1.08 Existing Utilities

Identify known underground, above ground and aerial utilities. Stake and flag locations. Hand excavate in the immediate vicinity of known existing utilities. Maintain and protect existing utilities during excavation.

1.09 Shoring and Bracing

Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain a minimum amount of shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

1.10 Dewatering

Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

Any necessary sampling and analysis of water prior to discharge will be performed by Westinghouse. Water will be discharged only at the direction of Westinghouse.

1.11 Damage to Westinghouse Facilities

Any damage to above-ground or known underground Westinghouse facilities shall be repaired and restored to original condition at no cost to Westinghouse. Repairs shall match existing surrounding areas wherever applicable.

1.12 Backfill and Compaction

In general, the material excavated during trenching and other construction operations shall be used as backfill. Perform the work as follows:

A. All backfill shall be compacted in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers. A minimum of three passes shall be made to compact backfill.
B. Place compacted backfill to the level or elevation directed by Westinghouse which facilitates subsequent pavement, concrete, or grass seeding operations.
C. Do not place wet or frozen backfill in trenches. Also, do not backfill on surfaces that are muddy, frozen, or contain frost or ice.
D. As determined by Westinghouse, tests may be required to ensure that backfill achieves 95 percent maximum density.

E. Place backfill and fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.

1.13 Protection of Existing Structures

Existing structures and foundations shall be adequately protected, braced, underpinned and receive other necessary temporary support while open excavations exist adjacent to or underneath these facilities.

1.14 Covering of Excavations

As directed by Westinghouse during the work, trenches shall be covered with plywood or steel plates. Plywood shall be used in pedestrian areas and steel plates shall be used in areas subject to vehicular traffic.

1.15 Pipe Removal Operations

The interior surfaces of the piping is known to be contaminated with uranium. A mandatory consideration in this job is to ensure that the piping is removed in such a manner that the uranium is not spread to other materials or surfaces which will require further cleanup efforts. Digging in the immediate vicinity of the pipe will require due care to ensure that the piping is not broken during the digging phase. For removal, the pipe will have to be segmented into appropriate lengths necessary to permit removal without breakage and for packaging in containers for transportation. All piping and any contaminated soil will be placed in appropriate containers and loaded onto transport vehicles by the contractor. The containers and the transport vehicles will be supplied by Westinghouse.

1.16 Dust Abatement

The Contractor shall institute careful cutting, handling, and installation procedures, and maintain during the term of this purchase order, an effective and continuous program of dust abatement insofar as his operations may cause or create dust conditions.

PROCEDURE NUMBER 001

RADIOLOGICAL MONITORING AND SOIL SAMPLING DURING REMOVAL OF MONITORED DRAIN LINE SYSTEM

April 16, 1992
Revision 0

Prepared by: A Joseph Nardi
A. J. Nardi

Approved by: A Joseph Nardi
A. J. Nardi, Project Manager

Approved by: R. G. Kitzer
R. G. Kitzer
Radiation Safety Officer

WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PA

9/15/97
CO

SECTION COPY

REVISION RECORD

Revision Number	Page or Section Changed	Date	Description of Change
0	All	4/16/92	Initial issue of procedure

I. SCOPE

This procedure covers the radiological surveys and soil sampling necessary to demonstrate that any excavated area is clean prior to backfilling that excavation.

II. REFERENCES

1. Survey Plan for Large Project.

III. PROCEDURE

1. All gamma surveys made under this procedure are to use a NaI probe connected to a suitable integrating instrument.

2. All final survey results are to be recorded either on the attached form or directly into the computer program database.

3. During removal of the Monitored Drain Line (MDL) system, conduct adequate periodic gamma surveys of the work to assure that the soil being removed does not indicate any contamination. (Record general results and any special notes in logbook).

4. Isolate any contaminated soil found and have it placed directly in containers to avoid mixing with other soil.

5. When the MDL has been exposed, mark the excavation (i.e. by flags or paint marks) at any particular point where soil samples should be taken. (See below).

6. After the MDL has been removed from the excavation, conduct a general gamma survey to verify that no contamination is present. (Record general results and any special notes in logbook).

7. Select specific locations where soil samples are to be taken and mark each location. Selection is based on the following criteria in order:

   a) At any location where contaminated soil had to be removed. For large areas (>$1m^2$) select a minimum of five sample locations per area.

   b) At any location where the general gamma survey results indicated anomalous results.

   c) At any location where there was a particular potential for pipe leakage to have occurred, such as pipe joints, severely degraded pipe, or indications which might indicate that field repairs had been made.

   d) At other locations such that there is not more than 10' between samples along the length of the original MDL location.

8. Conduct and record gamma survey results at a minimum of every 2' of trench length. Include a gamma survey at every location where a soil sample is to be taken. For large areas of excavation where contaminated soil had to be removed, make surveys on a 1' grid system. The integrated count time shall be at least one half minute at each survey location.

9. Take soil samples at all designated locations. Soil samples are to be taken by collecting soil from the surface to a depth of six inches.

10. Place the soil sample in an appropriate container, seal it, mark the container with the next sequential sample number and record the necessary information.

11. Photograph the excavated area.

12. If available, count each container of soil in the shielded counter arrangement for five minutes. Record the results.

13. Upon receipt of all soil analysis data, complete the attached form requesting authorization to backfill the excavation.

14. Obtain the necessary authorization from the Project Manager or his designated alternate.

15. Authorization to backfill any excavated area where contaminated soil had to be removed will require the prior concurrence of the NRC.

BACKFILL REQUEST/AUTHORIZATION

To be completed by requestor:

1) Describe the specific section of the excavation to be backfilled under this request (include map where possible):

____

____

2) Describe results of gamma surveys (attach copies of survey forms as appropriate):

____

____

3) Describe analysis results of soil samples (attach copies of analysis results as appropriate):

____

____

4) Note any special considerations:

____

____

Requested by: ____________________ Date: ____________

Authorization:

Authorization to backfill the above described excavation is:

____ Approved

____ Not Approved

Comments: ______________________________

____

Signature: ____________________ Date: ____________

BACKFILL REQUEST/AUTHORIZATION

To be completed by requestor:

1) Describe the specific section of the excavation to be backfilled under this request (include map where possible):

____

____

2) Describe results of gamma surveys (attach copies of survey forms as appropriate):

____

____

3) Describe analysis results of soil samples (attach copies of analysis results as appropriate):

____

____

4) Note any special considerations:

____

____

Requested by: ____________________ Date: ____________

- -

Authorization:

Authorization to backfill the above described excavation is:

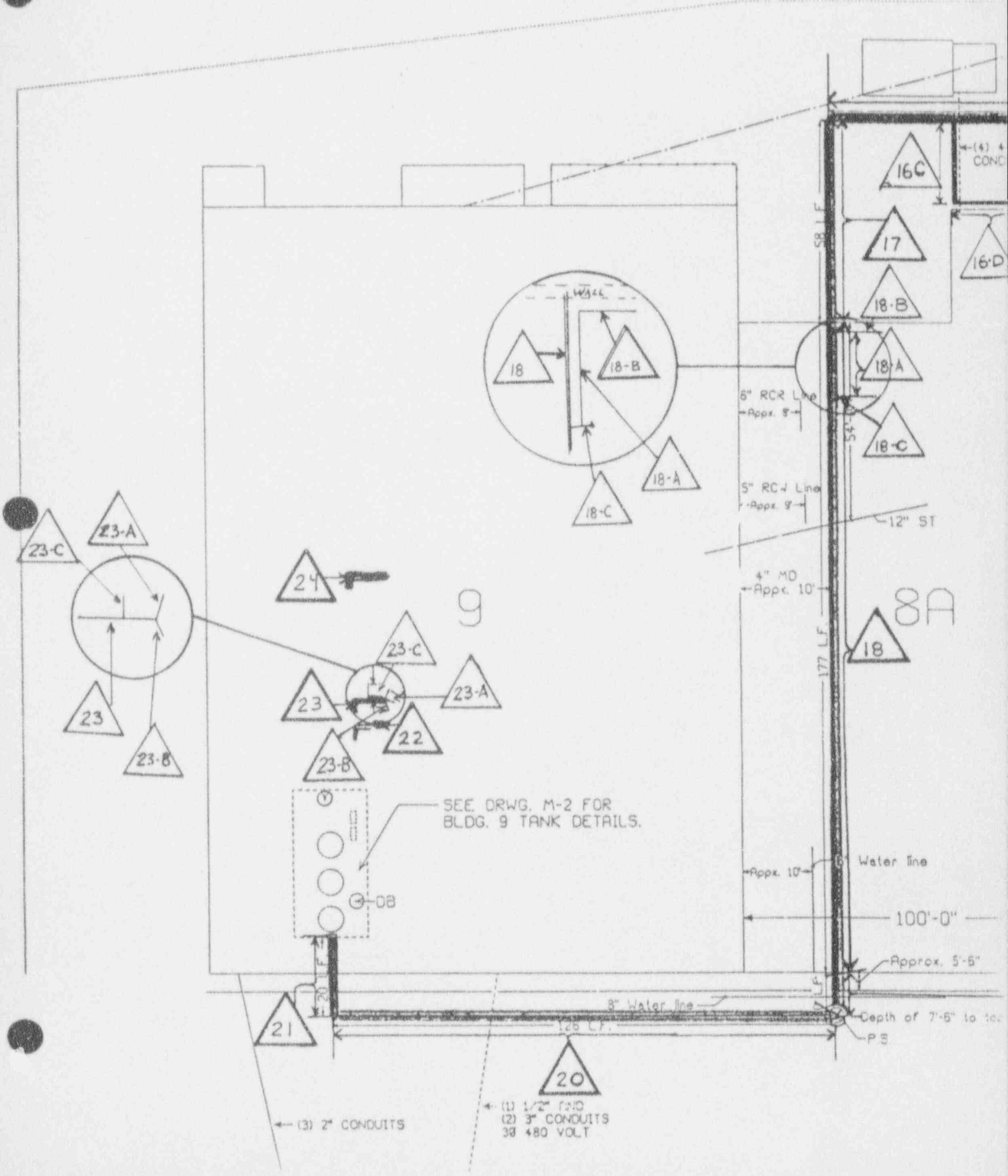
____ Approved

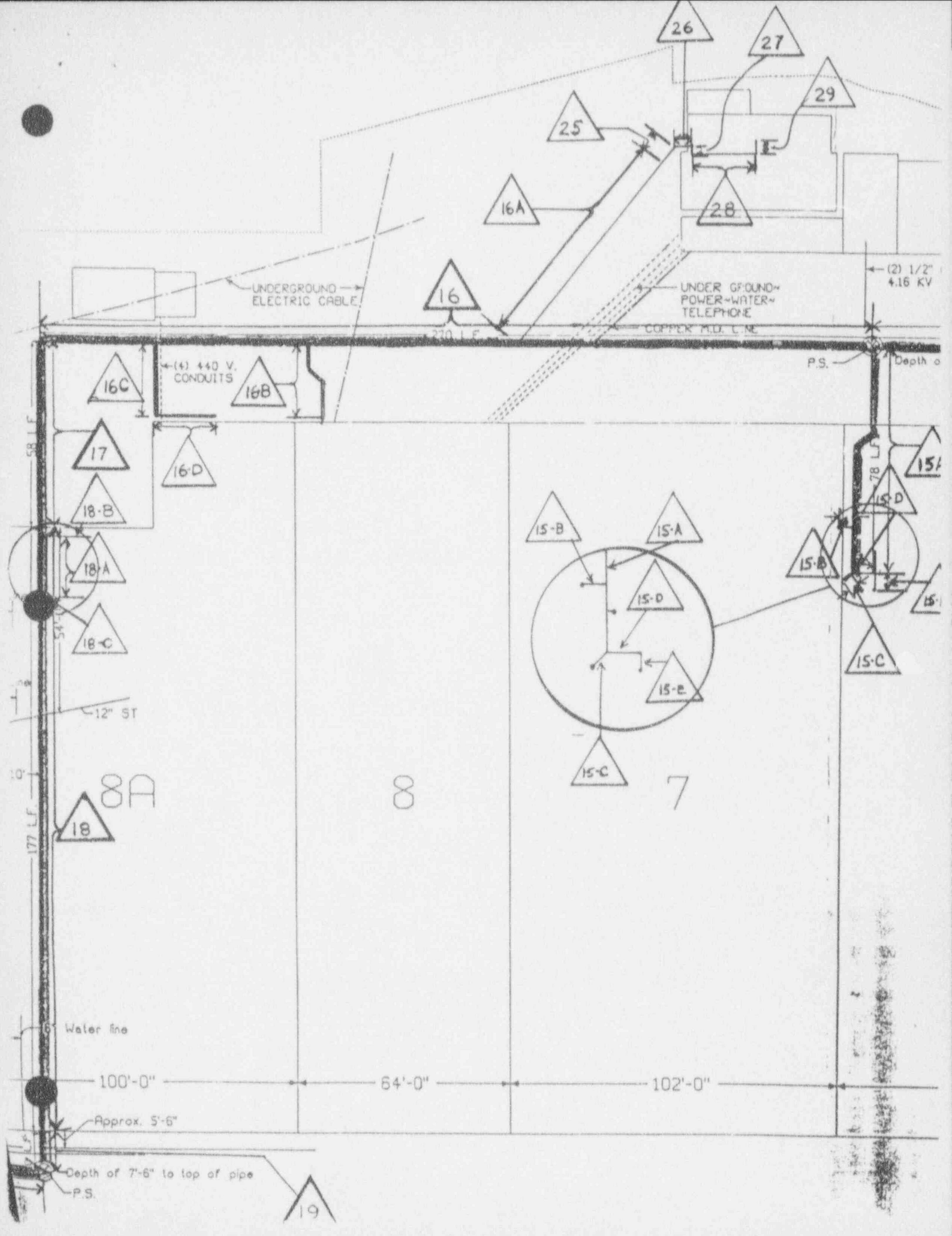
____ Not Approved

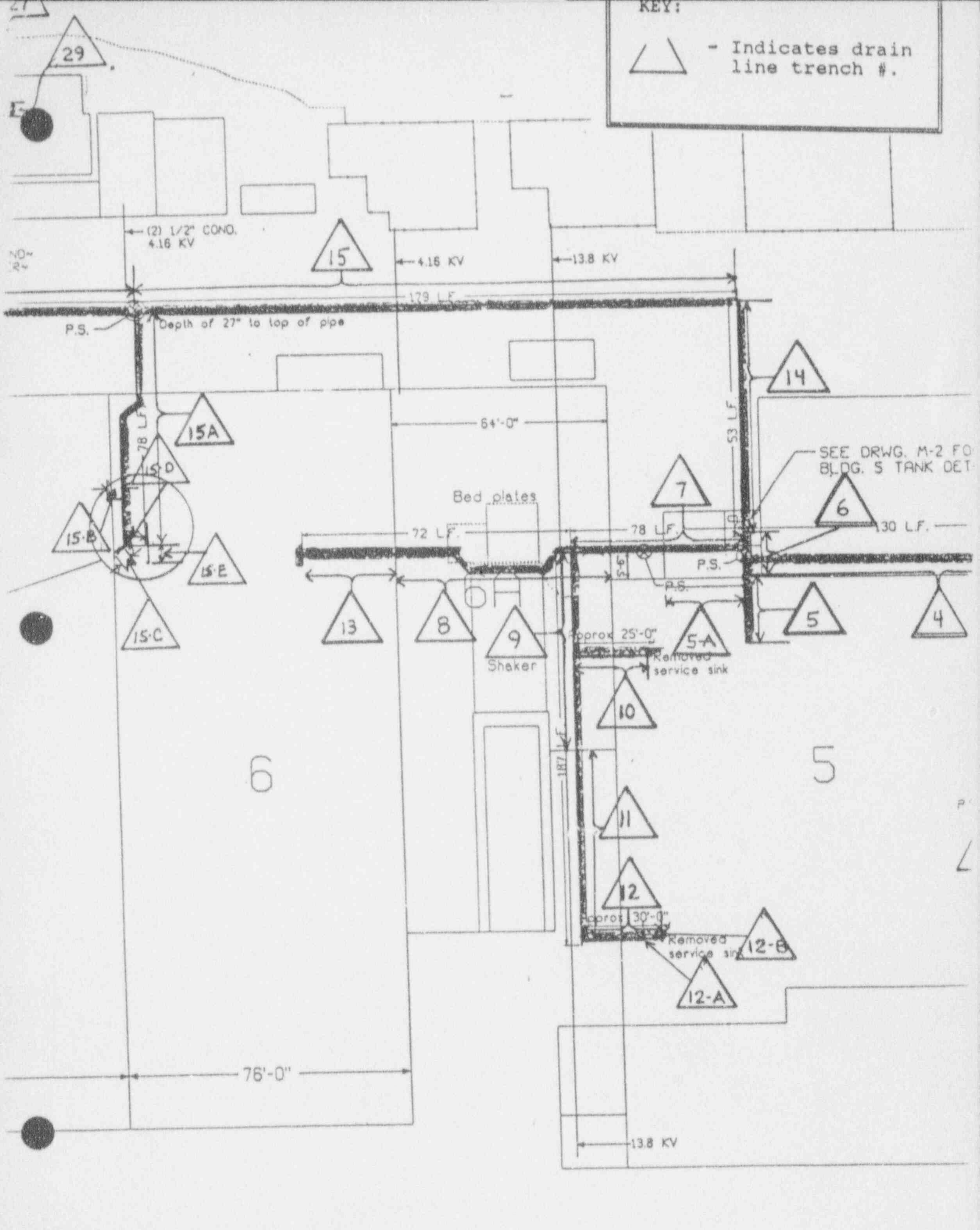
Comments: ____

____

Signature: ____________________ Date: ____________

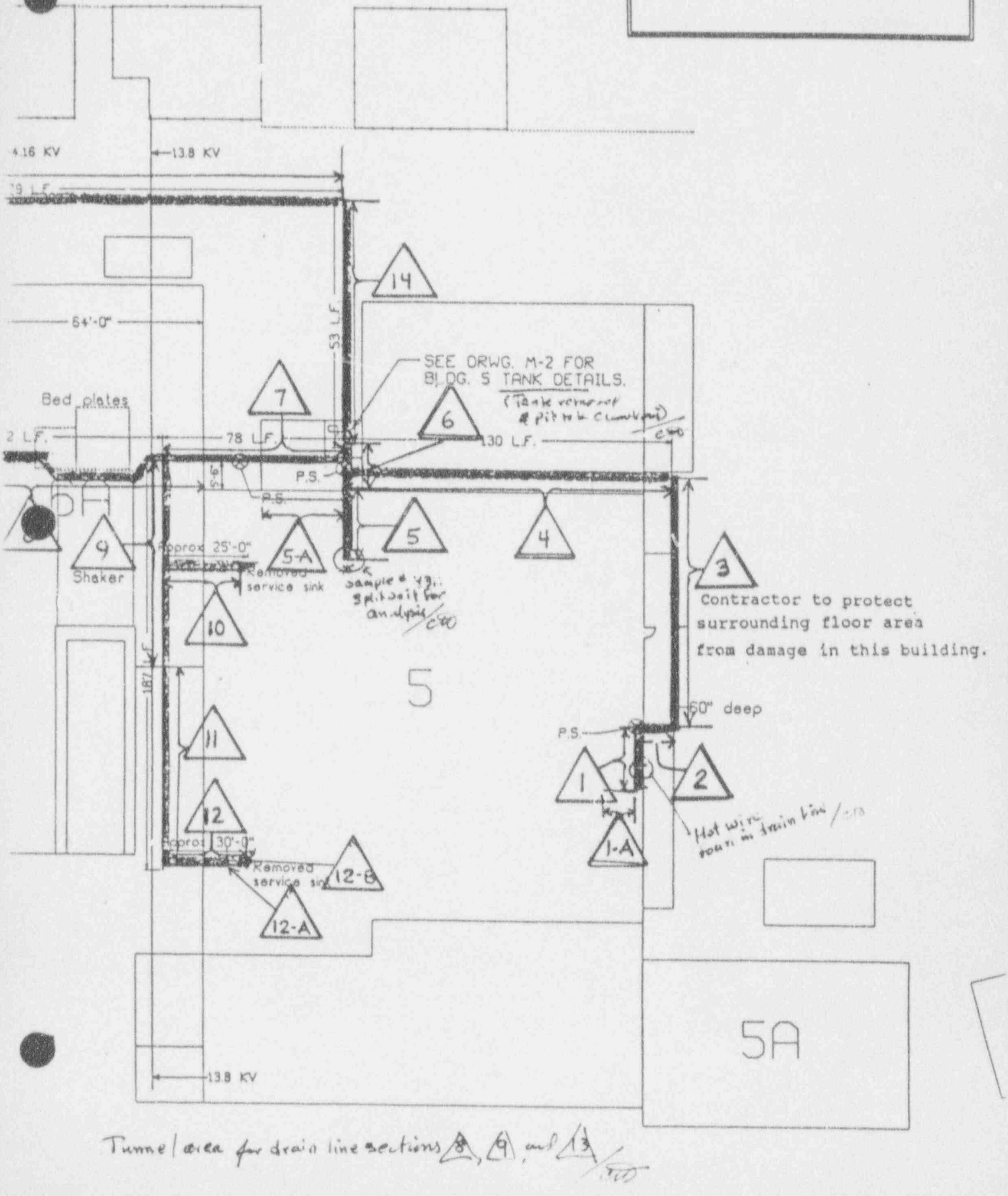

(4) 4
CONC
16C
17
16-D
58 L.F.
18-B
18-A
18-C
Wall
18
18-B
18-A
18-C
6" RCR Line
Appx. 8'
54'
5" RC4 Line
Appx. 8'
12" ST
4" MD
Appx. 10'
8A
177 L.F.
18
9
24
23-C
23-A
23
23-B
23-C
23-A
23
22
23-B
SEE DRWG. M-2 FOR
BLDG. 9 TANK DETAILS.
DB
Appx. 10'
6" Water line
100'-0"
Approx. 5'-6"
20 L.F.
L.F.
21
8" Water line
128 L.F.
Depth of 7'-6" to to
PB
20
(1) 1/2"
(2) 3" CONDUITS
3Ø 480 VOLT
(3) 2" CONDUITS


26
27
29
25
16A
28
16
UNDERGROUND ELECTRIC CABLE
UNDER GROUND~ POWER~WATER~ TELEPHONE
(2) 1/2" 4.16 KV
270 L.F.
COPPER M.D. LINE
P.S.
Depth o
(4) 440 V. CONDUITS
16C
16B
16D
17
18-B
18-A
18-C
58 L.F.
54'-0"
12" ST
10'
177 L.F.
8A
8
7
18
15-B
15-A
15-D
15-E
15-C
78 L.F.
15-D
15-B
15-C
6" Water line
100'-0"
64'-0"
102'-0"
Approx. 5'-6"
L.F.
Depth of 7'-6" to top of pipe
P.S.
19


27
29
KEY:
- Indicates drain line trench #.
(2) 1/2" COND. 4.16 KV
15
4.16 KV
13.8 KV
179 L.F.
P.S.
Depth of 27" to top of pipe
14
15A
78 L.F.
64'-0"
53 L.F.
SEE DRWG. M-2 FO
BLDG. 5 TANK DET
7
6
15-D
Bed plates
72 L.F.
78 L.F.
130 L.F.
15-B
15-E
P.S.
P.S.
13
8
9
5-A
5
4
15-C
Shaker
Approx 25'-0"
Removed service sink
10
6
5
187 L.F.
11
12
Approx 30'-0"
Removed service sink
12-B
12-A
76'-0"
13.8 KV

K. :

△ - Indicates drain line trench #.



Contractor to protect surrounding floor area from damage in this building.

Tunnel area for drain line sections 8, 9, and 13

M.D.L. TRENCH SOIL SAMPLE INDE DATA

TRENCH #	BUILDING LOCATION	BUILDING PROXIMITY	INSIDE/ OUTSIDE	TOTAL LINEAL FEET (Approximate) East to west	North to south
1	5	East Side	INSIDE		22
1-A	5	East Side	INSIDE	9	
2	5	East Side	INSIDE	5	
3	5	East Side	IN/OUT		65.5
4	5	North Side	IN/OUT	64	
5	5	North Side	INSIDE		26.5
5-A	5	North Side	INSIDE	18.5	
6	5	North Side	OUTSIDE		9
7	5	North Side	OUTSIDE	57	
8	6A	Mid Bldg.	INSIDE	64	
9	6A	Mid/South	INSIDE		54
10	5,6A		INSIDE	25	
11	6A	South Side	OUTSIDE		55
12	5	South Side	IN/OUT	30	
13	6	Mid Bldg.	INSIDE	25	
14	5	North Side	OUTSIDE		58
15	5,6A,6	North Side	OUTSIDE	179	
15-A	6	North Side	IN/OUT		78
15-B	6	North Side	INSIDE		9.5
15-C	6	North Side	INSIDE	3	
15-D	6	North Side	INSIDE	8	
15-E	6	North Side	INSIDE		7
16	8A,8,7,6	North Side	OUTSIDE	270	
16-A	7	North Side	OUTSIDE		56
16-B	8	North Side	OUTSIDE		16
16-C	8A	North Side	OUTSIDE		21
16-D	8A	North Side	OUTSIDE	10	
17	8A	North Side	OUTSIDE		53

M.D.L. TRENCH SOIL SAMPLE IND DATA

TRENCH #	BUILDING LOCATION	BUILDING PROXIMITY	INSIDE/ OUTSIDE	TOTAL LINEAL FEET (Approximate) East to west	North to south
18	8A	West Side	INSIDE		167
18-A	8A	West Side	INSIDE		21
18-B	8A	West Side	INSIDE	18	
18-C	8A	West Side	INSIDE	1	
19	8A	South Side	OUTSIDE		9.5
20	8A,9	South Side	OUTSIDE	126	
21	9	South Side	IN/OUT		14
23	9	Mid-Bldg.	INSIDE	11	
23-A	9	Mid-Bldg.	INSIDE		3
23-B	9	Mid Bldg.	INSIDE		2
23-C	9	Mid Bldg.	INSIDE		4
24	9	Mid Bldg.	INSIDE	13	
25	7	North Side	OUTSIDE		6
26	7	North Side	OUTSIDE	6	
27	7	North Side	OUTSIDE		4
28	7	North Side	OUTSIDE	20	
29	7	North Side	OUTSIDE		4

LARGE SITE HISTORICAL REVIEW

2/06/92

GROUP ID	MAIN GROUP DESIGNATION	COLOR CODE
I	OFFICE, ADMIN, AND PLANT OPERATIONAL AREAS WHERE HISTORICAL INFO INDICATES THAT NO RAM HAD EVER BEEN USED OR STORED.	GREEN
II	OFFICE, ADMIN, AND PLANT OPERATIONAL AREAS WHERE HISTORICAL INFO INDICATES THAT ONLY SEALED RAM SOURCES WERE USED OR STORED.	YELLOW
III	OFFICE, ADMIN, AND PLANT OPERATIONAL AREAS WHERE HISTORICAL INFO INDICATES THAT ONLY ENCAPSULATED RAM OR SEALED SOURCES, [AND] AREAS WHERE HISTORICAL INFO IS UNCERTAIN AS TO WHETHER UNENCAPSULATED MATERIAL MAY HAVE BEEN USED.	BLUE
IV	OFFICE, ADMIN, AND PLANT OPERATIONAL AREAS WHERE HISTORICAL INFO INDICATES THAT UNENCAPSULATED RAM HAD BEEN USED OR STORED.	RED

DESIGNATED LOCATIONS WHERE FUTURE SURVEYS OR CONSIDERATIONS WILL DICTATE D&D ACTIONS.

V	AREAS WHERE MEASUREMENT SHOW CONTAMINATION
VI	INTERNAL SURFACES OF VENTILATION SYSTEMS
VII	FLAT BUILDING ROOFS
VIII	TRENCHES DUG TO REMOVE MDL
IX	SITE AREAS EXTERNAL TO BUILDINGS

RGK

9/16/92

SECTION COPY

LOCATIONS AT LARGE WHERE RAM WAS USED 02/07/92

THE FOLLOWING LOCATIONS WERE IDENTIFIED BY SELECTED WESTINGHOUSE EMPLOYEES BASED ON PERSONAL KNOWLEDGE AND RECOLLECTION OF THE LARGE ACTIVITIES FROM 1961 TO 1992. SEE LIST BELOW.

LOCATION	FLOOR(S)	TYPE OF RAM ACTIVITIES				GROUP ID	COMMENTS
		UNENCAP	SEALED	INCIDENTAL	NONE		
4	BASEMENT		X			II	1977 HPO
	FIRST				X	I	ADMIN OFFICES
	SECOND				X	I	ADMIN OFFICES
	THIRD		X			II	1989 HPO
5	FIRST	X				IV	ENR UR/IRRAD UR
	SECOND	X				IV	ENR UR/IRRAD UR
	THIRD	X				IV	ENR UR/IRRAD UR
	FOURTH				X	I	?
5A	FIRST				X	I	STOREROOM
6	FIRST	X				IV	RX ASSEMBLY
	SECOND	X				IV	QA AREA
6A	FIRST	X				IV	FUEL ASSEMBLY
7	FIRST	X				IV	TRUCKLOCK/VAULT
	SECOND				X	I	?
8	FIRST				X	I	?
	SECOND				X	I	?
8A	FIRST	X				IV	OLD HPO/PU/CO
	SECOND				X	I	?
9	BASEMENT		X	X		III	MDL
	FIRST	X				IV	MET LAB/MFP/ACT
	SECOND				X	I	?
10	FIRST				X	I	LIBRARY
	SECOND				X	I	?
	THIRD				X	I	?
11	FIRST				X	I	ADMIN OFFICES
	SECOND				X	I	ADMIN OFFICES
	THIRD				X	I	ADMIN OFFICES
12	FIRST		X			II	DEP UR CASK
HYD FAC	FIRST	X				IV	FUEL FLOW
FIREHALL					X	I	FIRETRUCK
BACKLOT			X			III	LLRW STORAGE
CENTERLOT				X		III	INHOUSE XFER
[illegible]					X	I	[illegible]

→ CHANGE TO RED

SOURCE: INDIVIDUAL CONTACTS WITH WESTINGHOUSE PERSONNEL WHO WORKED FOR WESTINGHOUSE DURING THE NERVA, AND POST-NERVA ERAS FROM 1961 TO 1992, AND BRAINSTORMING MEETINGS AT LARGE ON FEBRUARY 06, 1992, AND JANUARY 13, 1992.

ANDY TURK	JIM FLANNIGAN
JACK CHAPLA	ROY KITZER
FRANK PRYZWARTY	
GEORGE YATSKO	
MILT CLEARY	

NOTE 1: THE PRINCIPLE "BUILDING" AREAS WHERE RAM WAS USED AND HANDLED, ESPECIALLY UNENCAPSULATED, OR POTENTIALLY PRONE TO CONTAMINATION OCCURRENCES, WERE BUILDINGS FIVE (5)- FIRST, SECOND, AND THIRD FLOORS; AND BUILDING NINE (9)- FIRST FLOOR.

NOTE 2: THE COLOR CODE SCHEME FOR THE BUILDINGS, AND OTHER LOCATIONS AND AREAS, IS AS FOLLOWS:

GROUP CATAGORY	COLOR CODE
I	GREEN
II	YELLOW
III	BLUE
IV	RED

RGK

WESTINGHOUSE FORM 68220A

GROUP ID	MAIN GROUP DESCRIPTION	SUBGROUP DESCRIPTION	SELECTION GRID SIZE	SAMPLE GRID SIZE	NUMBER OF GRIDS TO BE SELECTED	SURVEYS TO BE CONDUCTED	COMMENTS
IA	Office, Administrative, and Plant areas where historical information indicates no radioactive material had ever been used or stored.	Small rooms of <250 ft² of floor area	NA	1m x 1m	1 per room, location randomly selected	ABCDE	Lower surfaces. Selection of sample grid locations will be biased towards uncovered surfaces.
IB		All other areas	NA	1m x 1m	1 per 400 ft² of floor area, location randomly selected	ABCDE	
IIA	Office Administrative and Plant areas where historical information is uncertain but does indicate that any radioactive material had been used or stored	Lower Surfaces	2m x 2m	1m x 1m	10%	ABCDE	Lower Surfaces includes the floor and the walls up to a height of 2 meters.
IIB		Upper Surfaces	2m x 2m	1m x 1m	5%	BCDE	Upper Surfaces includes the walls above a height of 2 meters and the ceilings.
IIIA	Areas where historical information indicates only encapsulated material or sealed sources had been used or stored and areas where historical information is uncertain as to whether unencapsulated material may have been used.	Lower Surfaces	2m x 2m	1m x 1m	15%	ABCDE	
IIIB		Upper Surfaces	2m x 2m	1m x 1m	10%	ACDE	
IIIC		Miscellaneous horizontal surfaces	NA	NA	NA	CDE	Spot surveys of horizontal surfaces where dust should collect. Ex: light fixtures, raceways, structural beams,

A - γ Dose Rate @ 1M CTR GRID

B - Bγ Dose Rate CONT / 5 POINTS / GRID

C - B COUNT RATE @ CONT. 5 POINTS / GRID

D - α COUNT RAT @ CONT. 5 POINTS / GRID

1

9110147 C8

OUP ID	MAIN GROUP DESCRIPTION	SUBGROUP DESCRIPTION	SELECTION GRID SIZE	SAMPLE GRID SIZE	NUMBER OF GRIDS TO BE SELECTED	SURVEYS TO BE CONDUCTED	COMMENTS
IVA	Areas where historical information indicates unencapsulated radioactive material had been used or stored	Lower Surfaces	1m x 1m	1m x 1m	25%	ABCDE	
IVB		Upper Surfaces	2m x 2m	1m x 1m	15%	BCDE	
IVC		Miscellaneous horizontal surfaces	NA	NA	NA	CDE	Spot surveys of horizontal surfaces where dust would collect (i.e: ligh fixtures, raceways, structural beams, ei
VA	Areas where measurements indicate the presence of radioactive material at levels greater than 25% of the applicable criteria for α/β countrate or α/β smears when averaged over a single grid	Lower Surfaces	1m x 1m	1m x 1m	25%	ABF	
VB		Upper Surfaces	2m x 2m	1m x 1m	15%	BF	
VC		Miscellaneous horizontal surfaces	NA	NA	NA	CDE	A more extensive survey of these surfaces will be undertaken than would be under Group IVC
VI	Internal surfaces of ventilation ductwork and air handling equipment in areas where radioactive material may have been used or stored		NA	NA	NA	I	The external surfaces will be spot checked along the length of the ductwork with emphasis on expected dust collection points
			NA	NA	NA	CDE	The internal surfaces of the ductwork will be surveyed at accessible locations. Penetrations will be made to allow surveys at any location where the external gamma surveys indicate elevated radiation levels.

UP D	MAIN GROUP DESCRIPTION	SUBGROUP DESCRIPTION	SELECTION GRID SIZE	SAMPLE GRID SIZE	NUMBER OF GRIDS TO BE SELECTED	SURVEYS TO BE CONDUCTED	COMMENTS
VII	Flat Building Roofs		2m x 2m	1m x 1m	Average of 5% with 10% on buildings where unencapsulated material had been used or stor	ABC	Grid selection will be biased to select locations near ventilation exhausts, low points, etc.
VIII A	Trenches dug to remove Monitored Drain Line	Where there is no indication of pipe leakage or soil contamination	NA	NA	1 soil sample per 10' of trench length. Meter survey at every 2' of trench length.	H I	Soil sample location selection will biased to include areas near fittings and connections. Split soil sample will be retained for possible future analysis. Trenches will be backfilled upon completion of photography, meter surveys and soil sampling.
VIII B		Areas where soil contamination was found or suspected and had been cleaned up.	NA	NA	A minimum of 5 soil samples in the affected area. Meter survey reading for each 1 ft^2 of area.	H I	Trench area must remain open pending NRC inspection or NRC authorization to backfill.
IX A	Site areas external to the buildings	Gamma Count Locations	5m x 5m	NA	100% of grid intersections	I	
IX B		Soil Sample Locations	10m x 10m	10m x 10m	5%	G	No less than 30 composite soil sample will taken for this group. Grid selection will be biased based on results of gamma survey and towards low spots

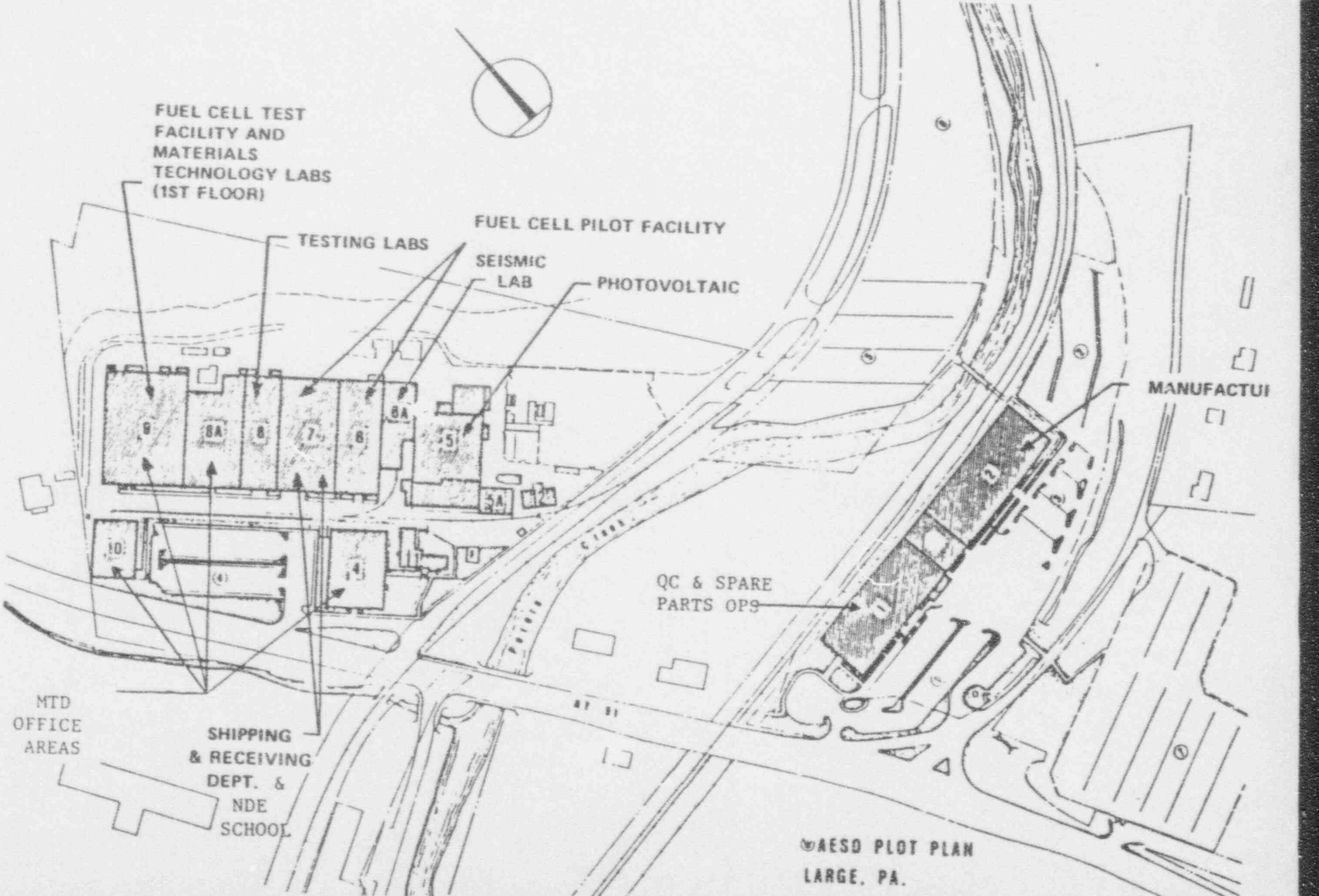
SUMMARY OF SURVEYS AND ACCEPTANCE CRITERIA

TYPE	DESCRIPTION	LIMIT	SURVEY METER	APPROXIMATE METER READING LIMIT	NOTES
A	Gamma dose rate @ 1m above center of grid	10 μR/hr above background		20 μR/hr (BKG = 10 μR/hr)	
B	Beta-gamma dose rate on contact, 5 points per grid	1 mr/hr (avg) 2 mr/hr (max)			
C	Beta count rate on contact, 5 points per grid	5000 dpm/100 cm^2 (avg) 15 000 dpm/100 cm^2 (max)			
D	Alpha count rate on contact, 5 points per grid	5,000 dpm/100 cm^2 (avg) 15,000 dpm/100 cm^2 (max)			
E	Alpha-beta smear survey taken at grid point showing highest alpha or beta count rate, or at center point of grid if all are about background. 1 smear/grid	1000 dpm/100 cm^2 (beta) 1000 dpm/100 cm^2 (alpha)			Smear will be taken on an area of 300 cm^2.
F	Scan entire area of grid with both the alpha and beta count rate meters. Record average and maximum readings observed. Take 5 alpha-beta smear surveys at grid locations showing highest count rate indications	Same as applicable limits above.			This survey technique will be used where other surveys for an area indicate >25 of limit.
G	1 Composite soil sample taken from 5 grid point locations.	30 pCi/g (U) (avg)			
H	1 Soil sample taken at that point.	30 pCi/g (U)			
I	GAMMA COUNT RATE USING PORTABLE NAI CRYSTAL	NONE	TERRAPLUS BR-256 OR EBERLINE	NONE	COMPARATIVE EVALUATION

Docket 70-997

Date: 12/21/88

Arrangement of Buildings on Large Site



AESD PLOT PLAN
LARGE, PA.

2,22 ~~±7~~ E-7 λ dpm × $\frac{\mu Ci}{2.22E6\ dpm}$

~~2.2~~ 1.0 E-13 μCi = ~~1.0E~~-7 pCi

Enclosed W AESD Mag
Dated 12/21/88

Enclosed "Large Site Historical
Review" dated 2/6/92

W Drawing "Large Site Contaminated
Waste Area, drawing M-1 dated
2/20/92 - Wordened
Copy of the drawing is enclosed

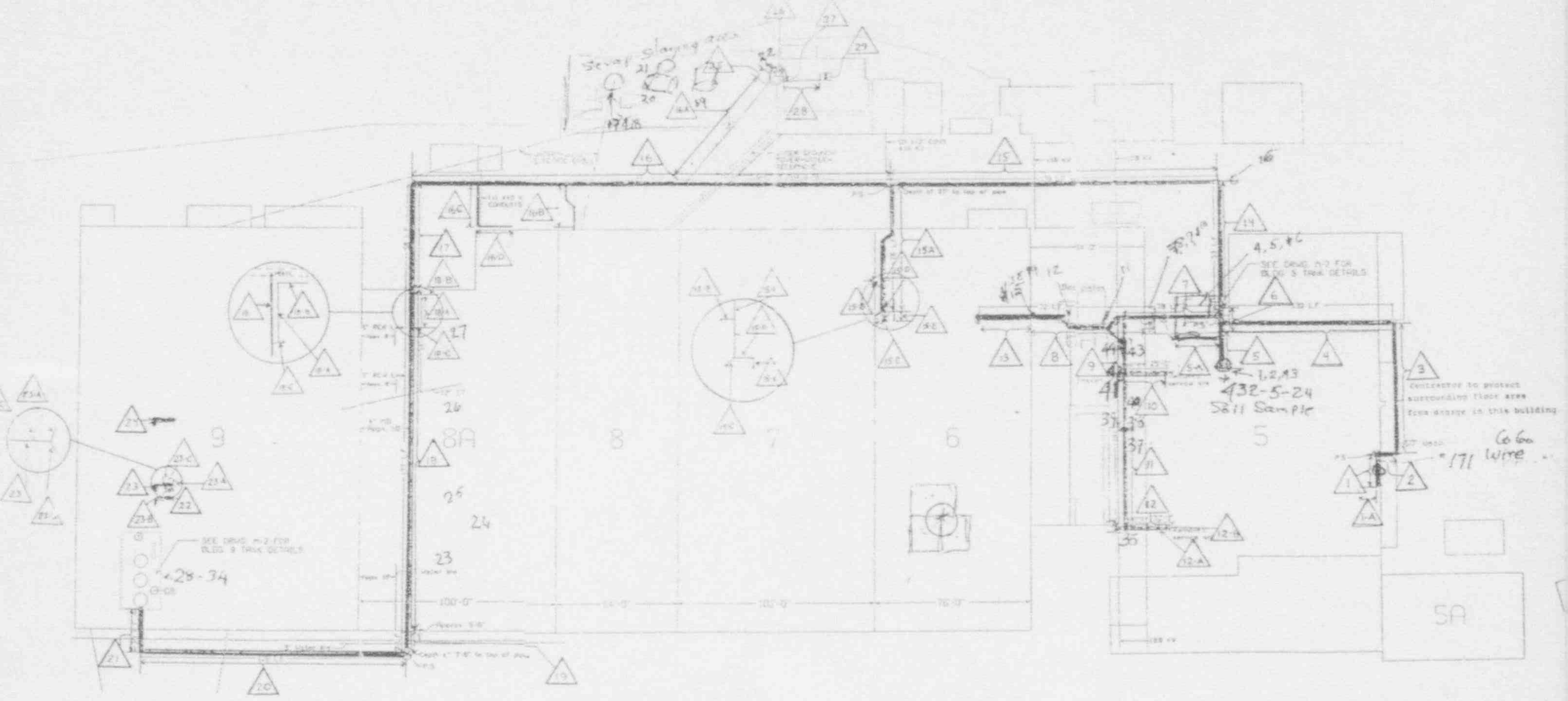
Enclose W Procedure Number 001 dated
[illegible] 4/16/92, Revision 0

(W) AESD FACILITY
LAGRE, PENNSYLVANIA

MONITOR DRAIN LINE SYSTEM

PHOTOGRAPHS

Photograph Numbers	Descriptions
(A)	MDL drawing M - 1, on wall in site HP Office.
(B)	MDL drawing M - 1, on wall in site HP Office.
1 - 3	Open trench and sampling contaminated soil from around removed check valve area of pipe section 5, Bldg. 5. Sample No. 432-5-24, split between NRC and the licensee.
4 - 6	Holding tank pit in back of Bldg. 5, 750 gal. tank removed.
7 - 10	Tunnel from east side of Bldg. 6A to get to piping under shaker, pipe section 7 removed
11 & 12	Beneath shaker, pipe removed & stubs evident.
13 - 15	Trench & tunnel from west side of Bldg. 6A. Exclusion from Bldg. 6.
16	View of backfilled trench along site road in back (north side) of buildings
17 - 21	Holding tanks, B-25 boxes containing MDL pipe sections, & other contaminated waste items in waste storage area.
22	Entrance to "cells" in which drums containing various types of waste are stored.
23 - 27	Bldg. 8A after the MDL sections 17, 18A, & 18 were removed, trench backfilled, and concrete finished to match Bldg. floor. Markings on floor indicate grid points for survey conducted to verify areas free of contamination to allow construction work.
28 - 34	Holding tank room beneath ground level of Bldg. 9. MDL piping & holding tanks removed. Evidence of past & present ground water seepage is noticeable.
35 - 44	Backfilled trenches from MDL pipe sections 11, 12, 12A, & 12B on south side of Bldg. 6A, and entrance to tunnel under this Bldg. to remove pipe section 9 and expose pipe in concrete from under shaker.



Ⓐ H&S Office
2 photos
of Map on Wall

"OFFICIAL RECORD COPY" ML 10

7 KP △△△ 7142

723263

File Letter

NAME US NRC

ADDRESS

CITY DATE

PHONE

	P.C.	QTY.
2 x 0		
3 x 0		
4 x 0		
5 x 0		
8 x 0		
OTHER 0		

5395

TYPE FILM

( ) KODACOLOR
( ) BLACK & WHITE
( ) EKTACHROME
( ) KODACHROME
( ) Other

SIZE FILM

ONLY 1 ROLL PER ENVELOPE

NUMBER OF

SPECIAL INSTRUCTIONS
- attach SPECIAL COUPONS here

Deposit $

CUSTOMER'S STATEMENT

ODR812 DATE 09/21/92

ITEM	Q'TY	@	AMOUNT
F.DEV	1	3.00	3.00
PRINT	24	0.29	6.96
TOTAL			9.96

Thanks!

24

007142

723263

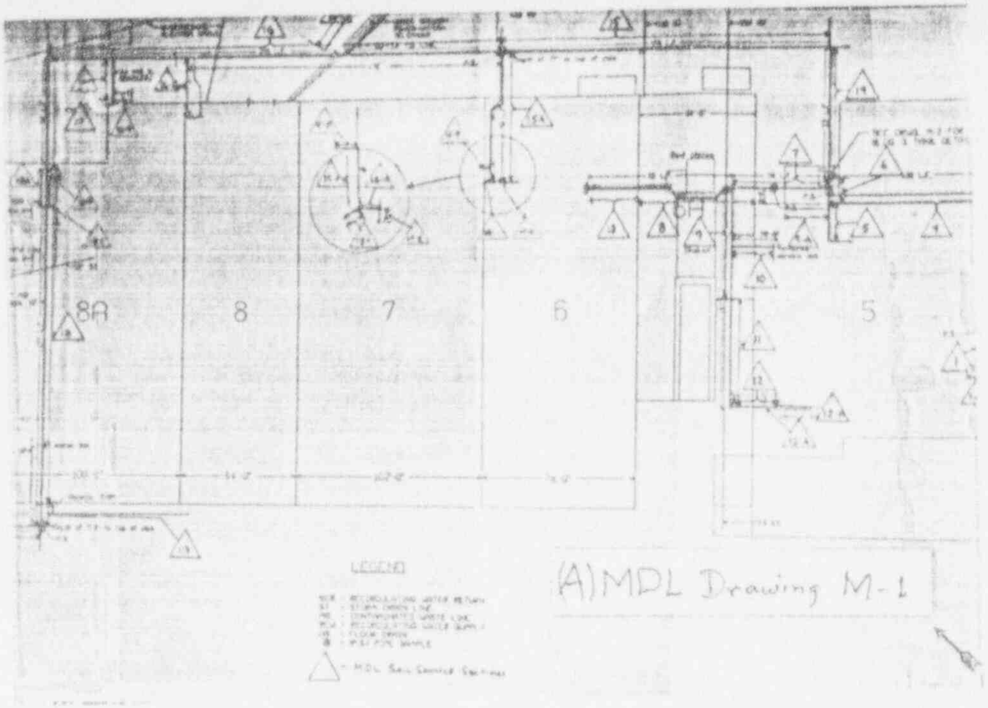
(W) AESD FACILITY
LAGRE, PENNSYLVANIA

MONITOR DRAIN LINE SYSTE

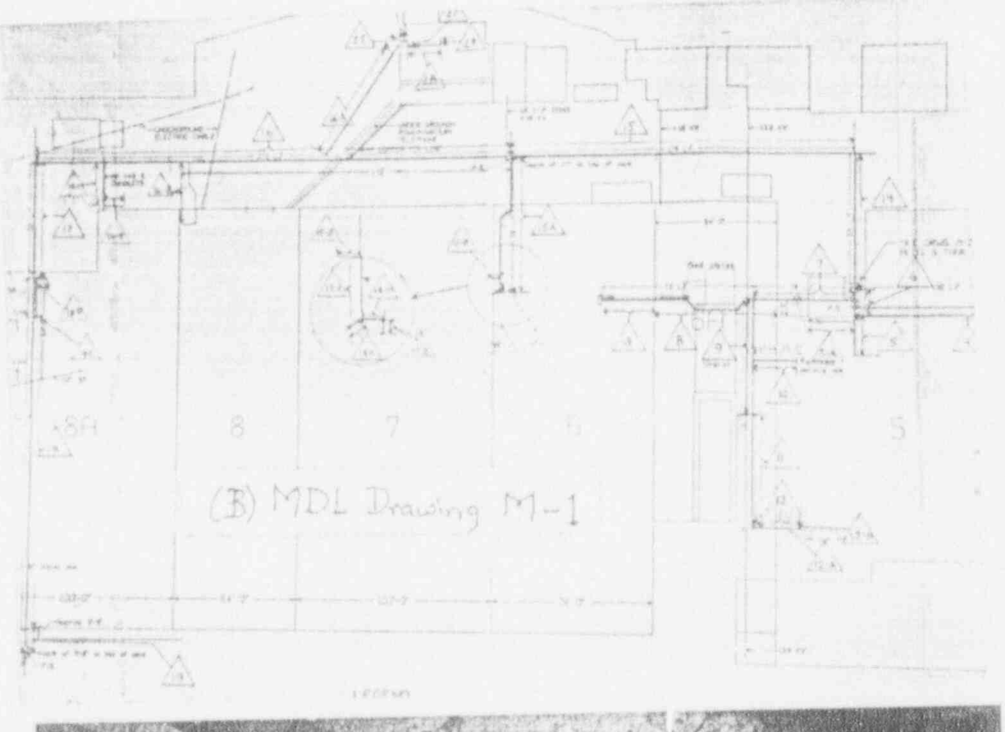
PHOTOGRAPHS

"OFFICIAL RECORD COPY"

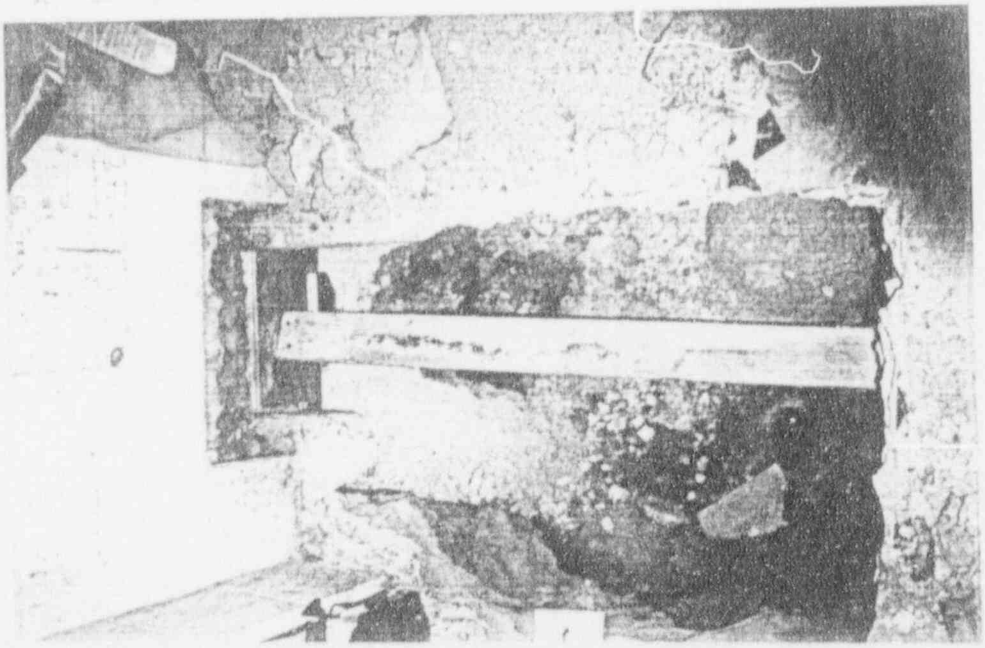
ML 10

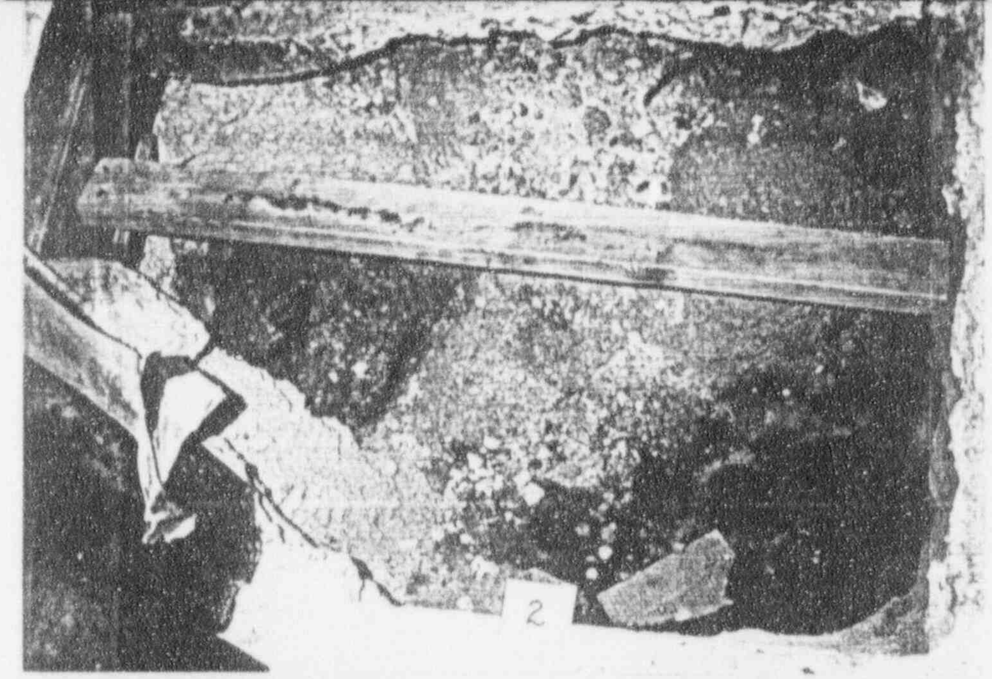


(A) MDL Drawing M-1

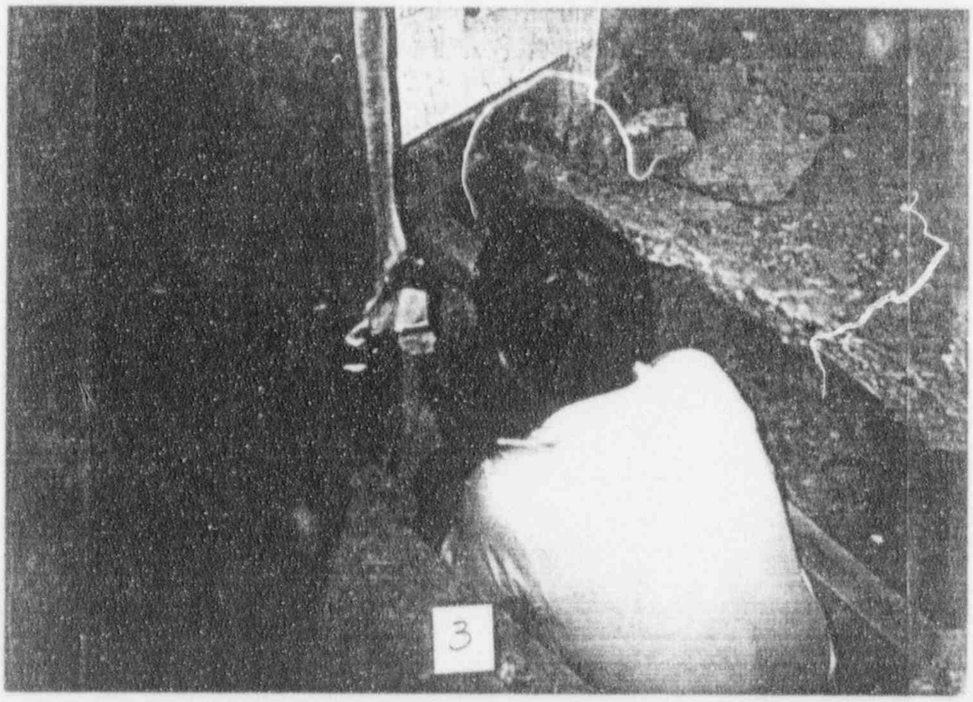


(B) MDL Drawing M-1

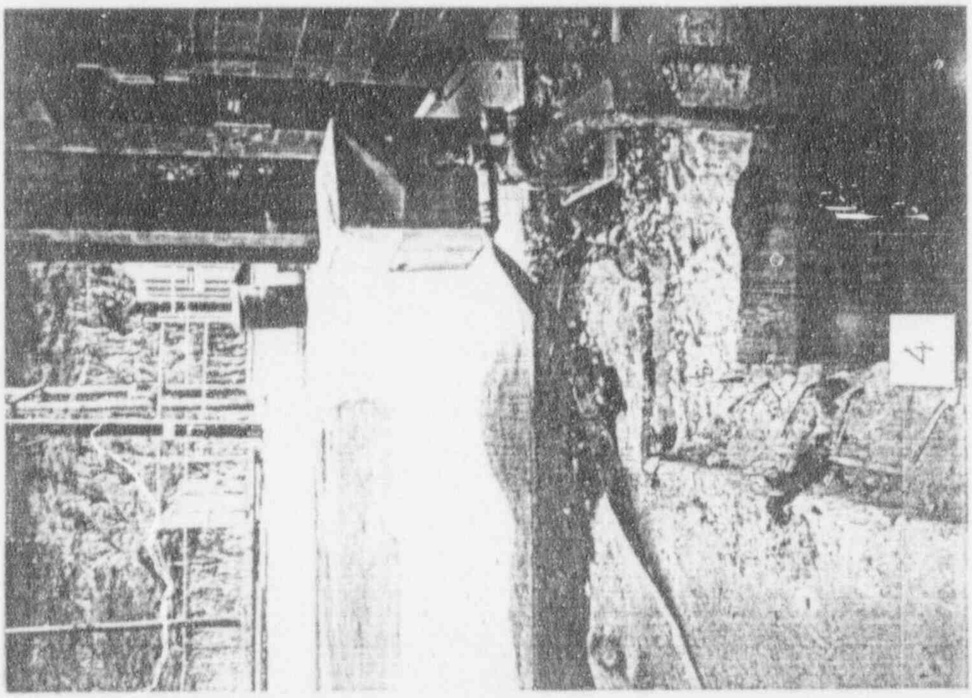




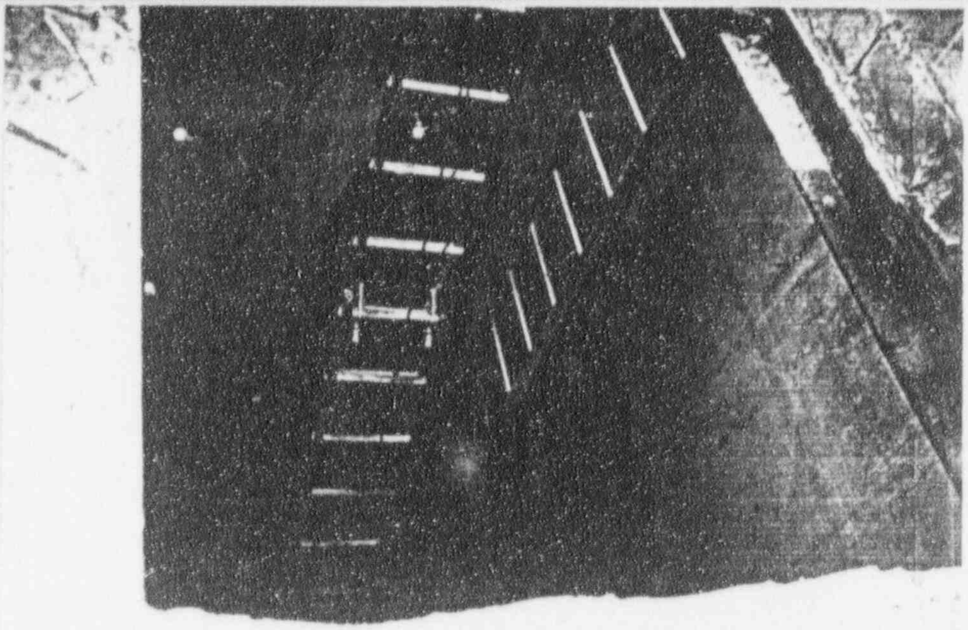
2



3

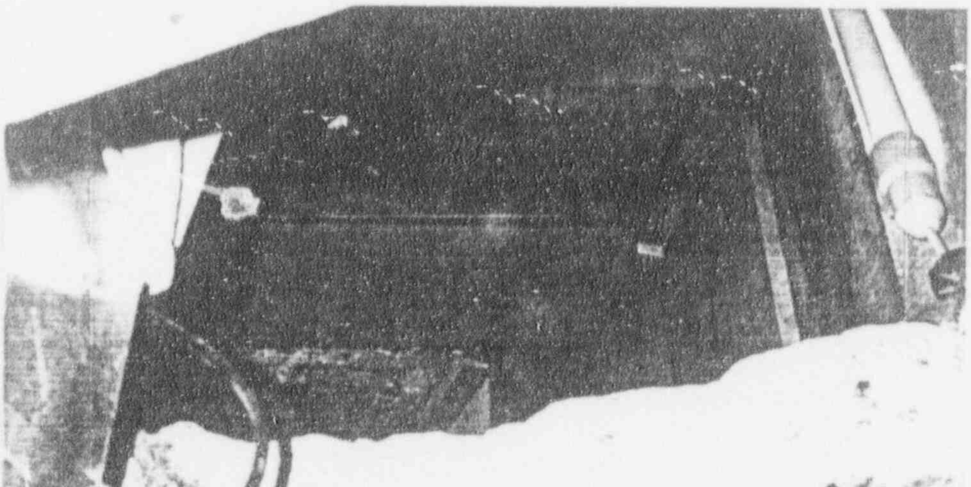


4

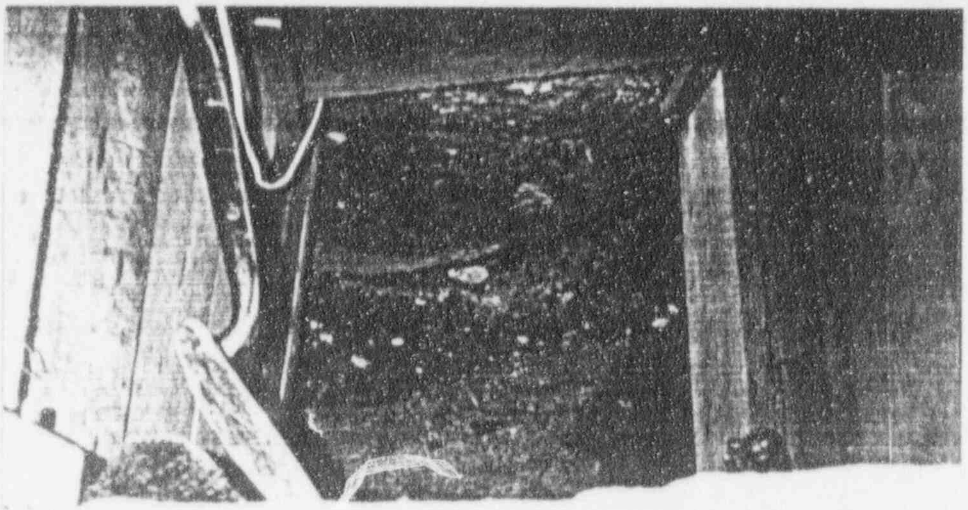


5

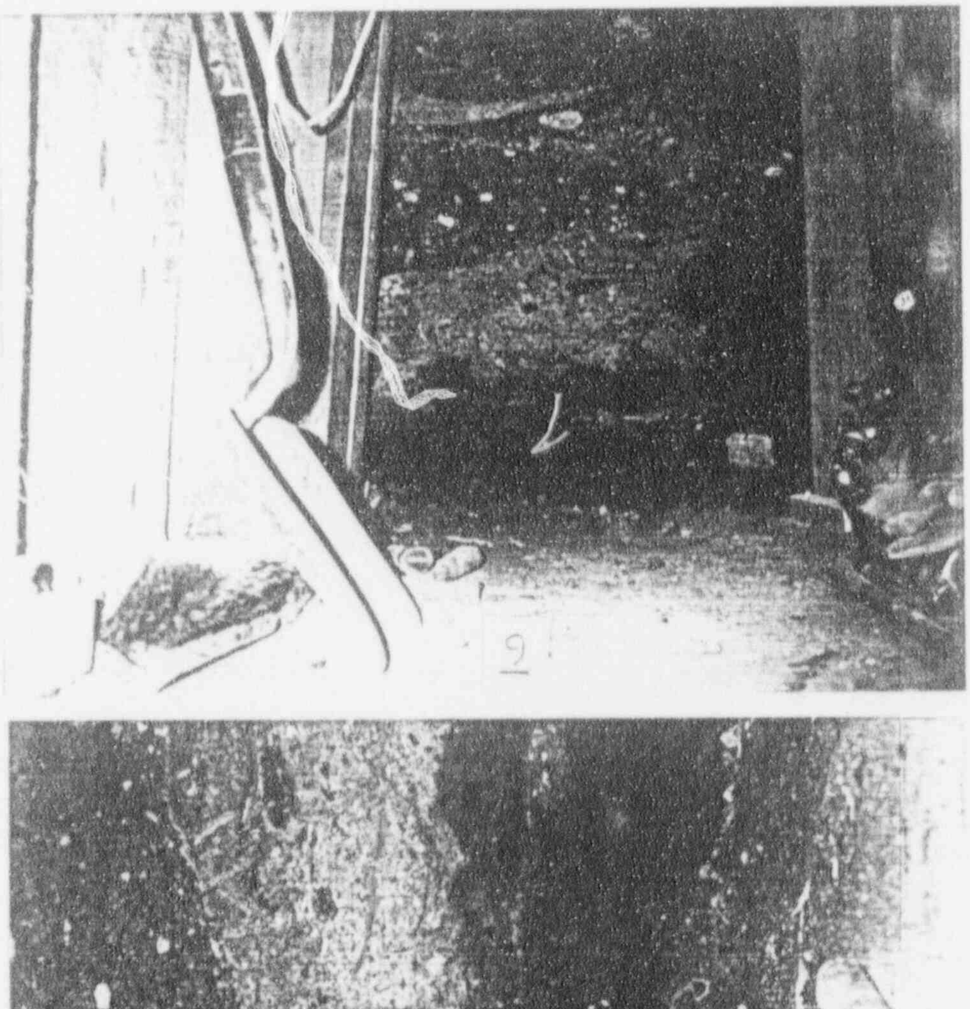
6



7

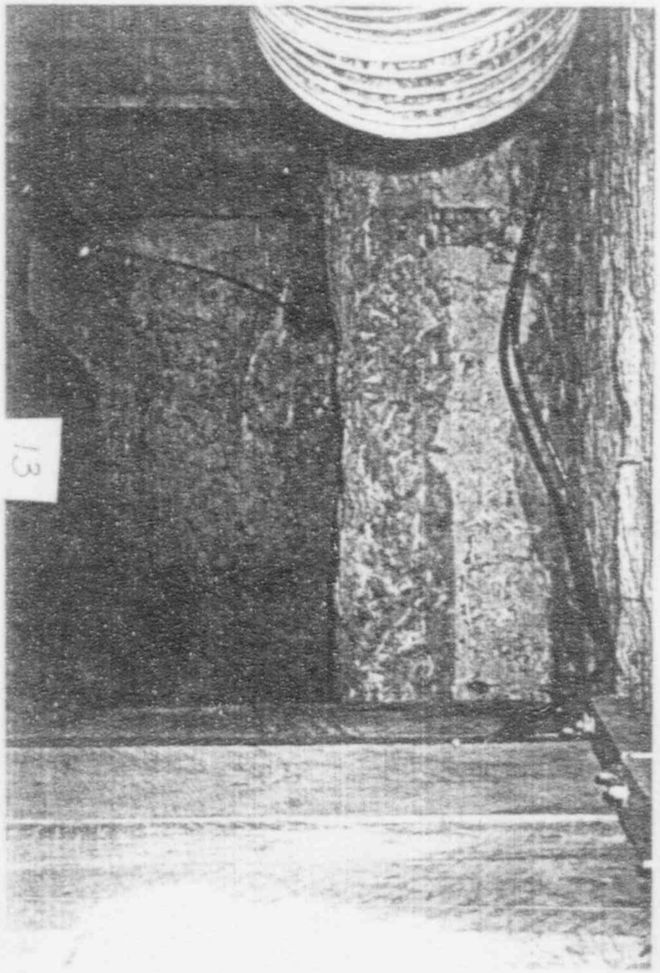


8

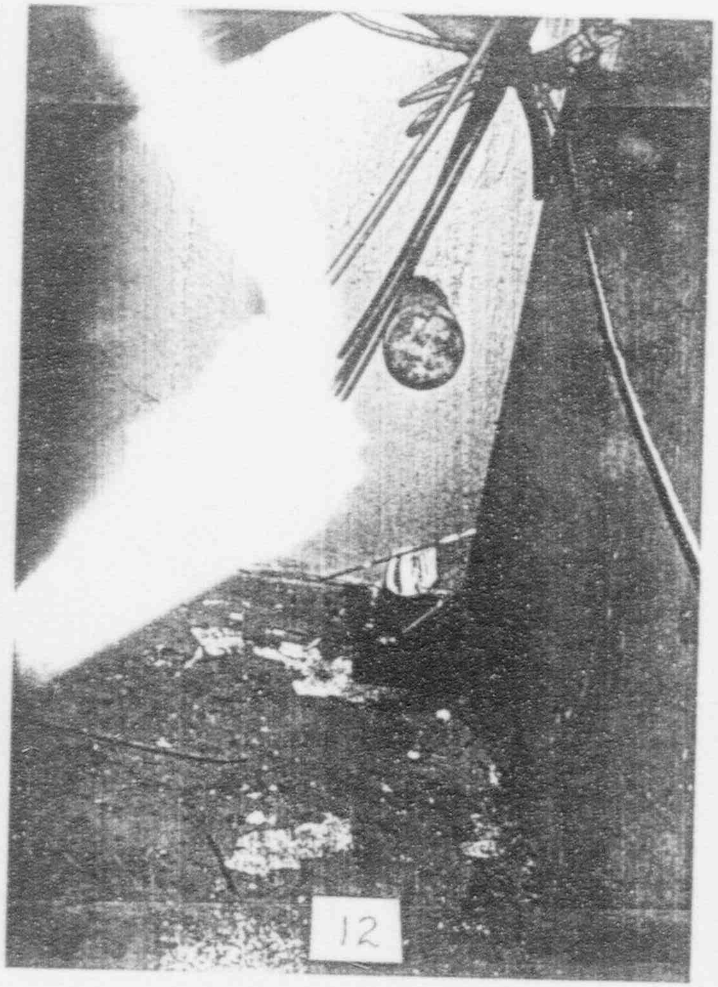


9

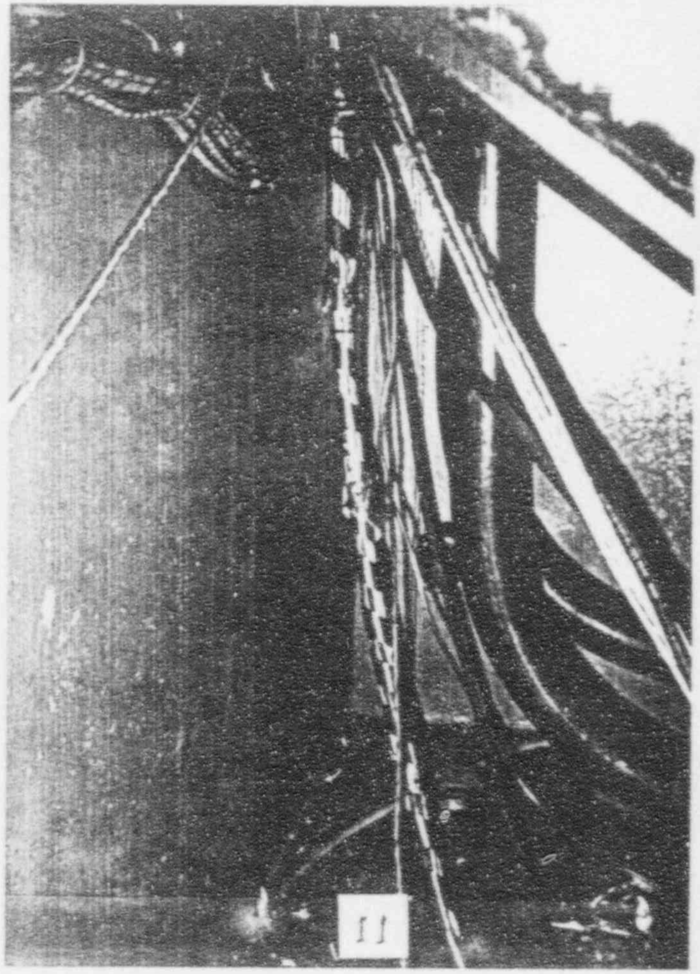
10



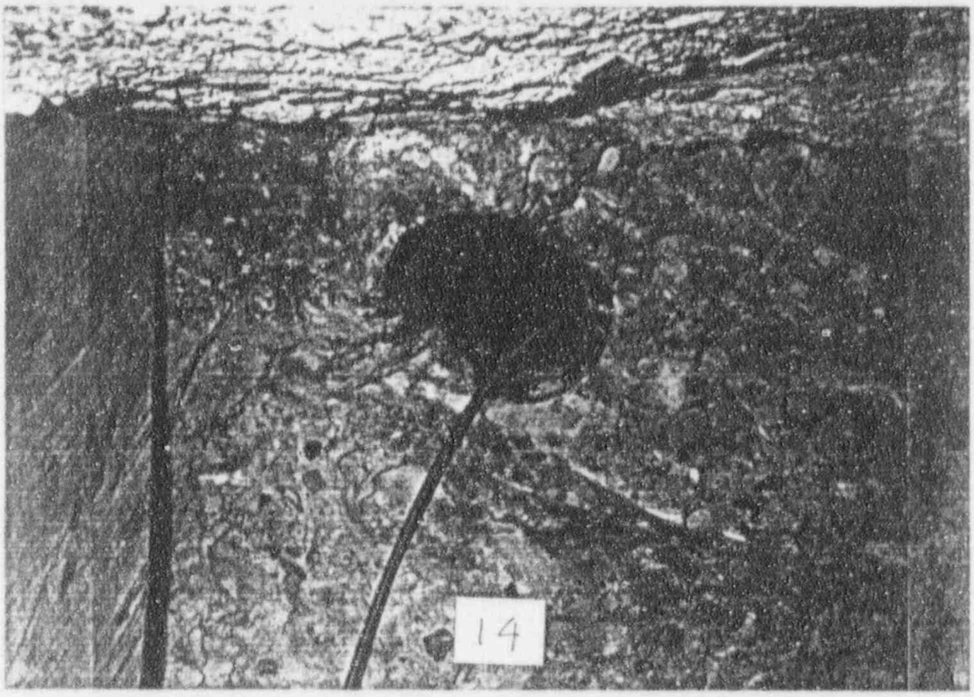
13

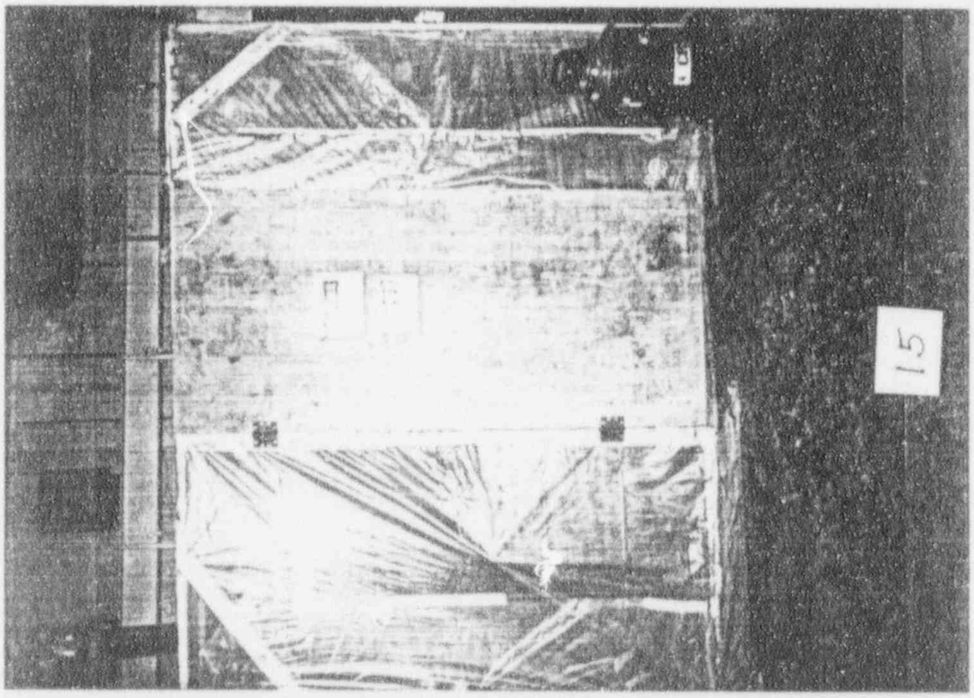


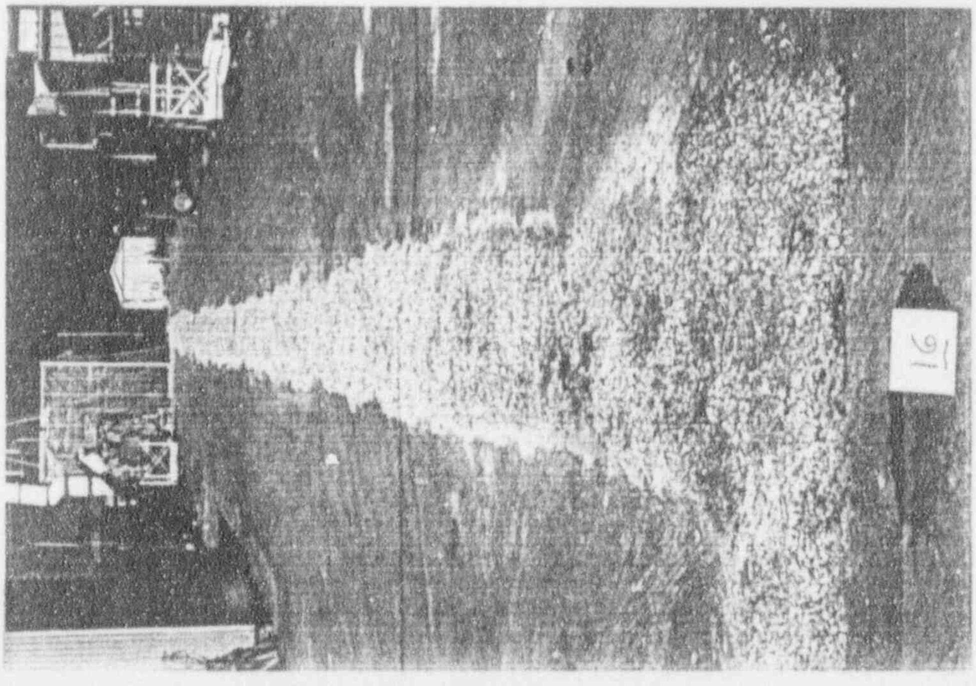
12

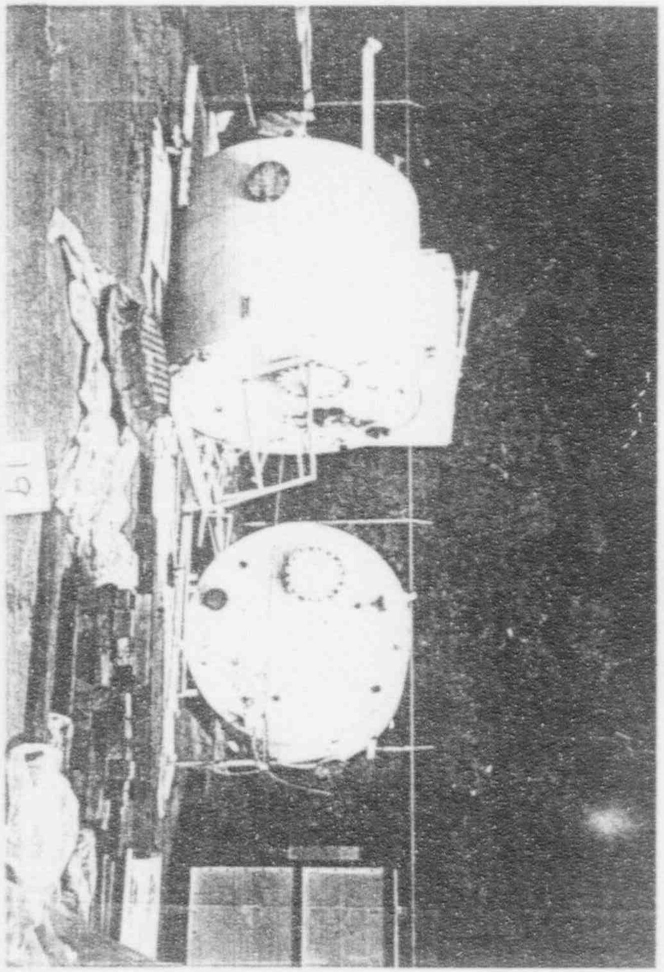


11


14


15


16

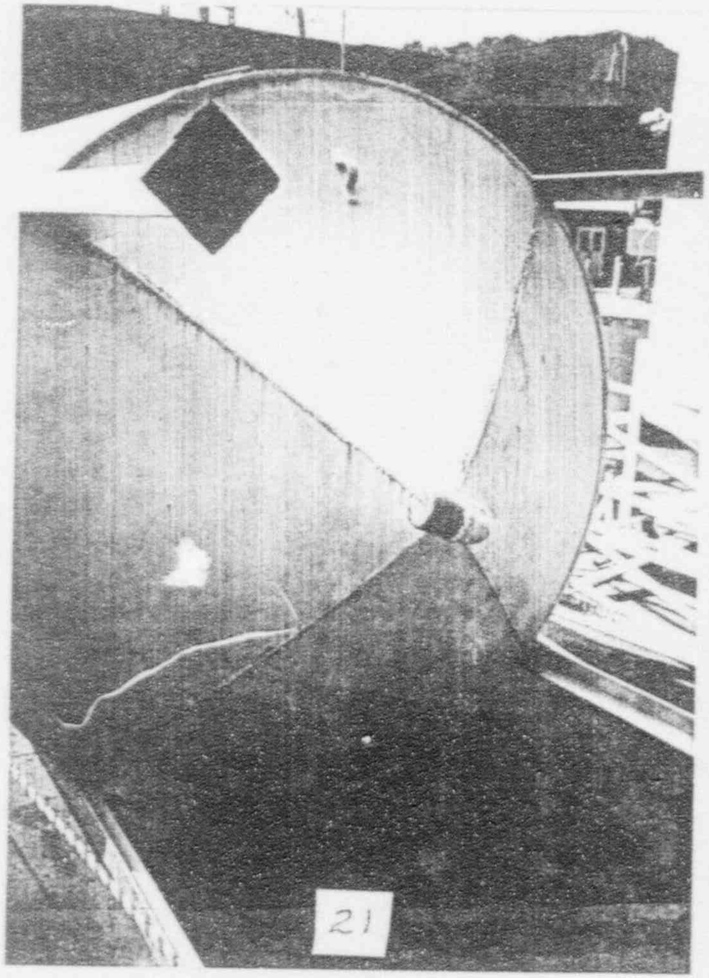


19

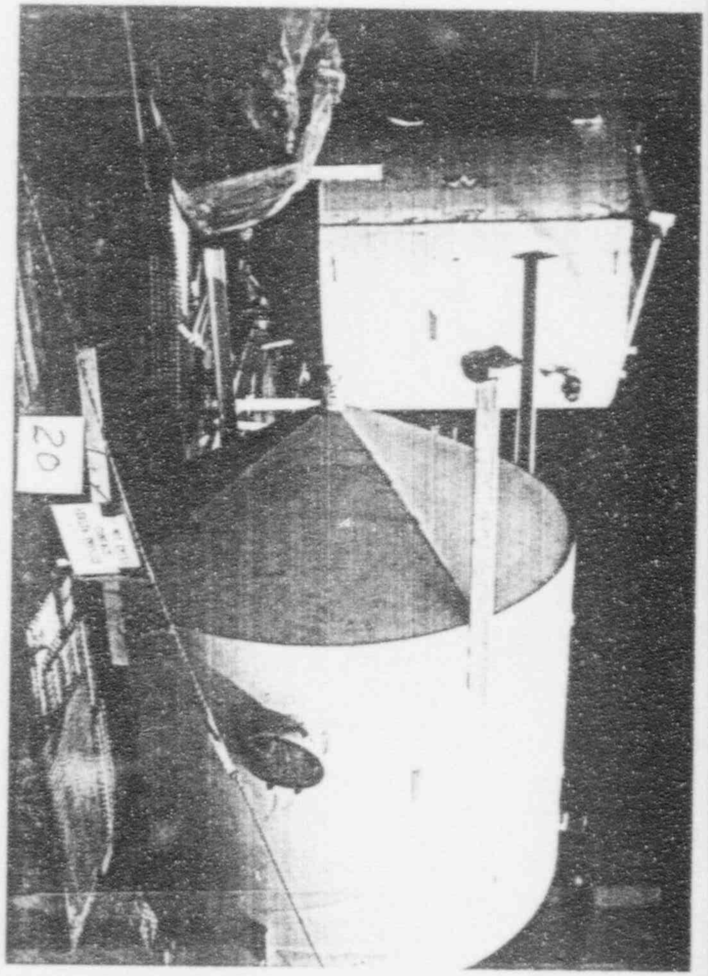
18

17

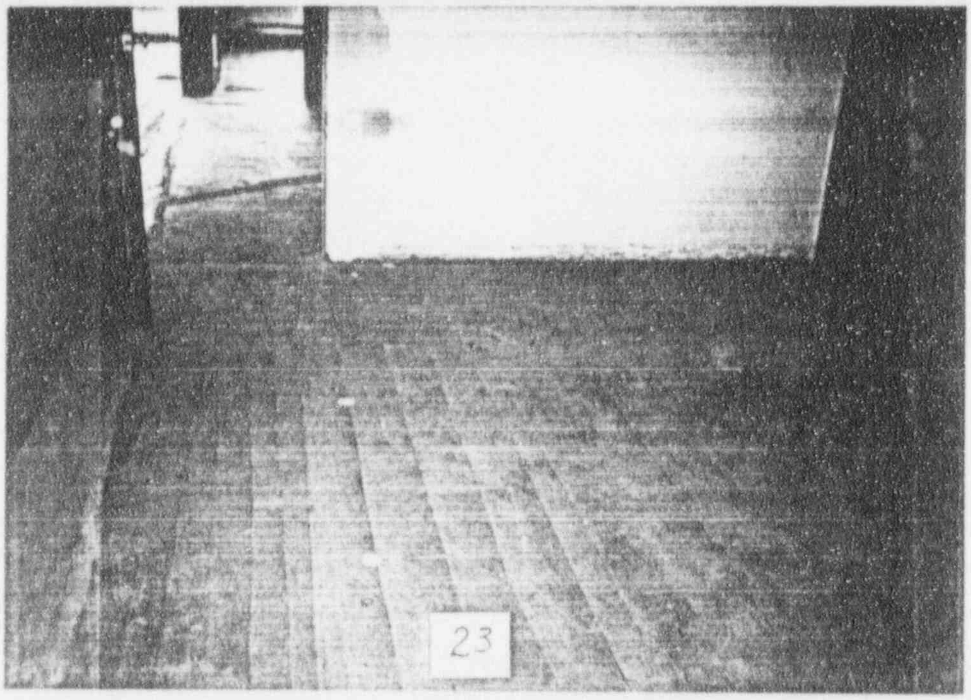
22



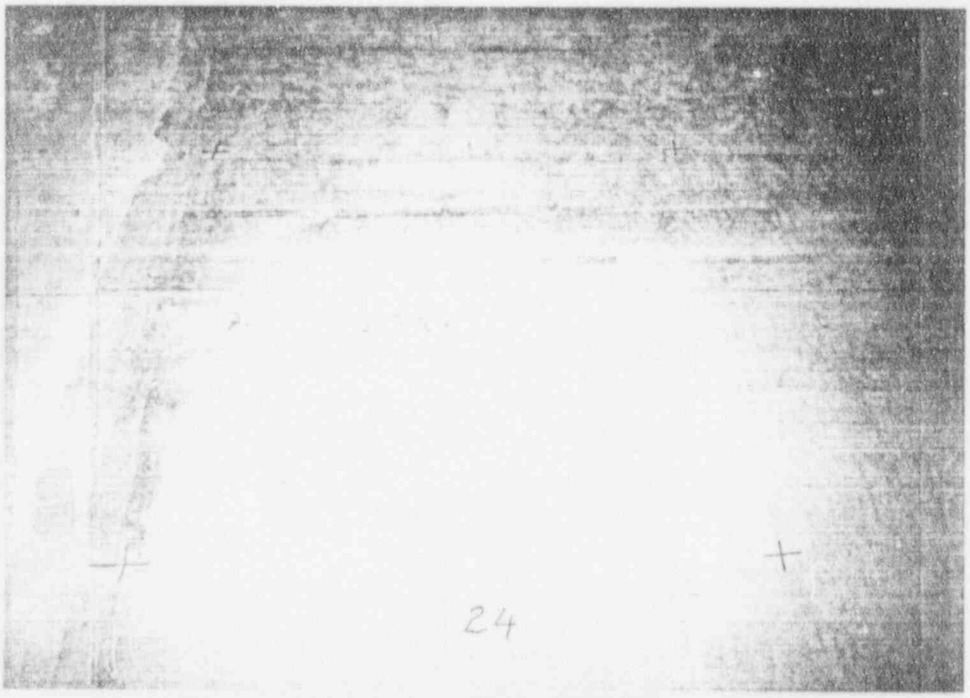
21



20

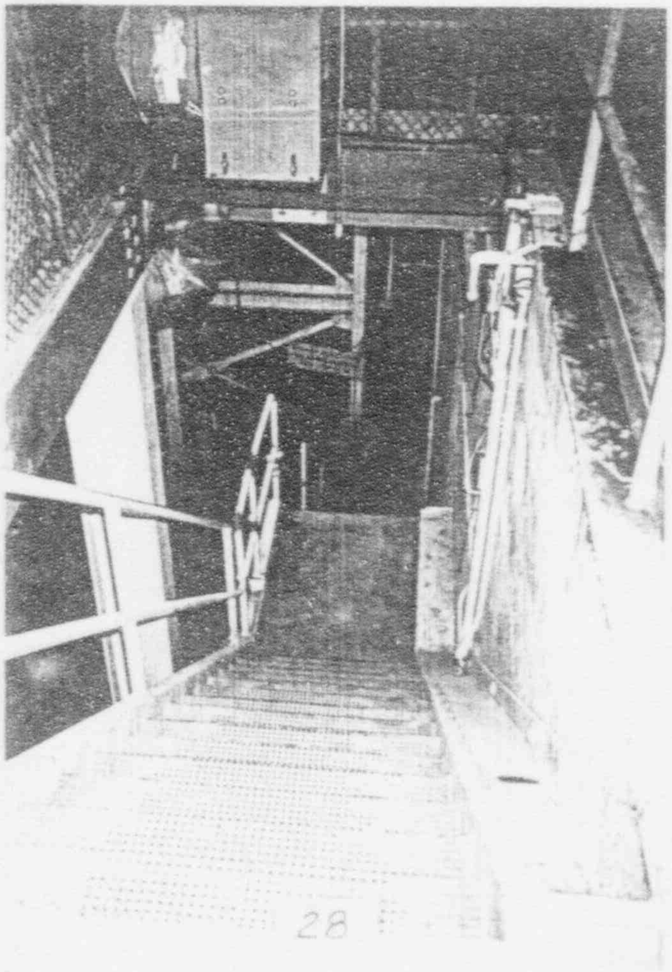


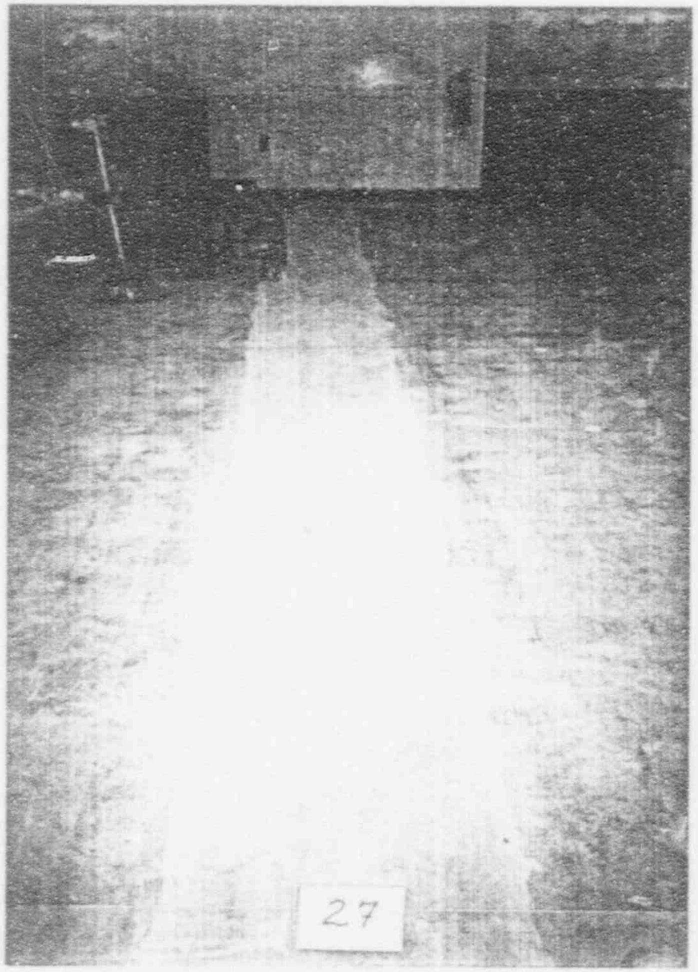
23

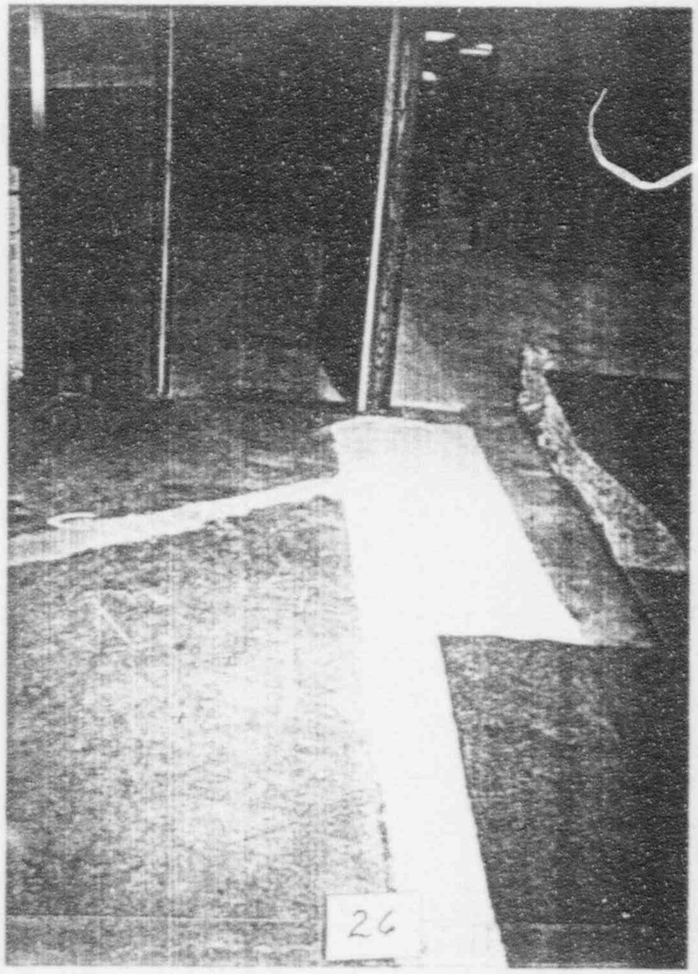


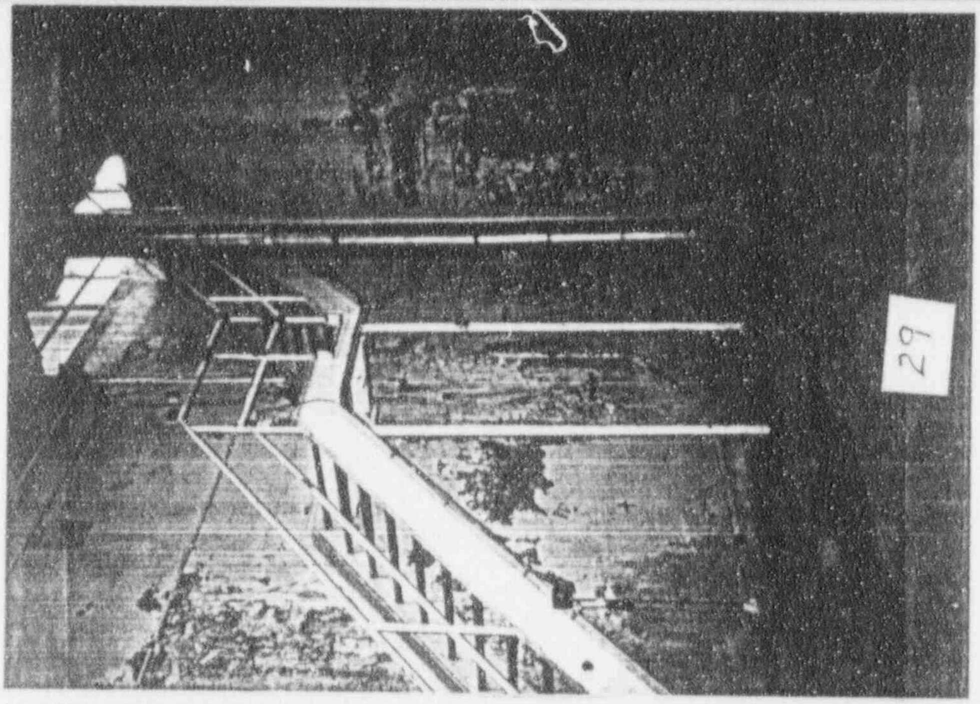
24

25

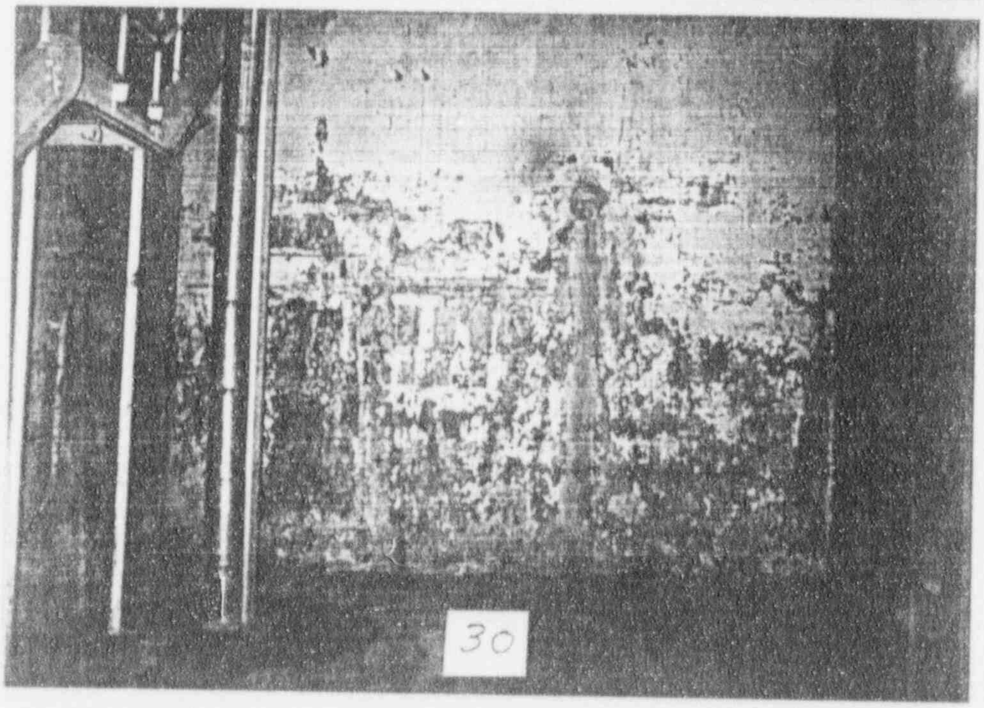

28


27


26

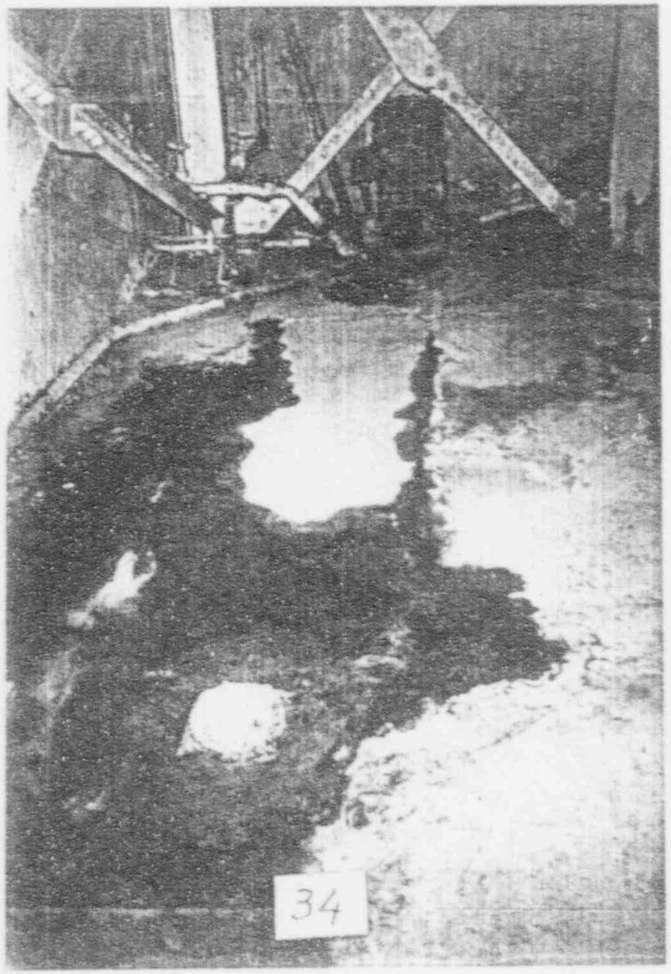


29

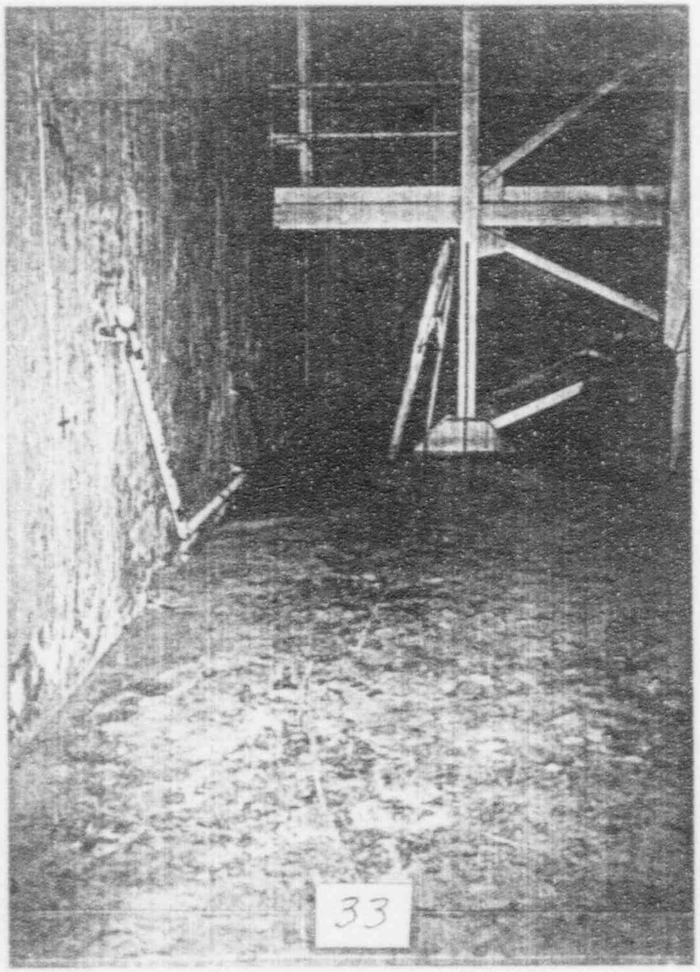


30

31

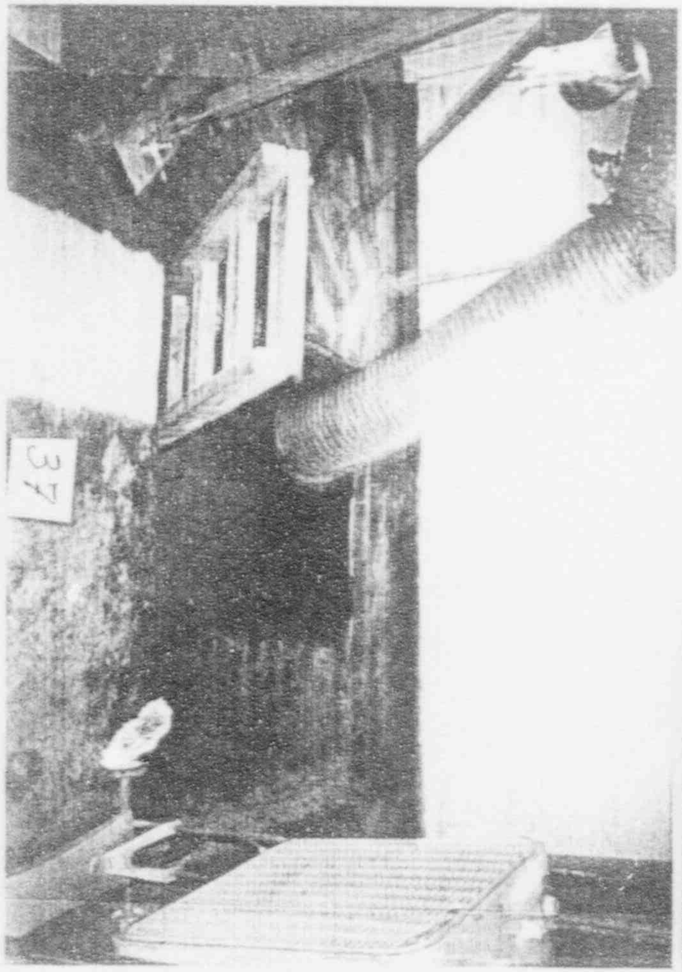


34

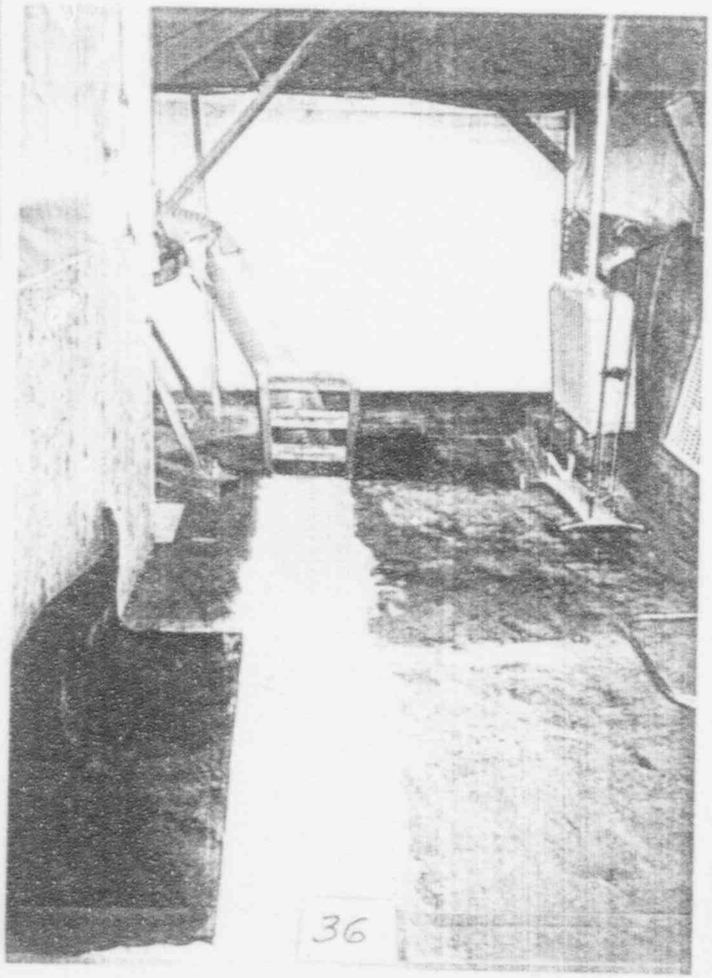


33

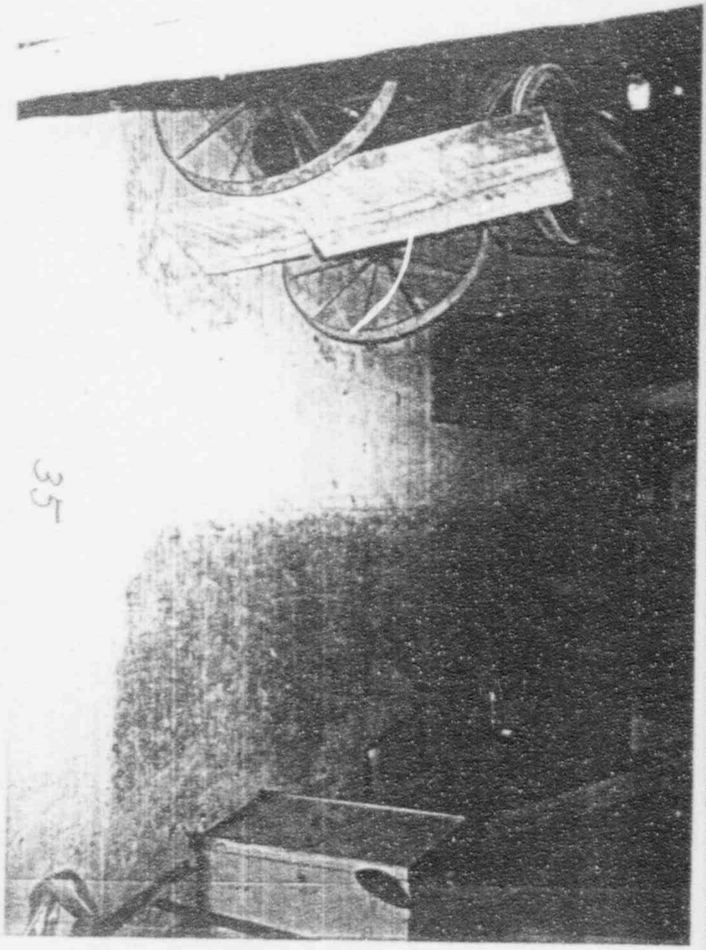
32



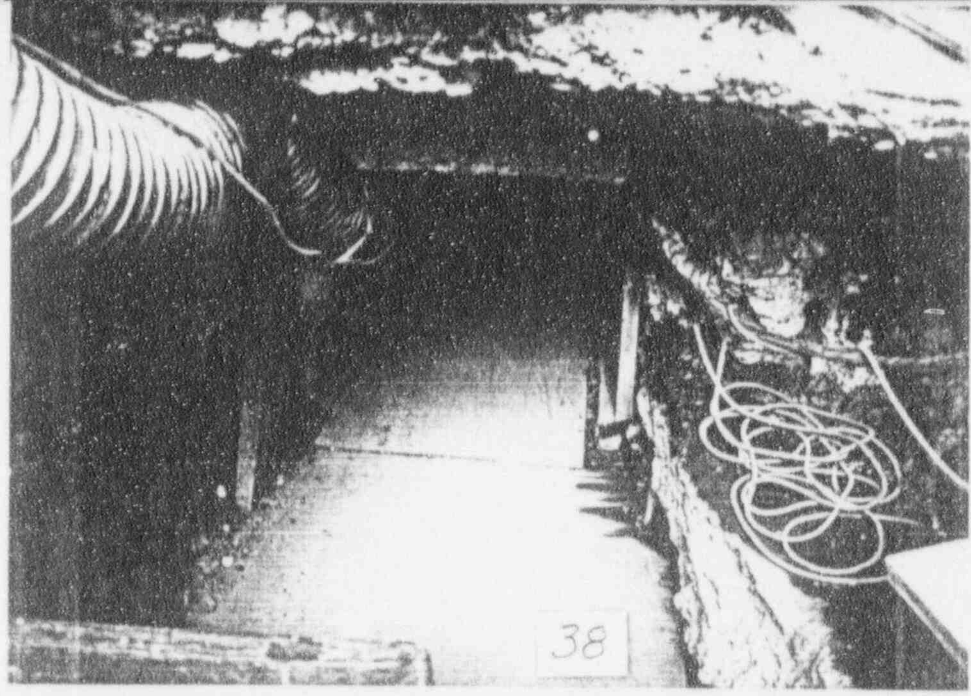
37



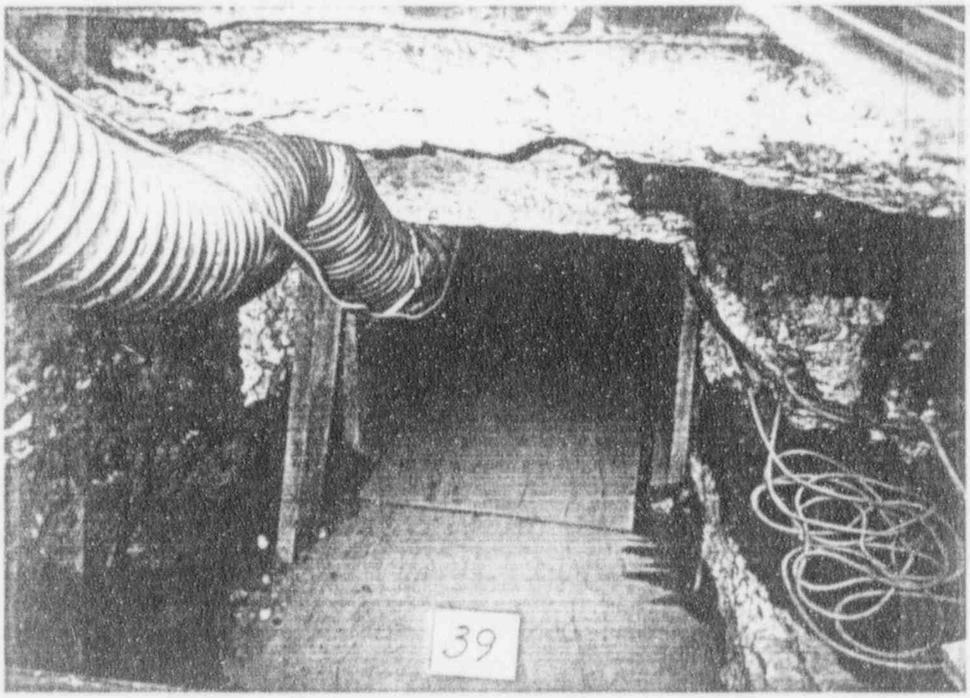
36



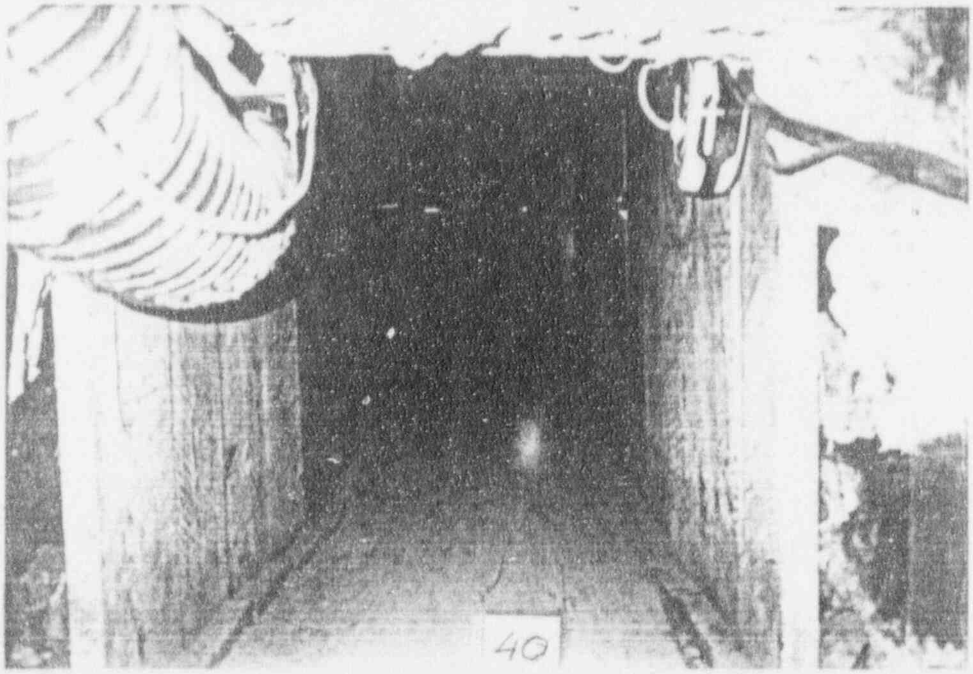
35



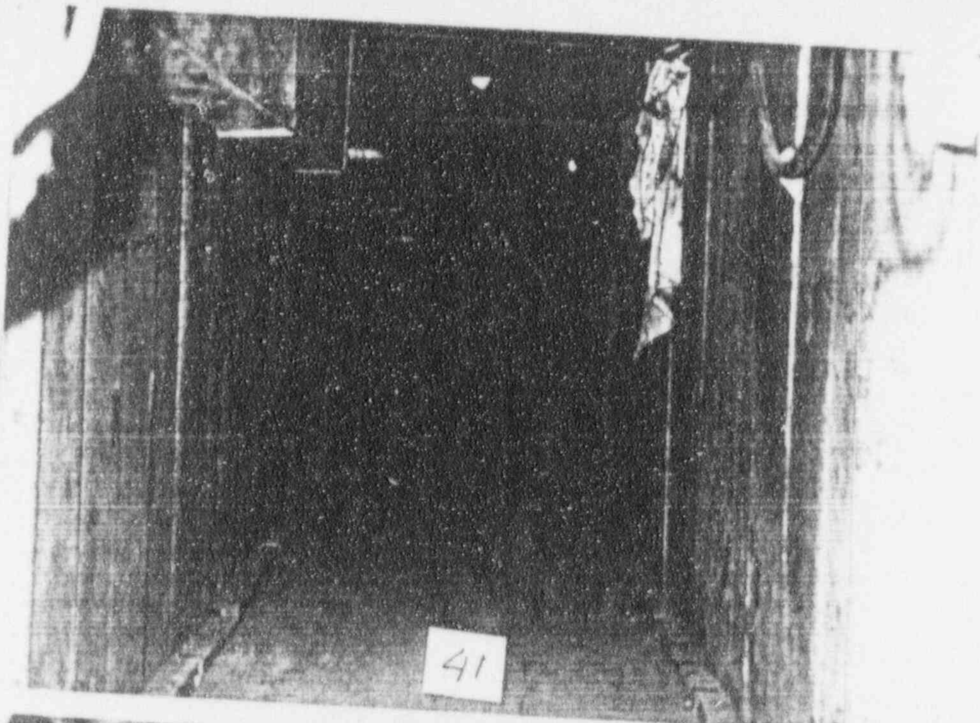
38



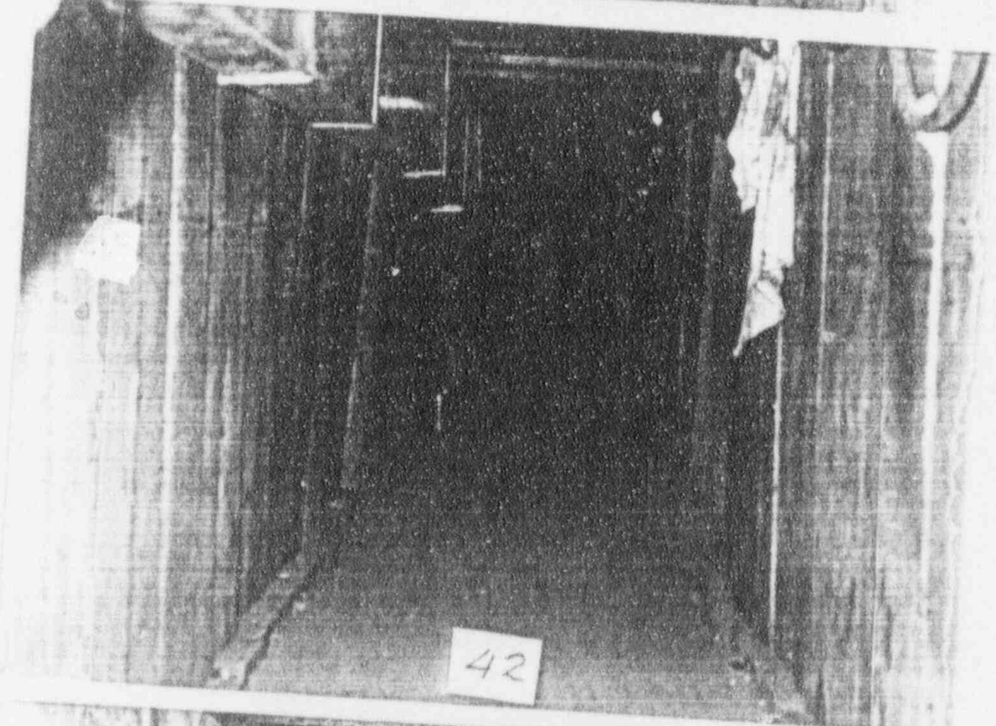
39



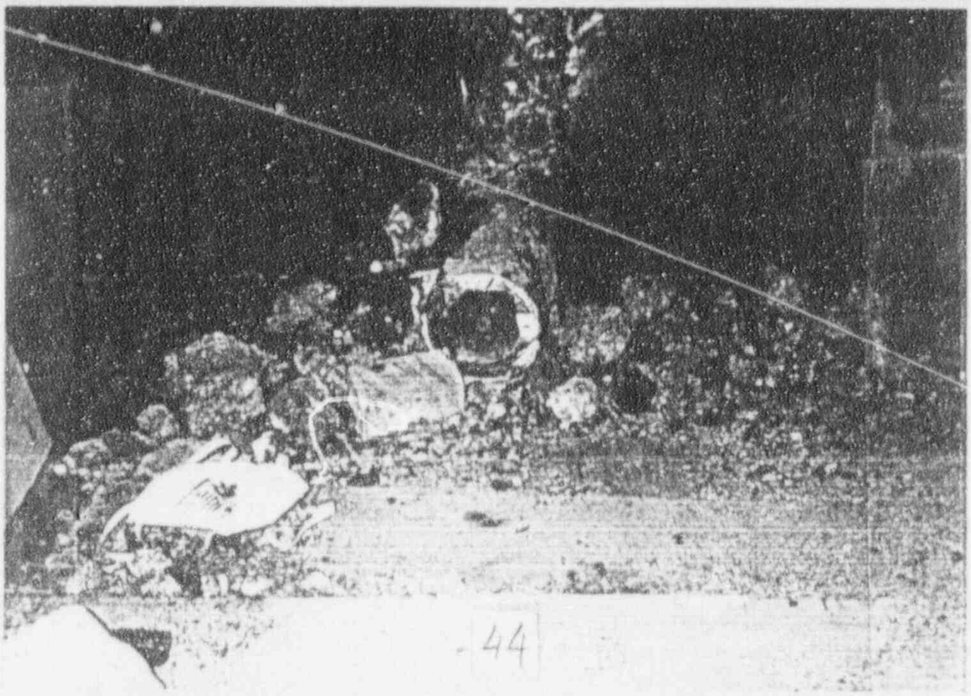
40

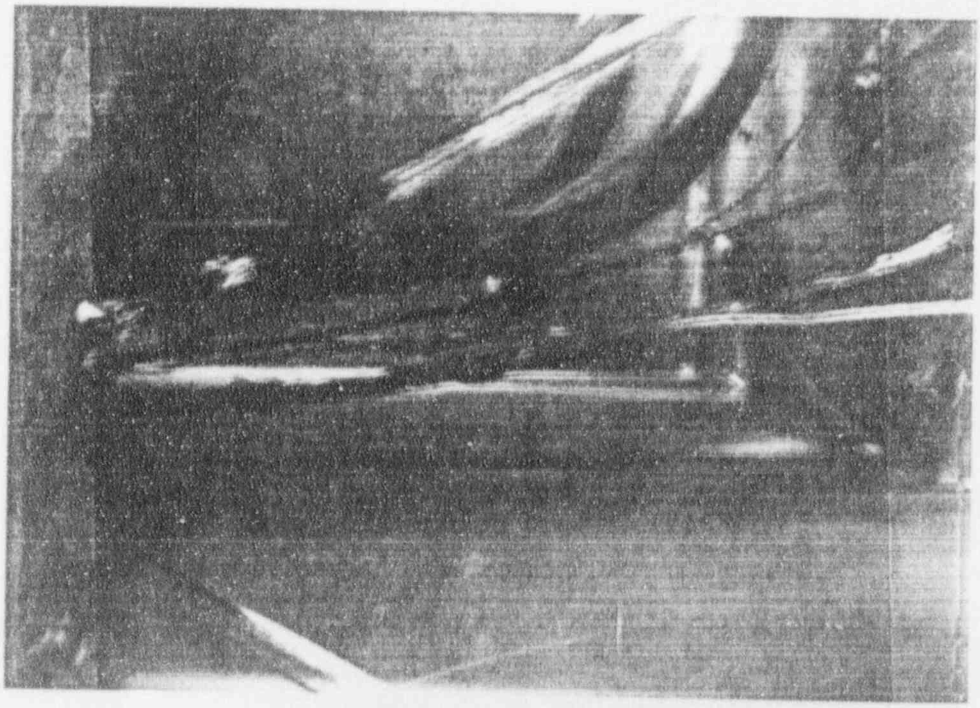


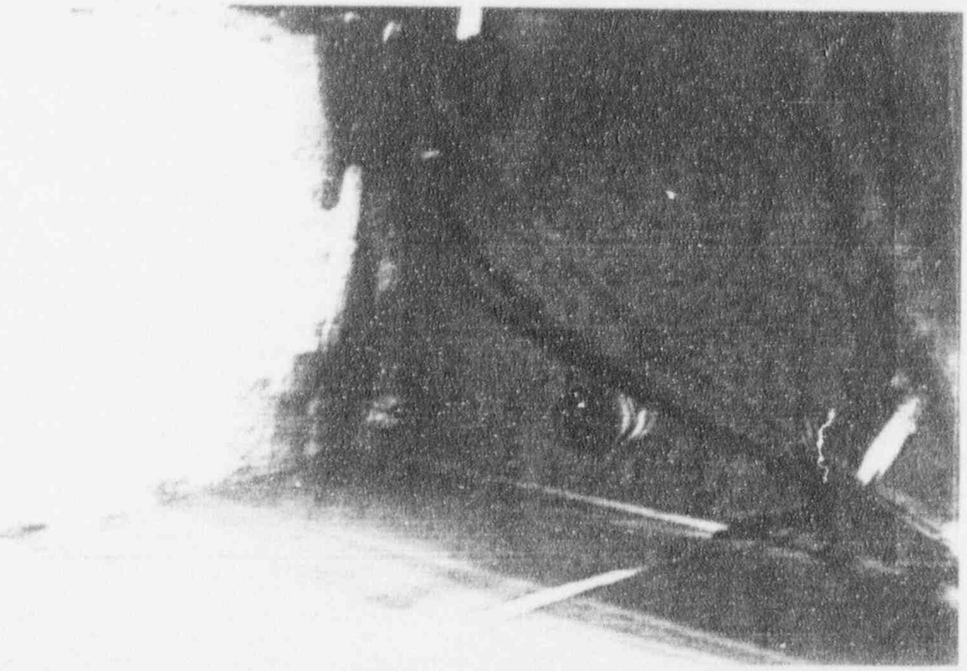
41



42


-44





OVERSIZE DOCUMENT PAGE PULLED

SEE APERTURE CARDS

NUMBER OF OVERSIZE PAGES FILMED ON APERTURE CARDS 1

9403210113-01

APERTURE CARD/HARD COPY AVAILABLE FROM

RECORDS AND REPORTS MANAGEMENT BRANCH

CONVERSATION RECORD

TIME 1:55

DATE 1/28/93

TYPE ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE ☒ INCOMING ☐ OUTGOING

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU Joe Nardi

ORGANIZATION (Office, dept., bureau, etc.) (W) Large PA

TELEPHONE NO: 412-374 4652

ROUTING	
NAME/SYMBOL	INT
[illegible]	
[illegible]	

SUBJECT Decommissioning / Decontamination of (W) Large PA, Site (412-382-7553 @ Large, PA)

SUMMARY

J. Nardi Called requesting a meeting to review status w/ RI personnel

Pipe Chase just about complete but identified

2 ~~some~~ other problems. One of these is working on & just

about corrected, The other - contamination found in the

storm sewer, under Building - Old Brewery storm Sewer.

Would like to review this w/ RI. Still waiting to finish

Decon by ~~end of~~ Feb '93

Can we meet @ RI some time?

☆. ☆

Reviewed w/ J.D.K. - Presently reviewing Bloomfield info because

Wayne Buckerstaff & Bo Bachmann have a gripe w/ him for putting [illegible].

Can't see any avail until next week. We will call

J. Nardi early in week to establish a date.

☆ Called J. Nardi & advised him we would be in touch next week.

ACTION REQUIRED

Call J. Nardi by 2/3/93.

NAME OF PERSON DOCUMENTING CONVERSATION Oberg

SIGNATURE Oberg

DATE 1/28/93

ACTION TAKEN

Called 2/4/93 @ 0820; He's not in today Secretary took message & will have him call!

Mr. Nardi called @ 10:45 2/4/93, informed him [illegible] 2/15

He said fine, Fix a date & time of [illegible] He'll be there!

SIGNATURE Oberg [illegible]

TITLE Oberg [illegible]

DATE 2/4/93

50271-101 ✩U.S. G.P.O. 198[illegible]-381-[illegible]

ML 14

CONVERSATION RECORD

"OFFICIAL RECORD COPY" OVER 2/4/93

OPTIONAL FORM 271 (12-76)

DEPARTMENT OF DEFENSE

2/5/93

John

I talked to Joe Nardi and said we could meet with him towards the end of the week of 2/15/93.

This is fine by him, any time is good, just let him know and he will be available.

If you want to include discussions on the Bloomfield Site - Wayne (Buchenstaff ?) & Bo (Bochman ?) - and the Large Site at the same time, lets set a date & time & advise these folks of it so they can join us. I'll give them all a call if you wish.

CONVERSATION RECORD

TIME 9:45 a

DATE 2/16/93

ROUTING	
NAME/SYMBOL	INT

TYPE ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE

☐ INCOMING

☒ OUTGOING

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU A. Joseph Nardi, Mg. Regulatory Services

ORGANIZATION (Office, dept., bureau, etc.) W El. Corp., Pgh, PA Re: Large, PA Site

TELEPHONE NO: 412-374-4652

SUBJECT Question Regarding Meeting, (Accompany and Storm Drain Contamination)

SUMMARY

Will anyone accompany Mr. Nardi to the meeting @ RI on 2/25/93?

- Possibly Mr. Roy Kitzer, RSO. He expressed an interest in attending. Will advise also of others.

Have you (W, Mr. Nardi) submitted any documentation regarding the contamination found in the storm sewer beneath the site?

- Nothing to date, should receive some initial information today, but nothing prior to this. This is part of the reason that the meeting was requested.

ACTION REQUIRED

Information

NAME OF PERSON DOCUMENTING CONVERSATION Oberg

SIGNATURE Oberg

DATE 2/16/93

ACTION TAKEN

SIGNATURE

TITLE

DATE

"OFFICIAL RECORD COPY" ML 10

CONVERSATION RECORD

TIME 4:15

DATE 4/21/93

TYPE ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE
☒ INCOMING
☐ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: A. J. Nardi, Mgr
Regulatory Services

ORGANIZATION (Office, dept., bureau, etc.): W El. Corp
Pittsburgh, PA

TELEPHONE NO: 412-374-
4652

SUBJECT: Large, PA Site, Status of Cleanups & Reports
SNM-951 070-00997

SUMMARY

Called to see if RI received latest set of reports. Advised him that they were here. (#16-#20 & #22-#24)

He stated that 4 more reports were proofed and in final reproduction and 5 more need to be reviewed and then sent to reproduction making a total of 9 more to be sent to RI.

One building has 3 more floors to be completed (surveyed) and will generate 3 more reports.

Finally, they have the grounds to complete, the roofs (need some good weather) and the stream survey that should be completed next week.

There will also be a report on the instrument calibration disposition of material

Finally there will be a Summary report to finish things off.

Please send some 314 Forms.

ACTION REQUIRED

Send NRC 314 Forms and await final reports

NAME OF PERSON DOCUMENTING CONVERSATION: Oberg

SIGNATURE: Oberg

DATE: 4/21/93

ACTION TAKEN

SIGNATURE

TITLE

DATE

"OFFICIAL RECORD COPY" ML 10

CONVERSATION RECORD

TIME 11:35

DATE 5/13/93

TYPE ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE

☐ INCOMING

☒ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: Joe Nardi, Mgr Reg. Services

ORGANIZATION (Office, dept., bureau, etc.): W El. Corp. Pgh. PA - (Re - Large PA)

TELEPHONE NO: 412-374 4652

SUBJECT: Large PA, PA Site Status SNM-951 & 070-00997

SUMMARY

(Returned call received yesterday 5/12/93)

Ⓝ Shipped reports last month* - you've received them (NRC)

Joe has last 4 bldg. report ready to ship to RI, possibly tomorrow.

Stream - Working on report & samples collected and submitted for anal., (69 samples) - possibly in a couple of weeks,

Roofs - Working right now, finish in another week

Grounds - Started - but early stages - another 2 weeks.

Some old picture of site showed waste storage stage pad, have to go back & check. Hot spots, took up asphalt & concrete road (spots) Soil samples around drums that were stored - storage pad, 12 samples for anal - no rad. levels w/ meters.

Would like to sit down w/ us & review again, would be happy to go to O.R. w/ reports to review w/ them. Should finish anal. 2 wks & reports in ~3 wks & working on final summary report. : Not avail wk after next, will be at Columbia Site, Can call him after, during wk of 6/1/93 (or Earlier),

ACTION REQUIRED

Await reports & Review timing w/ John K. for mtg

* Rec'd 5/3/93, Rpt # 21, 25, 26 - 32, and # 34

NAME OF PERSON DOCUMENTING CONVERSATION: Oberg

SIGNATURE:

DATE: 5/13/93

ACTION TAKEN

Reports # 16 - 20, & # 22 - # 24 Rec'd during week of 4/19/93

SIGNATURE:

TITLE: "OFFICIAL RECORD COPY"

DATE:

50271-101 ✪U.S. G.P.O. 1983-381-526/8346 CONVERSATION RECORD OPTIONAL FORM 271 (12-76) DEPARTMENT OF DEFENSE

ML 10

JUN 14 1993

License No. SNM-951 Docket No. 070-00997

Oak Ridge Institute For Science and Environment
ATTN: James Berger, Director
Environmental and Site Assessment Program
P. O. Box 117
Oak Ridge, Tennessee 37831-0117

Dear Mr. Berger:

Subject: REQUEST FOR TECHNICAL ASSISTANCE; CONFIRMATORY SURVEY BY OAK RIDGE INSTITUTE FOR SCIENCE AND ENVIRONMENT

As we recently discussed, Region I is requesting that the Oak Ridge Institute for Science and Environment conduct a confirmatory survey at the Westinghouse Electric Corporation, leased site at Large, Pennsylvania. The licensee has nearly completed the necessary remediation and final survey of the site. They plan to request that NRC terminate License No. SNM-951 and release the site for unrestricted use before the end of September 1993 when their lease expires.

The leased site at Large, Pennsylvania, has been licensed by the NRC since the early 1970's, principally for the use of unirradiated, highly enriched uranium. Some byproduct material was also used. The licensee determined that unirradiated enriched uranium is the major contaminant remaining, making the most significant isotope from a confirmatory survey perspective uranium-234. Other materials were used in small quantities or as sealed sources and their contribution to site contamination is small.

The licensee determined by surveys, sampling and analyses that the underground, monitored drain line system, used over the years to accept contaminated liquid waste for processing and subsequent release of cleaned water, was the only significantly contaminated area at the Large, Pennsylvania, site. This drain line has now been removed and the licensee is conducting the final survey.

To facilitate your survey and assure that the licensee's surveys are adequate, we request that you first evaluate the licensee's decontamination efforts, their survey plans, and techniques, as detailed in enclosed reports and other documentation. The documentation provided is not all available documentation, but does include descriptions of their remediation techniques and survey and measurement procedures.

ML 10

"OFFICIAL RECORD COPY"

Second, we would appreciate development of a survey plan and cost estimate for the site. We would be happy to arrange a site visit to facilitate planning for the survey.

Third, we would like to schedule the survey for the summer of 1993 if the licensee's submissions are adequate and funding and your schedule allows.

We appreciate your advice and assistance in this matter.

Sincerely yours,
Original Signed By:
Elizabeth Ullrich

for John D. Kinneman, Chief
Research, Development, and
Decommissioning Section
Division of Radiation Safety
and Safeguards

Enclosures:
1. Westinghouse Electric Corp. letter dated January 11, 1993
2. Westinghouse Electric Corp. letter dated February 12, 1993
3. Westinghouse Electric Corp. letter dated February 24, 1993
4. Plot Plan, ARRANGEMENT OF BUILDINGS ON LARGE SITE, dated December 21, 1988
5. License Termination Report #002, REMOVAL OF THE MONITORED DRAIN LINE SYSTEM, including RADIOLOGICAL SURVEY PROCEDURE (Appendix F), dated November 24, 1992
6. License Termination Report #004, DETERMINATION OF RADIOLOGICAL SURVEY ACCEPTANCE CRITERIA FOR LICENSE TERMINATION SURVEYS, dated December 1, 1992
7. License Termination Report #007, DETERMINATION OF SITE BACKGROUND VALUES FOR RADIOLOGICAL MEASUREMENTS, dated December 18, 1992
8. License Termination Report #009, GENERAL INFORMATION RELATIVE TO RADIOLOGICAL SURVEYS OF BUILDINGS, dated January 6, 1993

cc w/o enclosures:
D. Tiktinsky, NMSS

bcc w/o enclosures:
Region I Docket Room (w/concurrences)
J. Kinneman, RI
T. Oberg, RI

DRSS:RI	DRSS:RI
OBERG	KINNEMAN
6/14/93	6/14/93

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

JUN 22 1993

Docket No. 070-00997 License No. SNM-951

Westinghouse Electric Corporation
ATTN: Andrew T. Sabo, Director
Environmental and Regulatory Services
Energy Systems Business Unit
Post Office Box 355
Pittsburgh, Pennsylvania 15230

Dear Mr. Sabo:

Subject: Inspection No. 070-00997/92-001

This letter refers to the routine safety inspection conducted by C. T. Oberg of this office on September 15, 1992, of activities authorized by the above referenced license at Large, Pennsylvania. The areas inspected during the inspection are described in the Region I Inspection Report that is enclosed with this letter. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspector. The results of the inspection were discussed with you and Mr. J. T. Flanigan at the conclusion of the inspection.

Based on the results of this inspection, no violations were identified.

In accordance with Section 2.790 of the NRC's "Rules Of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter and the enclosed report will be placed in the Public Document Room.

No response to this letter is required. However, should you have any questions, we shall be pleased to discuss them with you.

"OFFICIAL RECORD COPY" ML 10

Your cooperation with us is appreciated.

Sincerely yours,

Elizabeth E Ullrich
for John D. Kinneman, Chief
Research, Development and
Decommissioning Section
Division of Radiation Safety
and Safeguards

Enclosure: NRC Region I Inspection Report No. 070-00997/92-001

cc:
Public Document Room (PDR)
Nuclear Safety Information Center (NRIC)
Commonwealth of Pennsylvania
R.G. Kitzer, Jr., Radiation Safety Officer
A. Joseph Nardi, Manager, Regulatory Services
James T. Flanigan, Senior Engineer

bcc:
Region I Docket Room (w/ concurrences)

C. T. Oberg, RI

U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Report No. 070-00997/92-001

Docket No. 070-00997

License No. SNM-951

Priority: 2 Category: A Program Code: 22110

Licensee:
Westinghouse Electric Corporation
Post Office Box 355
Pittsburgh, Pennsylvania 15203

Facility Name: Advanced Energy Systems Division

Inspected At: Large, Pennsylvania

Inspection Conducted: September 15, 1992

Inspector: C. Thor Oberg 6/15/93
C. Thor Oberg, Health Physicist
Date Signed

Approved By: Elizabeth Ullrich 6/15/93
for John D. Kinneman, Chief
Research, Development, and
Decommissioning Section
Date Signed

Inspection Summary: Routine, unannounced safety inspection conducted on September 15, 1992 (Report No. 070-00997/92-001).

Areas Inspected: Organization and scope of activities; facilities and the location and removal of the Monitored Drain Line system; monitoring, sampling, and analytical results; radioactively contaminated waste and planned disposition; and projected timing for termination of the license.

Results: No violations or radiological safety concerns were identified.

DETAILS

1. Persons Contacted

* Andrew T. Sabo
A. Joseph Nardi (telephone contact)
* James T. Flanigan
Irwin Dobrushin
Larry Smith
Scott Gillespi

* Those present at Exit Meeting

2. Site History

Westinghouse Electric Corporation (W) is authorized by License No. SNM-951 to possess uranium-235, neptunium-237, americium-241, and byproduct material for research and development and for instrument calibration at the Advanced Energy Systems Division (AESD) facility, Large, Pennsylvania. Previously, operations under this license (circa 1970) at this facility were conducted by the W Astro Nuclear Division.

The W AESD facility at Large, Pennsylvania, is leased from the Dick Corporation who wants the site in its original, contamination-free state when it is returned to them. Licensee representatives stated they plan to leave no evidence at the site to identify the fact that nuclear materials were used here.

During 1991, W personnel decontaminated and cleaned two buildings on this site. The licensee requested an amendment to License No. SNM-951 for the release of these buildings to the owner for unrestricted use. The license was amended and Buildings No. 1 and No. 2 were released to the owner, Dick Corporation. The licensed facility now consists of Building Nos. 4, 5A, 5, 6A, 6, 7, 8, 8A, 9, 10, 11 and 12 as identified in the enclosed W AESD map dated December 21, 1988.

In a letter to Region I dated July 18, 1991, W stated that they are proceeding with actions necessary to terminate License No. SNM-951. According to a W letter dated August 14, 1991, preliminary surveys and site historical reviews indicate that only the Monitored Drain Line (MDL) system at the Large site requires a significant decontamination effort because of uranium-234 (U-234) and uranium-235 (U-235) contamination. The MDL was a special drain system used as a waste line for liquids containing radioactive contamination. The system conducted contaminated water from various building locations to collection and holding tanks where, if necessary, the water was processed, monitored for radioactivity and subsequently released. A schematic layout of the MDL system is detailed in the enclosed W drawing "Large Site, Contaminated Waste Line, Drawing M-1" dated February 20, 1992.

W management is working closely with the site personnel to maintain comprehensive oversight. Each week management personnel meet at the facility with the Radiation Safety Officer (RSO) and the site Health Physicist (HP) to review the progress of the operations.

3. Removal of the Monitored Drain Line System

The probable locations of radioactive contamination within the buildings, based on the type of licensed materials utilized in the area, are delineated in the enclosed, "Large Site Historical Review" dated February 6, 1992, that includes a copy of a hand written plan for the physical close-out survey. The W drawing "Large Site, Contaminated Waste Line, drawing M - 1" dated February 20, 1992, shows the layout of the MDL system. A reduced copy of this drawing is enclosed with this report. The drawing is used by W personnel to identify the MDL sections and for soil sample locations.

According to the W letter dated August 14, 1991, the MDL system is the only known system at this site requiring significant decommissioning effort. The analytical report attached to this letter shows that ten samples of sludge or scrapings from the MDL system piping each contain EU in excess of appropriate release limits.

W initiated removal of the MDL system in accordance with the enclosed "SPECIFICATIONS" for "Removal Of The MDL System". During the removal of the MDL system, radiation monitoring and soil sampling has been conducted in accordance with the enclosed W PROCEDURE NUMBER 001 dated April 16, 1992, Revision 0 (enclosed). Attached to this procedure are full size copies of the M - 1 Drawing in four, 8-1/2 in. x 11 in. sections, and a copy of the MDL Trench Soil Sample Index Data.

The MDL piping was removed by excavating and trenching. The pipe was then cut into sections of reasonable length, removed from the trench and placed into W Model B-25 metal shipping containers. In some locations, the trenches were several feet deep, requiring substantial shoring to inhibit collapse of the trench walls. This was a particular problem for the removal of piping Sections 20 and 21 going into the holding tank space beneath Building 9.

The MDL system has been removed and the trenches have been back-filled, with the exception of: the trench excavated for the removed MDL system pipe Section 5; the trench and tunnel for removed pipe Section 7 going into Building 6A; the trenches and tunnels for the removed pipe Sections 9, 13, and the partially removed pipe Section 8; and the concrete lined pit (or sump) for the removed holding tank (tank No. 5) outside the north end (back) of Building 5; The Building 6A MDL piping passes under a seismic shaker and appears to be buried in the concrete support for the shaker. Apparently before the concrete was poured. the MDL was cut and replaced. with the appropriate connections. at a lower depth. Due to the ongoing operations in this building and hazards associated with open trenches, the licensee decided to tunnel under this building to remove the piping. The licensee retained the services of consultants with training and experience in tunneling and shoring operations who trained the contractor personnel and inspected both the trenching and tunneling operations. For the tunneling operations, the licensee supplies the workers with protective clothing, gloves, and dust masks. Further, the licensee is supplying fresh, filtered air into each tunnel. During working hours, the licensee is also taking daily Breathing Zone Air Samples (BZAS) using low air flow, personal air samplers at fixed locations inside the tunnels.

As of September 15, 1992, MDL pipe Sections identified as 7, 9, 13, and part of 8 have been removed and the contractor is working to remove the remaining portions of pipe Section 8 from the concrete beneath the seismic shaker. The licensee representatives asked the NRC inspector if it would be acceptable to decontaminate the pipe section in place instead of removing it from the concrete under the shaker. The inspector agreed that this was acceptable as long as they could verify that residual radioactive contamination remaining in piping meet the appropriate release criteria.

The tanks and pipe sections, plus some other items, are stored in an isolated area on a concrete pad, (beside the site "cell" area) across the site road from the back end (north side) of Building Nos. 7 and 8. Drums containing soil, sludge, disposable clothing, small tools, etc., stored inside the "cells", are awaiting shipment for processing and/or disposal as waste. 750 gallon holding tank that was removed from the concrete lined pit in back of Building 5 and the three holding tanks that were removed from the below ground level holding tank room in Building 9, are staged for final disposition along with the B-25 boxes containing the removed pipe sections.

When the assay results of trench soil samples showed no significant levels of EU or other radionuclide contamination, the trenches from which the samples were taken were backfilled and the layers of fill were compacted in accordance with W PROCEDURE NUMBER 001. The depth from which the pipe sections were removed was marked with a layer of gravel to identify the pipe line location. Thus, if additional sampling is necessary the trench could be reopened to the depth of the MDL piping without difficulty.

One trench has remained open because a detectable level of activity was found in soil samples removed from this location as discussed in the following Section 4. The location is inside Building No. 5, about 24 feet from the north end of the building along MDL pipe Section 5. The pipe fitting at this location was a check valve with its upstream connection made to a deep sink. The check valve allowed the sink to drain to the MDL but inhibited flow from the MDL to the sink. The MDL piping, valve, and the connecting drain line from the sink were removed, packaged, and are stored in the B -25 boxes for disposal. The trench will remain open until authorization to backfill is received from the NRC.

The licensee is accumulating a library of color photographs depicting the MDL removal operations. In addition, the licensee took photographs of the status of the MDL system removal on September 15, 1992, and gave these to the NRC Inspector for developing and printing. The photographs were placed in the docket file.

No safety issues were identified.

4. Acceptable Residual Radioactivity

The principle radioactive material that was used under License No. SNM-951 at the Large, Pennsylvania site was enriched uranium (uranium enriched in the U-235 isotope) that had not been irradiated. Based on this and the results of MDL residues and deposit analyses, the licensee has established an acceptance level for the release of uranium contamination in soil of 30 picocuries per gram. The acceptance level for the U-235 isotope is established as 1 picocurie per from of soil. The limit for the U-235 is based on the ratio of 30 to 1 for total uranium to U-235 as was determined by averaging analytical isotopic alpha and gamma spectrometer results. The average enrichment percentage was determined to be about 65 percent.

In addition to the above limits, surface contamination release limits were set at:

Average - 5,000 dpm/100 sq. cm. total
Maximum - 15,000 dpm/100 sq. cm. total
Removable - 1,000 dpm/100 sq. cm

The release limit for the net dose rate measured at 1 meter from a surface is:

5 microroentgens per hour net activity.

5. Personnel Monitoring

Whole body, personnel thermoluminescent dosimetry (TLD) badges are worn by the W and contractor personnel working on the MDL removal. To date, the highest radiation level recorded is a 47 millirem, shallow whole body dose, for a quarterly period. The licensee has installed 150 TLD badges throughout the site for environmental monitoring. These have not yet been removed and evaluated.

About 100 BZA's, taken at a rate of about 2 each day during tunneling operations, have been analyzed by the licensee using gas-flow proportional counters. The gross alpha and beta results obtained by counting the charcoal from the BZAS were also at the instrument's MDA levels: 1 to 9 E-12 a-dpm/ml of air and 1 to 10 E-10 b-dpm/ml of air (or 0.4 to 4 E-12 a-pCi/ml of air and 0.4 to 4.5 b-pCi/ml of air).

No safety issues were identified.

6. Soil Sampling

During the trenching and MDL removal operations, radiation surveys were conducted in the trenches with an Eberline Instrument Corp., ESP - 2 portable survey instrument using a 2 in. x 2 in., NaI(Tl) gamma scintillation detector (SPA - 3 type) and an alpha/beta probe (HP - 100 type). Double the average count rate on clean material (contact), plus or minus about a 25 percent fluctuation, was established as a trigger level for soil sampling, using this criteria, significantly more surveys and soil samples were taken than were anticipated. The licensee's survey instruments are being calibrated quarterly.

Soil samples were taken from the trenches at specific locations in accordance with Steps III. 6., 7., 8., and 9. in the W PROCEDURE NUMBER 001. In addition, samples were taken from the trenches where there was observed to be a pipe joint or evidence of a possible leak from the MDL (obvious holes in the piping). The soil samples were sent to the W Waltz Mill site for radioassay and radiochemical analyses. Rain (surface)/ground water samples were taken of the composite water after necessary dewatering of the trenches. Water samples were analyzed at the W AESD site. Sludge from the concrete retaining pit behind Building 5 was analyzed as soil at the W Waltz Mill site. Breathing Zone Air Samples (BZAS) are taken as previously discussed and analyzed at the W AESD site.

The Building 8A trench soil and water sample radioassay results were sufficiently low that the licensee backfilled the trenches. Clean soil fill was added and compacted. The last several inches of the trenches were filled with concrete and the surface finished to match the floor of the building. Subsequently, the licensee conducted a close-out type radiation survey of the building using a Ludlum Measurements, Inc., floor monitoring instrument with a Model 43 -37 type, large area, gas proportional detector and a count rate meter. Measurements were also made with the Eberline ESP - 2 and the two types of detectors specified in a preceding paragraph. Based on the above mentioned trigger level of double the measurements made on clean materials, no significant level of radiation or contamination was identified. The licensee will conduct a final survey of the area when the site confirmatory survey is conducted. The licensee will be using a new Reuter Stokes survey instrument instead of the ESP - 2, and will employ a recently modified survey grid system.

As of September 15, 1991, 426 soil samples (plus 2 reanalyzed soils, 3 sludge, and 1 wire sample) were taken for analysis. Each soil/sludge sample was about 1 liter in volume, thoroughly mixed to attain representative and reproducible samples, and about half of this was retained in storage for reanalysis. For verification of the analytical results, the licensee plans to reanalyze 15 soil samples that showed the highest activity concentration levels. With one exception, the results of the analytical data showed that the level of U235 contamination in the soil from the trenches ranged from about 0.25 (+/-50%) to 1.26 (+/-48%) picocuries of U235 per gram of soil (pCi U235/gm). The exception was the analytical result of soil taken from pipe Section 20 at 122 feet from the "L" joint to section 19 (from Building 8A) and just before the "L" joint into Section 21 (to Building 9). Because of the difficulties experienced by contractor personnel working at about a 10 foot depth in this trench, some contamination apparently spilled out of the pipe during the cutting or removal operation. Analytical results of the soil samples (No. 371 and 372) gave an average concentration of 1.5 (+/-20%) pCi U235/gm. About 3 or 4 inches of dirt from this area was shoveled into a 5 gallon drum and removed from the trench and the soil in the trench was again sampled and analyzed. The results of these analyses (sample Nos. 387 and 388) were equivalent to 0.065 and 0.28 pCi U235/gm of soil respectively. Based on these results, the licensee concluded that all of the contaminated soil had been removed and was contained in the drum. The drum was sealed and stored with the other waste materials.

Analytical data for the trench soil from the MDL pipe Section 5 check valve location Sample No. 85) gave the high concentration of 1.26 pCi U235/gm of soil. On September 15, 1992, another soil sample was taken at this location. The sample, No. 432-5-24, was thoroughly mixed and about 1,000 cubic centimeters (cc) of this mixture was split between the licensee and the NRC, Region I, for independent radioassays. Through September 15, 1992, a total of 430 soil and sludge samples from the W AESD site at Large, Pennsylvania, have been submitted to the W Waltz Mill Site for radioassay. The licensee has retained duplicates of most of the samples analyzed. With an assumed ratio of 30 to 1 for U234 in U235, the licensee estimated the range of U234 contamination in the soil to be from 7.5 to 38 pCi/gm.

The analyses of three sludge samples (Nos. 419 - 421) taken from the concrete retaining pit behind Building 5 (holding tank pit) averaged about 6.6 pCi U235/gm of sludge with a maximum of about 9.8 pCi/gm. The sludge was removed from the pit and deposited in three 55-gallon drums. The drums have been stored with the other waste material for ultimate disposal.

No safety issues were identified.

7. Water Sampling

When water accumulated from rain and/or ground water, the trenches were dewatered and the water was sampled. The water was pumped to above ground retention basins (plastic swimming pools) and held for final disposition based on the results of sample analyses. About 75 water samples, from rain and ground water in trenches and from other MDL system locations, have been analyzed for gross alpha and beta counting by the licensee.

A 5 milliliter (ml) volume for each sample was evaporated and counted in gas-flow proportional counters. The results of these analyses were equivalent to the instrument's minimum detectable activity (MDA) levels: 1 to 5 E-7 alpha disintegrations per minute (a-dpm) and 1 to 5 E-6 beta dpm (b-dpm). These values are equivalent to 0.4 to 2 E-7 pCi of alpha activity and 0.4 to 2 E-6 pCi of beta activity in the water samples. The retained water was subsequently pumped into tank trucks and taken off site for disposal instead of attempting to release it on site.

As of September 15, 1992, about 95 percent of the MDL system has been removed, packaged in appropriate containers, and staged awaiting shipment for disposal. About 99 percent of the trenches have been backfilled, as is authorized by the analytical results from soil samples.

No safety issues were identified.

8. Discovery of Cobalt-60 Wire

While monitoring the MDL pipe sections in Building 5, a reading of 2 to 3 milliroentgens per hour (mr/hr) was obtained by the licensee on contact with pipe Section 1. When the piping was cut and removed from the trench, no activity was found in the soil at that location. The pipe section was cleaned and a radiation level of about 5 mr/hr was measured from the 250-300 milliliters (ml) of residue. The residue was analyzed and the activity determined to be Cobalt-60 from a piece of wire containing cobalt-60. The wire was removed from the residue and retained in storage at the W Waltz Mill Site. Although byproduct materials including Cobalt-60 have been used at this site, because of the finding of this wire at a dead end of the system, the licensee cannot explain how the wire got into the piping. The radiation from this section of piping is the only significantly high level of radiation measured from the MDL piping system. No other similar levels of radiation have been identified.

No safety issues were identified.

9. Radioactive Waste

The licensee anticipates that during October 1992, they will complete the removal of the MDL system and the packaging of contaminated materials. Contaminated equipment and other waste materials will be staged for shipment and final disposition. This waste includes 7 B-25 Boxes containing MDL system piping and fittings; 4 holding tanks; some miscellaneous equipment and items; some 55 gallon and 5 gallon drums of soil; and some 55 gallon drums containing contaminated protective clothing, gloves, small tools, etc. The licensee plans to ship the accumulated waste materials to the W Systems Engineering Group (SEG) (Hydro Nuclear) in Tennessee.

At SEG, the metallic waste will be decontaminated, processed by melting, and the billets possibly returned, sold as scrap, or retained for shielding. The drums containing dry waste material will be compacted and transferred to Barnwell, South Carolina, for burial. Other containers and drums of materials that do not fit the two preceding categories will be transferred directly to Barnwell for burial.

The licensee will determine to establish the amount of uranium in the waste shipments so that SEG does not exceed their license limits. The licensee's shipment may have to be delayed until SEG reduces their uranium inventory, and can accept material again.

No safety issues were identified.

10. Projected Timing for Termination of the License

The licensee anticipates that they will be able to initiate their final confirmatory survey at the W, AESD site at Large, Pennsylvania, during October or November of 1992. By March or April of 1993, the Licensee plans to have their close-out survey completed and evaluated and all contaminated materials shipped for disposal. A request for an amendment to terminate License No. SNM-951 will be submitted to Region I of the NRC along with a copy of the confirmatory survey and an NRC Form 314 certifying the disposition of materials. The site will be made available for the NRC close-out inspection and surveys. W presumes that this will provide sufficient time for the NRC to complete their evaluation of the facility, release the site for unrestricted use, and terminate the license during the calendar year of 1993.

11. Exit Interview

The inspector reviewed his inspection findings with those individuals identified in Section 1 of this report. To the inspector it was apparent that the licensee is making a sincere and conscientious effort to remove any and all evidence of the use of radioactive materials, authorized by License No. SNM-951, from the W, AESD, Large, Pennsylvania site.

CONVERSATION RECORD

TIME 3:20 P

DATE 6/25/93

TYPE ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE ☒ INCOMING ☐ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: Joe Nardi, Mgr. Reg. Service

ORGANIZATION (Office, dept., bureau, etc.): W El. Corp Pgh, PA re Large PA

TELEPHONE NO: 412-374 4652

SUBJECT: Requesting a Meeting & Discussion of Mixed Waste

Lic # SNM-951, Doc # 70-00997, TAC: U00034 043

SUMMARY

Call to inquire if any decision on meeting w/ RI & him as before

• Responded – J.D.K. still on vacation & hadn't talked to him in 2 weeks & that CTO will be on insp. next week.

He also has another problem that he wants to discuss w/ us regarding Mixed waste. When they cleaned out the ~~Sty~~ Storm Sewer they collected material containing Perchlorethylene & trichlorethylene + 42 pCi/gm of material. Can't find a way to get rid of this mixed waste. Any possibility of relaxing requirements (30 pCi/g) since so near to it? Waste treatment can't be done because they don't have a permit. This would be a major topic on the agenda for a meeting. Is there anyone else to talk to while you're away? Can RI help w/ this Mix waste?

• Said would leave a message for J.D.K. to call & if didn't hear from CTO or JDK by end of week, could call Mark Roberts.

ACTION REQUIRED

Leave Message w/ John Kinneman & advise Mark Roberts

NAME OF PERSON DOCUMENTING CONVERSATION: Oberg

SIGNATURE: Oberg

DATE: 6/25/93

ACTION TAKEN

Understand, Working to resolve schedule © 7/12/93

"OFFICIAL RECORD COPY"

SIGNATURE: [illegible] Extra Drawk to go to OVISE

TITLE: + Hdq

DATE: ML 10

50271-101 ✩U.S. G.P.O. 1983-381-526/8346

CONVERSATION RECORD

OPTIONAL FORM 271 (12-76) DEPARTMENT OF DEFENSE

CONVERSATION RECORD

TIME ~10:30am

DATE 7/19/93

TYPE

☐ VISIT ☐ CONFERENCE ☒ TELEPHONE

☒ INCOMING

☐ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU A. Joe Nardi

ORGANIZATION (Office, dept., bureau, etc.) W Elec Corp Pgh. PA (Large, PA)

TELEPHONE NO: 412-374 4652

SUBJECT Status of Large, PA Site Close-out Review & Survy./OR.

Lic SNM-951, Doc. 70-00997, TAC-L20643

SUMMARY

Called to inquire as to what is happening. Informed him that we are working on arrangements w/ ORISE to schedule close out survey.

Wanted to know if he should take copies of reports to ORISE and help them to review w/ them. Said we would call if this would be necessary.

Only has final summary to send RI, will mail within a couple of days. Only thing remaining is Form NRC 314, disposition of ~~[illegible]~~ material from site. Problem still exists w/ the mixed waste. Has spoken to JDK about this and hopes to be able to transfer to Waltz Mills and then process the mixed waste on a one time basis, license amendment or exemption to process.

Not aware of any decision as yet. Will contact A.J. Nardi if needed.

(OVER)

ACTION REQUIRED

Await final summary report & disposition of Mat'l.

NAME OF PERSON DOCUMENTING CONVERSATION Obey

SIGNATURE Obey

DATE 7/20/93

ACTION TAKEN

SIGNATURE

TITLE "OFFICIAL RECORD COPY"

DATE

50271-101

U.S. G.P.O. 1983-381-526/8346

CONVERSATION RECORD

OPTIONAL FORM 271 (12-76)
DEPARTMENT OF DEFENSE

SECTION COPY ML 10

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

ENERGY/ENVIRONMENT SYSTEMS DIVISION

July 23, 1993

John D. Kinneman, Chief
Research Development, and
Decommissioning Section
Division of Radiation Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

SUBJECT: LICENSE TERMINATION REPORTS #002, #004, #007, AND #009 FOR WESTINGHOUSE ELECTRIC CORPORATION, LARGE, PA

Dear Mr. Kinneman:

ESSAP has reviewed the subject documents and offers the attached comments for your consideration. It is anticipated that a site visit will be made in early August. Please direct any questions you may have to me at (615) 576-2908.

Sincerely,

Michele R. Landis

Michele R. Landis

MRL:rde

Enclosure

cc: T. Mo, NRC/NMSS, 6H32
D. Tiktinsky, NRC/NMSS, 6H3
J. Swift NRC/NMSS, 6H3
A. Ansari, ESSAP
J. Berger, ESSAP
PMDA, 6E6
File/233

"OFFICIAL RECORD COPY"
ML 10

P. O. BOX 117, OAK RIDGE, TENNESSEE 37831-0117

Managed and operated by Oak Ridge Associated Universities for the U.S. Department of Energy

General Comments

In general, the documentation is thorough and complete. Procedures and methods utilized were adequate and appropriate. The post-remedial action data is accurate, complete and demonstrates compliance with the guidelines.

In all of the documents, it would be more appropriate to replace the use of "gamma dose rate" (reported in units of μR/h) with "gamma exposure rate."

Specific Comments

Document: License Termination Report #002, REMOVAL OF THE MONITORED DRAIN LINE SYSTEM, including RADIOLOGICAL SURVEY PROCEDURE (Appendix F), dated November 24, 1992.

1. Page 4 — ESSAP recommends the use of gamma surface scans for the identification of areas of elevated direct radiation. The use of only gamma direct measurements can result in missing "hot spots."

2. Page 5 — Will the two pits and the sections of piping abandoned in place be included in the confirmatory process? If so, it would be useful to have the radiological survey data for review.

3. Page 6 — Replace "PcI" with "pCi."

4. Table 2 — License Termination Report #009 commits to surface area weighted grid block averaging—the data for this has not been provided for the five hot spots identified in this table.

5. Appendix F — Page 1 - What is the "Survey Plan" indicated in Section II. Is an operational check (i.e., background and source check) to ensure

correct instrument response performed? If so, how is it documented in an auditable manner?

How is "anomalous" defined?

Document: License Termination Report #004, DETERMINATION OF RADIOLOGICAL SURVEY ACCEPTANCE CRITERIA FOR LICENSE TERMINATION SURVEYS, dated December 1, 1992.

1. Page 2 — Item 1 - The reference in Appendix 1 should be the August 1987 version. Item 2 - The exposure rate guideline is in Reference B, not Reference A.

Document: License Termination Report #007, DETERMINATION OF SITE BACKGROUND VALUES FOR RADIOLOGICAL MEASUREMENTS, dated December 18, 1992.

1. Table 1 — The units for beta-gamma "dose" rate should be "mrad/hr" rather than "mr/hr."

Document: License Termination Report #009, GENERAL INFORMATION RELATIVE TO RADIOLOGICAL SURVEYS OF BUILDINGS, dated January 6, 1993.

1. Table 4 — How are the instruments calibrated? What type(s) of sources are used? Are operational checks performed? How is this information documented?

2. Table 9 — Further details should be provided to evaluate the adequacy of the following:

   (a) survey methodologies and equipment for:

      (1) surface scans
      (2) direct measurements
      (3) surface dose rate measurements
      (3) exposure rate measurements
      (4) sample collection
      (5) chain-of-custody
      (6) methods for referencing measurement and sampling locations

   (b) instrument calibrations and operational checks

   (c) radiological analysis procedures for soil samples to include sample preparations, alpha and gamma spectroscopy (peaks evaluated), and data manipulation

   (d) QA/QC methodologies for field survey activities and the laboratory performing sample analysis

   (e) data presentation and comparison to the guidelines

CONVERSATION RECORD

TIME 4:25 pm

DATE 7/27/93

TYPE

☐ VISIT ☐ CONFERENCE ☒ TELEPHONE

☐ INCOMING

☒ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU: A.J. Nardi, Mgr. Regulatory Services

ORGANIZATION (Office, dept., bureau, etc.): W El Corp Pgh, PA ; Re Large PA site

TELEPHONE NO.: 412-374-4652

SUBJECT: Termination Reports; Request for Additional Information

SNM-951, 070-00997, TAC L00643, 22110, A2

SUMMARY

Request the following

1) Radiological analyses procedures for soil sampled including sample preparations, alpha and gamma spectrometry (peaks evaluated, and data manipulation

Should be avail. from Waltz Mill shop

2) QA/QC methodologies for laboratory performing sample analyses (as well as field survey activities, Reports 036, 037, and 042)

Ok for surveys.. will check w/ Waltz Mill for their QA/QC

Calc. of MDA — ? See §3.3 of Rept 009 for survey activities

MDA from NUREG/CR-4349 except for scans which give the exceptionally low — didn't like

Instead — used sources of different strengths, paper over source to meas or not, experimental vs. real info

(OVER)

ACTION REQUIRED

Licensee to obtain info from Waltz Mill & send this week

NAME OF PERSON DOCUMENTING CONVERSATION: Oberg

SIGNATURE: Oberg

DATE: 7/27/93

ACTION TAKEN

SIGNATURE

TITLE: "OFFICIAL RECORD COPY"

DATE: ML 10

50271-101

U.S. G.P.O. 1983-381-526/8346

CONVERSATION RECORD

OPTIONAL FORM 271 (12-76)
DEPARTMENT OF DEFENSE

Report # 009

Recalculated

See attached Lotus 1-2-3 printout for calculations

TABLE 6

MINIMUM DETECTABLE ACTIVITY FOR VARIOUS INSTRUMENTS

② $MDA = \dfrac{4.65\sqrt{B_R/2t_c}}{E \cdot A/100}$

① $MDA = \dfrac{2.71 + 4.65\sqrt{B_R \cdot t}}{t \cdot E \cdot A/100}$

	INSTRUMENT DESCRIPTION	RADIATION DETECTED	COUNTING TIME	MINIMUM DETECTABLE ACTIVITY	ACCEPTANCE CRITERIA VALUE	UNITS	MDA AS % OF ACCEPTANCE CRITERIA	Equation Used
		ALPHA SURFACE ACTIVITY						
1	EBERLINE MODEL ESP-2 WITH 100 cm2 PROBE AREA (MODEL HP-100A)	TOTAL ALPHA	1 min.	26 18	54 5,000	dpm/100 cm2	0.36%	①
2	LUDLUM FLOOR MONITOR MODEL 239-1F WITH 434 cm2 PROBE AREA	TOTAL ALPHA	1 min.	23 21	41 5,000	dpm/100 cm2	0.42%	①
3	EBERLINE MODEL PAC-4G WITH 50 cm2 PROBE AREA (MODEL AC-21) TIME CONSTANT = 12 sec	TOTAL ALPHA	NA	31 50	— 5,000	dpm/100 cm2	1.0%	②
4	EBERLINE MODEL ASP-1 WITH 50 cm2 PROBE AREA (MODEL AC-3) TIME CONSTANT = 10 sec	TOTAL ALPHA	NA	44 38	— 5,000	dpm/100 cm2	0.76%	②
		BETA SURFACE ACTIVITY						
5	EBERLINE MODEL ESP-2 WITH 100 cm2 PROBE AREA (MODEL HP-100A)	TOTAL BETA	1 min.	269 269	299 5,000	dpm/100 cm2	5.4%	①
6	LUDLUM FLOOR MONITOR MODEL 239-1F WITH 434 cm2 PROBE AREA	TOTAL BETA	1 min.	95 127	131 5,000	dpm/100 cm2	2.5%	①
7	EBERLINE MODEL PAC-4G WITH 50 cm2 PROBE AREA (MODEL AC-21B) TIME CONSTANT =12 sec	TOTAL BETA	NA	172 135	— 5,000	dpm/100 cm2	2.7%	②
8	EBERLINE MODEL E-520 WITH PANCAKE PROBE OF 15 cm2 AREA TIME CONSTANT = 8 sec	TOTAL BETA	NA	574 42 ?	— 5,000	dpm/100 cm2	0.84%	②

MDA Calculated based on using E & B_R from Data survey report review.

RECALCULATION OF MDA VALUES

7/27/93

A J Nardi

"OFFICIAL RECORD COPY"

ML 10

Rec'd 8/9/93

CEO

TABLE 6 (CONTINUED)

MINIMUM DETECTABLE ACTIVITY FOR VARIOUS INSTRUMENTS

	INSTRUMENT DESCRIPTION	RADIATION DETECTED	COUNTING TIME	MINIMUM DETECTABLE ACTIVITY	ACCEPTANCE CRITERIA VALUE	UNITS	MDA AS % OF ACCEPTANCE CRITERIA	See Table 1 of Report # 007	MDA
		SURFACE DOSE RATE							
9	EBERLINE MODEL ESP-2 WITH HP-270 PROBE	BETA/GAMMA DOSE RATE @ SURFACE	NA	(1)	0.2	mr/hr		.023 + 2(.025) =	
10	EBERLINE MODEL E-520 WITH HP-270 PROBE	BETA/GAMMA DOSE RATE @ SURFACE	NA	(1)	0.2	mr/hr		.014 + 2(.004) =	0.022
		GAMMA DOSE RATE @ 1 METER							
11	EBERLINE MODEL PRM-7 MICRO-R SURVEY METER	GAMMA DOSE RATE @ 1m ABOVE SURFACE	NA	(1)	5 above background	microR/hr		10.63 + 2(2.06) =	14.75
12	REUTER-STOKES PRESSURIZED ION CHAMBER	GAMMA DOSE RATE @ 1m ABOVE SURFACE	5 min.	(1)	5 above background	microR/hr		9.52 + 2(1.11) =	

NOTE: (1) No MDA has been calculated for these instruments.

Later used $B_0 + 2\sigma$ as the MDA where σ was derived by using background determination data in Report # 007

These two values were used in Table 2 of Report # 042

Recalculated

~~MDA~~ Calculated using $E \& B_I$ based on review of data reports.

Based on review of Tennelec Reports

TABLE 6 (CONTINUED)

MINIMUM DETECTABLE ACTIVITY FOR VARIOUS INSTRUMENTS

	INSTRUMENT DESCRIPTION	RADIATION DETECTED	COUNTING TIME	MINIMUM DETECTABLE ACTIVITY	ACCEPTANCE CRITERIA VALUE	UNITS	MDA AS % OF ACCEPTANCE CRITERIA	
		ALPHA/BETA SMEAR SURVEYS						
13	EBERLINE MODEL SAC-4	REMOVABLE ALPHA	1 min.	14 15	1,000	dpm/100 cm2	1.5%	①
14	TENNELEC MODEL LB-5100	REMOVABLE ALPHA	1 min.	10 9	28 1,000	dpm/100 cm2	0.9%	①
15	EBERLINE MODEL MS-3	REMOVABLE BETA	1 min.	106 98	1,000	dpm/100 cm2	9.8%	①
16	EBERLINE MODEL BC-4	REMOVABLE BETA	1 min.	154 154	1,000	dpm/100 cm2	15.4%	①
17	TENNELEC MODEL LB-5100	REMOVABLE BETA	1 min.	17 12	36 1,000	dpm/100 cm2	1.2%	①
		ALPHA SCANS FOR SURFACE ACTIVITY						
18	EBERLINE MODEL ESP-2 WITH 100 cm2 PROBE AREA (MODEL HP-100A)	TOTAL ALPHA	NA	10 500	5,000	dpm/100 cm2	10%	
19	LUDLUM FLOOR MONITOR MODEL 239-1F WITH 434 cm2 PROBE AREA	TOTAL ALPHA	NA	34 1000	5,000	dpm/100 cm2	20%	
		BETA SCANS FOR SURFACE ACTIVITY						
20	EBERLINE MODEL ESP-2 WITH 100 cm2 PROBE AREA (MODEL HP-100A)	TOTAL BETA	NA	3553 1,300	5,000	dpm/100 cm2	26%	
21	LUDLUM FLOOR MONITOR MODEL 239-1F WITH 434 cm2 PROBE AREA	TOTAL BETA	NA	1195 800	5,000	dpm/100 cm2	16%	

These MDA values were experimentally determined

NOTE: SURFACE SCAN DONE WITH DETECTOR MOVED OVER SURFACE AT A RATE OF ONE DETECTOR WIDTH PER SECOND, MONITORING AUDIBLE SIGNAL.

Calculated using $MDA = \frac{3 \cdot B_R}{E \cdot A/100}$

CALCULATION OF MDA FOR INTRUMENTS

LINE NUMBER FROM TABLE	Br	t	E	A	Tc	MDA	
1	0.917	1	0.271	100		26	Surface Activity at fixed point
2	7.76	1	0.157	434		23	
3	0.24		0.234	50	12	31	
4	0.213		0.191	50	8	44	
5	441.7	1	0.373	100		269	
6	401	1	0.232	434		95	
7	20.27		0.384	50	12	172	
8	3.77		0.203	15	8	574	
13	0.14	1	0.327	100		14	Smear Counts
14	0.055	1	0.3697	100		10	
15	22.4	1	0.233	100		106	
16	25.7	1	0.171	100		154	
17	1.4	1	0.4964	100		17	
18	0.917		0.271	100		10	Scans
19	7.76		0.157	434		34	
20	441.7		0.373	100		3553	
21	401		0.232	434		1195	

↑ From Table 1, Report #007 (See attached)

↑ From Table in Appendix B, Report #007 (See Attached)

CALCULATION OF MDA FOR INTRUMENTS

high, was based on one head. Later dropped to ~5

LINE NUMBER FROM TABLE	Br	t	E	A	Tc	MDA
1	3	1	0.2	100		54
2	50	1	0.2	434		41
3					12	
4					8	
5	350	1	0.3	100		299
6	1300	1	0.3	434		131
7				50	12	
8				15	8	
13	0.14	1	0.327	100		14
14	0.055	1	0.3697	100		10
15	22.4	1	0.233	100		106
16	25.7	1	0.171	100		154
17	1.4	1	0.4964	100		17
18	0.917		0.271	100		10
19	7.76		0.157	434		34
20	441.7		0.373	100		3553
21	401		0.232	434		1195

These are based on looking at a number of reports to get realistic B_R + E and using a visual average of what is realistic. These are the only instruments really used for pratical purposes.

7/27/93
AJ Nordi

	α					β			
	E		BKG			E		BKG.	
ESP-2	19.3		0		ESP-2	27.4		306	
			2					313	
			3					287	
			4					319	
			4					356	
Ⓛ	23.1	21.7	0	1		34.3	31.3	174	188
			1	1				262	145
				1					222
				0					181
				1					140
FLMON	18.8		1		FLMON	28.8		1345	
			6					1338	
			1					1304	
			5					1045	
			1					1195	
	20.4		55			30.3		1525	
			50					1050	
			50					1403	
			53					1147	
			54					1450	
			54					1482	
								1362	
			50						
Tenn	37.8				Tenn	49.9			

Report # 007

INSTRUMENT SPECIFICATIONS FOR BACKGROUND DETERMINATIONS

INSTRUMENT & S/N	DETECTOR TYPE	EFFICIENCY	CORRECTION FACTOR
LUDLUM 2221 Floor monitor	434 cm2 Gas Prop.	Alpha: 15.7% @1/4" Beta: 23.2% @1/4"	6.39 4.31
EBERLINE ESP-2 #1510	100 cm2 Gas Prop.	Beta: 37.3% only @ Contact	2.68
EBERLINE ESP-2 #1517	100 cm2 Gas Prop.	Alpha: 27.1% only @ Contact	3.69
EBERLINE ESP-2 #1522	HP-270	N/A	N/A
EBERLINE E-520 #5242	GM Pancake	Beta: 20.3%	4.93
EBERLINE E-520 #5242	HP-270	N/A	N/A
EBERLINE PAC-4G #4478	AC-21 AC-21B	Alpha: 23.4% Beta: 38.4% (Both @ Contact)	4.27 2.60
EBERLINE PRS-1 #346	NaI SPA-3	N/A	N/A
EBERLINE PRM-7 #234	GM Tube	N/A	N/A
EBERLINE ASP-1 #1891	Scintillation	19.1 %	5.23
REUTER-STOKES #L-2088	Pressurized Ion Chamber	N/A	N/A
EBERLINE MS-2 #1848	GM Tube	Beta: 23.3%	4.11
EBERLINE BC-4 #808	GM Tube	Beta: 17.1%	5.81
EBERLINE SAC-4 #1128	Scintillation	Alpha: 40.5%	2.47
EBERLINE SAC-4 #263	Scintillation	Alpha: 32.7	3.06
TENNELEC LB5100 #1	Gas Proportional	Alpha: 36.97% Beta: 49.64%	2.70 2.01

TABLE 1
BACKGROUND RADIATION LEVELS MEASURED FOR VARIOUS INSTRUMENTS

	INSTRUMENT DESCRIPTION	RADIATION DETECTED	SURFACE DESCRIPTION	BACKGROUND RADIATION LEVEL	STANDARD DEVIATION	UNITS
		ALPHA SURFACE ACTIVITY				
1	EBERLINE MODEL ESP-2 WITH 100 cm2 PROBE AREA (MODEL HP-100A)	TOTAL ALPHA	ALL	0.917	0.642	COUNTS/MINUTE
2	LUDLUM FLOOR MONITOR MODEL 239-1F WITH 434 cm2 PROBE AREA	TOTAL ALPHA	ALL	7.76	4.39	COUNTS/MINUTE
3	EBERLINE MODEL PAC-4G WITH 50 cm2 PROBE AREA (MODEL AC-21)	TOTAL ALPHA	ALL	0.240	0.218	COUNTS/MINUTE
4	EBERLINE MODEL ASP-1 WITH 50 cm2 PROBE AREA (MODEL AC-3)	TOTAL ALPHA	ALL	0.213	0.232	COUNTS/MINUTE
		BETA SURFACE ACTIVITY				
5	EBERLINE MODEL ESP-2 WITH 100 cm2 PROBE AREA (MODEL HP-100A)	TOTAL BETA	ALL-INTERIOR ALL-EXTERIOR	441.7 519.9	88.8 132.2	COUNTS/MINUTE COUNTS/MINUTE
6	LUDLUM FLOOR MONITOR MODEL 239-1F WITH 434 cm2 PROBE AREA	TOTAL BETA	ALL	401.0	67.5	COUNTS/MINUTE
7	EBERLINE MODEL PAC-4G WITH 50 cm2 PROBE AREA (MODEL AC-21B)	TOTAL BETA	ALL	20.27	3.88	COUNTS/MINUTE
8	EBERLINE MODEL E-520 WITH PANCAKE PROBE OF 15 cm2 AREA	TOTAL BETA	ALL-INTERIOR ALL-EXTERIOR	3.77 4.33	0.667 1.26	COUNTS/MINUTE COUNTS/MINUTE
		SURFACE DOSE RATE				
9	EBERLINE MODEL ESP-2 WITH HP-270 PROBE	BETA/GAMMA DOSE RATE @ SURFACE	ALL	0.023	0.025	mr/hr
10	EBERLINE MODEL E-520 WITH HP-270 PROBE	BETA/GAMMA DOSE RATE @ SURFACE	ALL	0.014	0.004	mr/hr
		GAMMA DOSE RATE @ 1 METER				
11	EBERLINE MODEL PRM-7 MICRO-R SURVEY METER	GAMMA DOSE RATE @ 1m ABOVE SURFACE	ALL-INTERIOR ALL-EXTERIOR	10.63 13.00	2.06 3.06	microR/hr microR/hr
12	REUTER-STOKES PRESSURIZED ION CHAMBER	GAMMA DOSE RATE @ 1m ABOVE SURFACE	ALL-INTERIOR ALL-EXTERIOR	9.52 10.75	1.11 2.25	microR/hr microR/hr

From Report # 007

TABLE 1 (CONTINUED)

BACKGROUND RADIATION LEVELS MEASURED FOR VARIOUS INSTRUMENTS

INSTRUMENT DESCRIPTION	RADIATION DETECTED	SURFACE DESCRIPTION	BACKGROUND RADIATION LEVEL	STANDARD DEVIATION	UNITS
	ALPHA/BETA SHEAR SURVEYS (1)				
13 EBERLINE MODEL SAC-4	REMOVABLE ALPHA	ALL	0.14	0.08	COUNTS/MINUTE
14 TENNELEC MODEL LB-5100	REMOVABLE ALPHA	ALL	0.055	0.021	COUNTS/MINUTE
15 EBERLINE MODEL MS-3	REMOVABLE BETA	ALL	22.4	3.03	COUNTS/MINUTE
16 EBERLINE MODEL BC-4	REMOVABLE BETA	ALL	25.7	1.54	COUNTS/MINUTE
17 TENNELEC MODEL LB-5100	REMOVABLE BETA	ALL	1.40	0.078	COUNTS/MINUTE

NOTE (1): These are typical background radiation levels for these instruments based on approximately 30 days of daily checks. No specific data is presented in this report on these measurements.

RS 93-041

Westinghouse Electric Corporation

Nuclear Manufacturing Divisions

Box 355
Pittsburgh Pennsylvania 15230-0355

July 30, 1993

070-00997

U. S. Nuclear Regulatory Commission, Region I
475 Allendale Road
King of Prussia, PA 19406-1415

Attention: Mr. C. T. Oberg

Subject: Submittal of Additional Information Concerning Termination of License Number SNM-951 (Docket 70-997)

In response to your request, attached is additional information regarding the analytical techniques for the determination of uranium concentrations by alpha and gamma spectrometry.

If you have any questions concerning the attached information, please contact me at the above address or by telephone on 412-374-4652 or call Jim Flanigan on 412-374-4651.

Very truly yours,

A Joseph Nardi

A. J. Nardi, Manager
Regulatory Services

dh

Enclosures

OFFICIAL RECORD COPY ML 10

117646

AUG 0 2 1993

EXHIBIT 1

WESTINGHOUSE ELECTRIC CORPORATION
ADVANCED PROGRAMS
ANALYTICAL LABORATORY

Procedure No. A-10
Rev. 3, July 1992

Quality Control in the Analytical Laboratory

Approved by: B. Minushkin, Manager
Test Engineering & Analytical Laboratory
6/24/92
Date

Approved by: M. O. Smith, Manager
Quality Engineering & Field Surveillance
6/26/92
Date

Approved by: S. J. Walmsley
S. J. Walmsley, Manager
Product Assurance & Testing
6-26-92
Date

RECORD REVISION SHEET

A-10

Quality Control in the Analytical Laboratory

REVISION NUMBER	DATE	REVISIONS MADE
0	3-86	Initial Release
1	10-87	Page 1, typo, Para. 2.0 Page 11, Para. 3.4.2 Page 13, Para. 4.0
2	7-89	Page 3, 5, Para. 3.3 Page 8, 9, 10, 11, Para. 3.4.1 Page 12, Para. 3.5
3	7-92	Page 2,3, Para. 3.2.1 Page 4,5, Para. 3.3 Page 6,7, Para. 3.3.2 Page 8, Para. 3.4 Page 11, Para. 3.4.2 Page 12, Para. 3.4.3

WESTINGHOUSE ELECTRIC CORPORATION
ADVANCED PROGRAMS
ANALYTICAL LABORATORY

Procedure No. A-10

Quality Control in the Analytical Laboratory

1.0 SCOPE

The Quality Control procedure for the Analytical Laboratory is designed to provide means to measure the characteristics of, and control processes and measurement equipment to established requirements. The system also provides criteria for early warning when the process or equipment exhibit bias or degradation of performance.

The Quality Control program is a key element of the Laboratory Quality Assurance Program (QAPP-0013).

2.0 SUMMARY

This procedure address the following elements of the overall Quality Control program:

- o Operating Procedures and Instructions
- o Sample Records
- o Control of Analytical Methods
- o Performance Checks of Measurement Systems
- o Review and Analysis of Data and Computations
- o Training and Qualification
- o Audits

The extent to which the program is applied to specific samples and/or jobs will be determined primarily by customer stated contractual requirements and by predetermined laboratory practices.

3.0 QUALITY CONTROL REQUIREMENTS

3.1 Operating Procedures and Instructions

Laboratory activities associated with the receipt, handling, testing and analysis of samples will be performed in accordance with approved written instructions and procedures. The written instructions and procedures shall document sample receipt and identification, identify requested tests and analysis, specify, when appropriate, the applicable Analytical Methods to be used and the assigned laboratory responsibility. This requirement is implemented, for small, routine and/or repetitive jobs by use of Analytical Laboratory Procedure No. A-5 and A-8 along with appropriate procedures covering the Analytical Chemical Methods. Controlled copies of these procedures and analytical methods shall be provided to all laboratory personnel and shall be kept in each of the laboratory areas.

When required by customer contract, Work Plans will be prepared for major contracts or nonroutine analysis. The instructions for use, preparation and approval of Work Plans is given in Analytical Laboratory Operating Instruction (OI) 84-1.

3.2 Records

3.2.1 Sample and Job Records

The records necessary to document the tests and analysis performed by the laboratory and the results of analyses are specified for each sample. These records shall include:

- o Analysis Request cross referenced to related customer shipping and/or analysis request forms. 3

- o Analysis Report and/or alternative customer requested analysis report form.

- o References to original data including one or more of charts, printouts, log book entries or computer disk/tape files.
- o Data sheets and calculational sheets (usually part of Analytical Procedures).
- o Record of review, evaluation and approval of method, results and calculations.

3

Records which facilitate tracking and control of a sample in its progress through the sequence of laboratory process are specified and maintained in accordance with Analytical Laboratory Procedure No. A-5 and/or specific Operating Instructions.

The tracking and control of samples shall include:

Analytical Laboratory Numbers (AL#). Each job submitted to the laboratory shall be assigned a laboratory identification number the "Analytical Service Request Number" or "AL#." This number is recorded on the Chemical Analysis Request form. The AL# is a unique, sequential number and is used to correlate all the samples, data, reports, and other documentation associated with a particular job. The final report that is returned to the customer always references the AL# and all laboratory records and data associated with a job are filed according to the AL#. See Procedure No. A-5, Sample Receiving, Logging, and Data Filing.

Sample Number. Each separately identifiable sample within a job (AL#) is assigned a sequential sample number. The sample numbers are prefixed with the last two digits of the year and are sequential starting from one, i.e. 86-103 is the 103rd sample received in the year 1986. The Sample Number will be recorded on the Analytical Service Request Form and in log books, charts, etc., containing data for the sample. Sample identification numbers used by the customer will be cross referenced to the our internal sample number.

Sample Marking. Laboratory personnel will mark each sample or sample container with its unique sample number when the samples are accepted by the laboratory and prior to any work being performed on the samples. The sample is marked in such a way that the marking does not contaminate the sample, that it remains on or with the samples and remains readable. The identification is usually done by placing the sample in a sample container and marking the sample container.

Log Books. All laboratory work records shall be kept in permanently bound log books. The log book entries, data charts, printouts and reports for a specific sample will be identified by the AL# and the sample number to minimize the possibility for samples or data to be lost or intermixed within or between jobs.

3.2.2 Record Retention

Records will be retained in accordance with Operating Instruction 82-3 or specific customer contractual requirements.

3.3 Control of Analytical Methods

The control of analysis methods in the W-AP Analytical Laboratory shall be based upon: | 3

- The use, to the extent possible, of written, approved procedures which are nationally recognized and/or validated by the W-AP Analytical Laboratory.

- The analysis of one or more (as appropriate) of the following depending on the timely availability of matrix controls:

    - NIST certified materials of matching value and matrix;
    - Industry acceptable secondary standards;
    - Preparation and use of synthetic matrix controls;

  - Spiking of unknown and/or reference standard samples when none of the above is available;
  - Replicate measurement on standards, controls and/or samples; 3
  - Measurement of system blanks, reagents and/or matrix interference criteria when influencing the accuracy of the calibration range or resulting in detection limit requirements.

- Participation, to the extent available, in Interlaboratory Analysis comparison programs.

3.3.1 Selection, Review and Approval of Analytical Methods

The Analytical Methods shall be selected and reviewed for technical adequacy (applicability) by a qualified scientist before approval by management and distribution for use in the laboratory. Whenever possible nationally recognized methods such as ASTM, NIOSH, HASEL, etc., shall be adopted and/or used as the basis for analytical methods. The validity and adequacy of new procedures shall be established via analysis of appropriate quality control samples performed under the direct supervision of a qualified scientist.

The laboratory shall maintain a central file and laboratory procedure books in which all of the current procedures used for repetitive analytical work are kept. The preparation, control and approval of these procedures is covered by Analytical Laboratory Procedure No. A-8. Each procedure shall have a unique number and revision record to avoid the possibility of an incorrect method being used on a job. The procedures are kept in a loose leaf notebook so that new procedures can be added and obsolete ones removed. The notebook contains only the current procedures. Obsolete procedures are kept in a historical procedure file. Each analyst in the laboratory has and shall maintain a procedure book containing the current procedures appropriate for their work.

The controlled analytical procedures assures the customer and management that all analyses are carried out in a planned and controlled manner so that the data produced will be valid. The procedures are written in such a manner that they aid training by providing the technical basis for the procedure as well as documenting the processes used in the analysis.

3.3.2 Quality Control Samples

The Analytical Laboratory shall characterize and control methods used in analysis of samples through use of quality control samples. Analytical methods and procedures used in the laboratory will specify the types of quality control samples required for that particular analysis. The fraction of the analytical effort (number of samples) will be determined, 1) by customer contractual requirements, 2) by the minimum requirements of the specific analytical procedure and; 3) shall not be less than approximately five (5) percent of the analytical load for the various categories of analyses performed by the laboratory.

The quality control sample will include one or more of the following as specified appropriate Analytical Procedures and in Instrument Operation Procedures: 3

- o Duplicate analysis of samples shall be performed.
- o Reagent/process blank samples analyzed along with unknown samples.
- o Spiked samples which are similar to the unknown and contain known quantity of a standard traceable to NBS or other recognized standards source.
- o Standard sample which are traceable to NBS or other recognized standards source. These samples will be used primarily for characterizing/calibrating instruments and equipment.

The results of analysis of quality control samples shall be recorded and when requested, reported along with unknown samples. A record of all quality control samples shall be maintained in a bound notebook or other suitable hardcopy or electronic media. In addition the results obtained in analysis of quality control samples shall be recorded and maintained in files associated with the files containing the original of the procedures to which they apply. 3

Results of quality control samples analyzed in conjunction with calibration and check of equipment (counters, spectrometers, etc.) shall be recorded in a bound notebook or other suitable hardcopy or electronic media which provides a record of the calibration of the equipment. 3

Acceptable quality control sample analyses shall agree with the reference material within a 3s limit. For duplicate determinations, the analyses shall be acceptable if the 3s limits overlap. Alternately, past history can be used to establish the acceptable variation in quality control samples through the use of control charts. When sufficient data are available, the results of the analysis of the quality control samples shall be plotted on a control chart reflecting the percent deviation from the mean of identical samples. Appropriate "warning" and "action" control limits, generally 2s and 3s, respectively should be established. When measurements fall outside of the approved control limits, corrective actions shall be formulated and implemented by laboratory senior scientist and management.

3.3.3 Interlaboratory Sample Analysis Programs

The W-AES Analytical Laboratory shall participate in appropriate interlaboratory comparison programs. The information thus obtained may provide objective measures of the accuracy of results obtained by the analytical laboratory and/or its personnel, methods and equipment. If the result of intercomparison analyses exceed the control limits for the sample as defined by the coordinating agency, an investigation shall be conducted and corrective action will be implemented.

3.4 Performance Checks of Measurement Systems

The laboratory shall establish or adopt and implement procedures for the use, calibration check, adjustment, maintenance and control of all measuring and test equipment. The results of calibration check and/or performance measurements shall be recorded in appropriate written and/or electronic media 3 dedicated to the specific measurement system. Control charts with appropriate control limits (generally 2s and 3s) shall be plotted. The control limits for "warning" and "action" should be prominently displayed along with instructions to be followed if the limits are exceeded.

Calibration and/or performance check schedules shall be established for the various measurement systems used in the laboratory.

3.4.1 Radiation Measurement Systems

The calibration schedule given below assumes that the instrument is being used to collect data. Calibrations are not required when the instrument is not being used.

Calibration of Gamma Detectors (See Procedure No. A-521)

Daily Checks - Daily checks of a standard source will be made on each gamma detector. The data from the daily checks will be entered in a bound logbook and plotted on a control chart. The control chart will be marked with 2s warning and 3s action limits. The 2s limit is used as a warning that something may be going out of control. If four consecutive counts are within the 3s limit but outside the 2s limit then the detector will be considered out of control. Evaluation and corrective actions will be implemented to correct the problem. It will be documented in the maintenance log that the detector performance is back in control. The same action is taken if two consecutive counts are outside the 3s action limit. No data can be taken from a detector that is out of control.

Weekly Background Checks - Weekly checks of the background will be made on each gamma detector using a 4,000 second count. Each background spectrum will be analyzed for radionuclides. The one sigma percent error for each radionuclide identified will be observed, and when it is less than 50%, it will be recorded in the maintenance log book. When the same radionuclide is detected in two consecutive background counts with an error less than 50%, action will be taken.

Six Month Background Checks - Every six months a 60 hour (216,000 seconds) background count will be made on each detector. This count or a weighted average of this count with previous counts will be used for background corrections. These counts will also be used as a basis for what to expect on the weekly background checks.

Yearly Efficiency Checks - Each gamma detector will have a complete efficiency check across its useful energy range whenever it is installed (or after any repairs or modifications are made). Thereafter three energy peaks will be added or checked annually to assure that the efficiency of the detector remains constant. A 2s warning and a 3s action limit will be constructed as soon as the data permits. An efficiency check will also be made whenever the need is indicated, such as a significant change in the daily check source that can't be explained.

Calibration of Alpha Scintillation Counters for Gross Alpha Counts (See Procedure No. A-523)

Daily Background Checks - A daily background check will be made on each detector. This check shall be recorded in a bound notebook and plotted on the Daily Source Check Control Chart.

Daily Source Checks - A daily check will be made using a standard alpha source. This check shall be recorded in a bound notebook and plotted on a control chart. The control chart will have 2s warning and 3s action limits.

Thin Window Flow Proportional Counters for Gross Beta Counts (Procedure No. A-523)

Daily Background Checks - A daily background check will be made on each detector. This check shall be recorded in a bound notebook and plotted on the Daily Source Check Control Chart.

Daily Source Checks - A daily check will be made using a standard beta source. This check shall be recorded in a bound notebook and plotted on a control chart. The control chart will have 2s warning and 3s action limits when enough points have been collected to calculated the limits.

Canberra-2210 - Perform a daily check of the alpha and beta channels using an Am-241 or Pu-239 source for the alpha channel and Cs-137 for the beta channel.

Nonroutine Work - Thin window flow proportional counters can also be used for gross alpha counting. These counters will be calibrated before use for nonroutine work.

Calibration of Alpha Spectrometers - (Procedure No. A-522)

Quarterly Energy Resolution Checks - The energy resolution of the alpha spectrometer shall be determined on at least a quarterly basis. The results of these measurements shall be recorded in a bound notebook.

Monthly Background Check - Approximately once each month but at intervals not to exceed six weeks a 27,000 second background check will be made on each detector. The results of this background check (count) will be recorded in a bound notebook. Control limits will be calculated for the "Monthly Background Check" based upon data obtained from the "Six Month Background Determination" as follows:

2 sigma C.L. = 2*SQR((Count for 300,000 Sec Bkgd)*0.09)
(warning) Round up

3 sigma C.L. = 3*SQR((Counts for 300,000 Sec Bkgd)*0.09)
(action) Round up

Six Month Background Determination - Every six months a 300,000 second background count will be made on each detector. This count or a weighted average of this count with previous counts will be used for background corrections.

Calibration of the Liquid Scintillation Counter (See Procedure No. A-531)

Daily Checks - A counter check will be made each day that a count run is started on the liquid scintillation counter by counting the three Packard unquenched standards which were supplied with the instrument. The three standards check the background and the counting efficiency for tritium and carbon-14. Instructions for the daily check count are given in Procedure No. A-531.

3.4.2 Analytical Balances

The Analytical Balance used in the laboratory will be controlled by Procedure No. A-11 of the Analytical Laboratories. This procedure requires daily (when in use) calibration checks, semiannual control checks, and yearly calibration and service checks.

3.4.3 General Chemistry Analytical Instruments

Comparative type analytical instrumentation before or during use. The instrument calibration provides the information as to accuracy, sensitivity and variance or reproducibility. 3

The following instrumentation which utilize comparative calibration methods are under this section:

Comparative Instrumentation

Instrument	Manufacturer	Function	Detector
ICP	IL200	Metals	PMT
ICP - Em Spec	Fisons	Metals	PMT
Em Spec	Jarrell-Ash	Metals	Photo plates
X-ray Fluorescence	Ortec	Metals	Si-Li
X-ray - SEM	Ortec	Metals	Si-Li
LIC	Dionex	Anions	Conductivity
LIC	Bio Rad	Anions	Conductivity
Carbon	Leco	Carbon	IR sensor
Nitrox	Leco	O2, N2	IR sensor
Sulfur	Leco	Sulfur	Comb/titration
pH	Various	pH	
** Conductivity	YSI	mhos	
Spectrometer	B&L	Colormetric PMT	

3

"CALIBRATION BEFORE USE", shall consist of a minimum of three values for linear and four points for second order curve fitting. A blank value is only required when samples values are BELOW the lowest calibration and/or control standard. LSFIT type calculation can provide a blank intercept value.

Control Standards - A minimum of one is required except in those instances where three independent multi-element matrix calibration standards are used. Such acceptable standards, but not limited to, are: NIST low alloy steel series (#361, 362, 363, 364, 365) or prepared synthetic matrix standards.

The use of a mixed matrix standard accounts for interference effects, calibration accuracy and precision of analysis as determined by mean variance between certified versus measured value over the calibration range. The total deviation from certified element is calculated as a mean average.

Synthetic Matrix - Composition is acceptable when a certified matrix control standard is not available. Such a preparation may use certified oxides, elemental solutions and/or spiking of a certified matrix (NIST or equivalent) with trace level elemental concentrations. Several are required as identified in the calibration section.

Repeating Frequency - A calibration standard and a control standard are to be repeated at a frequency of at least after every tenth (10th) sample during an analysis sequence.

Sample Behavior - During analysis, in cases where the sample response is unusual, these samples are to be spiked and/or diluted to assure accuracy. Spiked addition provides for verification of element identity and/or recovery. Examination of spectral peaks for spreading, distortion and/or baseline shifts are indicative of interferences. Such action shall be initiated by the operator or by the responsible scientist where appropriate.

3

Repetitive Values - Computer instrumentation having multiple measurements per element sequence for standards, controls and samples provides a statistical determination of the measurement precision. A minimum of three (3) readings need to be obtained. Typically, these values should be within 3 times the standard deviation of the particular value or twice the calibration average deviation whichever is greater. Specifics for each instrument and/or analysis may vary.

Control Status Log - A log file, book and/or computer shall be maintained identifying the AL request number, operator, log book - page, and the certified versus measured value where applicable for routine type analysis.

3.5 Review and Analysis of Data and Computations

The test observations, analysis data, computations and all analysis reports will be subject to review by the analyst and to independent review by a senior chemist prior to approval of the Chemical Analysis Report.

Prior to requesting approval of a Chemical Analysis Report the analyst will review the following items for completeness, reasonableness and consistency:

- o Sample log-in, identification and tracking records.
- o Log book entries cross-references, print outs, data sheets and calculations.
- o Results obtained on quality control samples.

Any recognized discrepancies, anomalies or omissions shall be documented in the laboratory log book and brought to the attention of a senior chemist and/or laboratory management.

Investigation and correction of the recognized discrepancies, anomalies or omission will be undertaken, as appropriate and with approval, and these actions shall be documented in the records for the analysis.

Following review and any corrective actions the analyst will sign and/or initial the Chemical Analysis Report form indicating completion and review of the work.

An independent review of the analysis data and verification of the computations shall be performed by a senior scientist or other qualified individual prior to approval of the Chemical Analysis Report.

All computer programs used in data management, calculations and/or report generation shall be documented and verified prior to initial use and after each modification. The verification process shall include test runs in which the output of the computer program for a given input is compared to "true" values that are known or determined independently of the computer program.

3.6 Qualification and Training

The qualifications of personnel to perform laboratory assignments which may effect safety and/or quality of analytical results shall be specified and documented in appropriate job descriptions. In addition laboratory personnel shall be trained, under direct supervision of senior laboratory scientists, so that they obtain and can demonstrate a sound knowledge of the methods, techniques, measurements and requirements of the procedures and instruction used in carrying out laboratory assignments. Training shall be conducted and records of training and qualification shall be maintained in accordance with Procedure No. A-6.

4.0 AUDITS

Planned and periodic internal monitoring and external audits shall be made to verify implementation of the laboratory's Quality Assurance Program Plan. The Audits and Internal Monitoring will be carried out in accordance with Divisional Procedure QMP 18-1.

EXHIBIT 2

OI-Westinhouse Large

1. Samples shall be received into the laboratory in accordance with Procedure A-5.

2A. Gamma Analysis
Samples recieving gamma analysis shall be analyzed in 2oz. can geometry. Prior to analysis of the sample shall be blended and and representatively aliquoted. Rocks, debris, & vegetation will not be discrimnated from the aliquot. For large debris crushing may be required for analysis.

2B. Weigh the aliquoted sample.

2C. Refer to Procedure A-525 for gamma spectrometry.

2D. Retain samples in archive for future reference.

3A. Alpha Spectrometry Analysis
Samples for alpha spectrometry analysis will be dried and crushed prior to analysis.

3B. A stock solution will be made from the prepared soil in accordance with OI_86-4, Appendix L.

3C. Perform a Uranium determination by alpha spectrometry, in accordance with procedure A-529, Determination of U by alpha spectrometry.

EXHIBIT 3

WESTINGHOUSE ELECTRIC CORPORATION
ADVANCED ENERGY SYSTEMS DIVISION
TECHNOLOGY DEPARTMENT
ANALYTICAL LABORATORIES

Procedure No. A-529

Separation of Am, Cm, Pu, and U for Alpha Spectrometry

Prepared by: C. A. Blackburn — 5-26-87
C. A. Blackburn
Test Engineering and
Analytical Laboratory
Date

Approved by: B Minushkin — 5-26-87
B. Minushkin, Manager
Test Engineering and
Analytical Laboratory
Date

Approved by: M O Smith — 5-29-87
M. O. Smith, Manager
Quality Engineering and
Field Surveillance
Date

Approved by: C. R. Adkins — 6-1-87
C. R. Adkins, Manager
Technology Department
Date

Westinghouse Electric Corporation
Advanced Energy Systems Division
P.O. Box 158
Madison, PA 15663

WESTINGHOUSE ELECTRIC CORPORATION
ADVANCED ENERGY SYSTEMS DIVISION
TECHNOLOGY DEPARTMENT
ANALYTICAL LABORATORIES

Procedure No. A-529

Separation of Am, Cm, Pu, and U For Alpha Spectrometry

1.0 SCOPE

This procedure covers the determination of transuranic and uranium isotopes in water samples or in acid "stock solutions" prepared from solid, resin, sludge, etc., waste samples.

2.0 SUMMARY

The procedure applies to water samples or acid "stock solutions." Specific instructions will be provided for dissolution of samples and preparation of stock solutions.

An aliquot of the sample is prepared, unseparated, for alpha spectrometry to estimate the aliquot size to be used in the separations. A Pu separation is run with a Pu tracer to provide quantitative measurements of the Pu isotopes present. When the gross alpha spectrum provides satisfactory resolution of the peaks, it, plus the plutonium fraction, can be used to perform the measurements of the Am and Cm. The americium, curium separation is run when the resolution of the unseparated spectrum is not satisfactory or when plutonium is not needed. The uranium separation is independent of the other measurements.

Radiotracers are added to the sample to produce quantitative results. The tracers added to, and the isotopes determined from, each fraction are:

Fraction	Tracer	Isotopes Measured
Gross Alpha	(optional)	
Am,Cm	Am-243	Am-241, Cm-242, Cm-243,244
U	U-232	U-238, U-235, U-234, U-233
Pu	Pu-242	Pu-239,240, Pu-238

3.0 INTERFERENCES

The presence of iron in the Am-Cm elutant will prevent measurement of this component due to alpha absorption on the electroplated planchet. If iron is present it must first be separated by co-precipitation of the alpha emitting isotopes on cerium fluoride.

4.0 REAGENTS

Reagent grade chemicals shall be used in all tests. Unless otherwise indicated it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

Unless otherwise indicated, references to water shall be understood to mean reagent water conforming to Specifications D 1193. Type III.

4.1 Anion exchange resin BioRad AG1X4 200-400 mesh, chloride form.

4.2 Anion exchange resin BioRad AG1X4 200-400 mesh, nitrate form. The chloride form resin is converted by washing with 1:1 nitric acid until the effluent gives no AgCl precipitate with a silver nitrate solution.

4.3 Hydrochloric acid: 6M and 0.5M.

4.4 Nitric acid: 8M, 3M, 0.5M, and 0.05M.

4.5 Cerium carrier: 50 micrograms Ce/ml, dissolve 0.16 grams of cerous nitrate in 1 liter water.

4.6 Radiotracers: Radiotracers are identified by the vendor, isotope, dilution code, and the lab book number/page number where the preparation of the tracer is recorded.

5.0 GROSS ALPHA SPECTRUM

This spectrum and the plutonium fraction can be used to make the measurements as calculated in Section 11.1.

There are three methods for the preparation of a planchet for the gross alpha spectrometry. The first method is to evaporate an aliquot of the sample directly onto the stainless steel planchet. This method can not be used when there is hydrochloric acid present, or when there is a heavy residue produced on the planchet. The second method is to electrodeposite an aliquot of the sample onto the planchet. Iron is a common interference in this method since it plates and degrads the resolution of the alpha spectrum. The third method is to coprecipitate the alpha emitting elements along with a cerium carrier. The precipitate is either collected on a filter or dissolved and electrodeposited onto a stainless planchet. This methods removes many interferences such as Ca, Si, Al, Fe, Ni, etc. Uranium is not recovered with this method.

5.1 Evaporation Method

5.1.1 Evaporate an aliquot of the sample on a stainless steel or platinum planchet. The diameter of the deposite should not be greater than the diameter of the alpha detector. Flame the planchet when dry.

5.2 Electrodeposition Method

5.2.1 Take an aliquot of the sample and evaporate to near dryness.

5.2.2 Go to Step 9.2 of the Electrodeposition Procedure.

5.3 Cerium Precipitation Method

5.3.1 Transfer an aliquot of the sample into a glass centrifuge cone. The centrifuge cone must be free of scratches on the inside since HF will be used.

5.3.2 Dilute the sample to about 15 ml with water, add 1/2 ml HCl, and four drops of Fe carrier. For samples which contain iron, the carrier may have to be omitted.

5.3.3 Heat to near boiling and add 20% NaOH to precipitate iron (pH 8-9). Add 1/2 ml excess 20% NaOH.

5.3.4 Centrifuge, pour off, and discard the supernate. While the centrifuge cone is still inverted, wash the inside of the cone with water from a squirt bottle.

5.3.5 Dissolve the precipitate with minimum HNO_3 (+HCl if necessary) with high heat. Dilute with water to about 8 ml and add 1 ml of the Ce carrier. Add 1 ml of 10% hydroxylamine hydrochloride, heat, and place in a hot water bath for five minutes, then an ice bath for five minutes.

5.3.6 Add 0.5 ml HF, mix. Let stand for five minutes.

5.3.7 Filter with .45 HA filter.

OPTION: This filter may be dried and counted, however the plated sample will usually produce a better alpha spectrum.

5.3.8 Dissolve the Ce precipitate off the filter with eight drops concentrated HCl and eight drops saturated boric acid.

5.3.9 Add 2 ml 4M HCl - Let stand 15 minutes.

5.3.10 Remove filter and rinse with 2 ml 4M HCl.

5.3.11 Add two drops of thymol blue indicator. Add concentrated NH_4OH dropwise until the color changes to yellow.

5.3.12 Go to Step 9.4 of the Electrodeposition Procedure.

6.0 PLUTONIUM SEPARATION

6.1 Transfer an aliquot of the sample into a beaker and add a known amount of Pu-242 tracer. Add the Pu-242 tracer to the blank sample also.

6.2 Add 1-2 ml of concentrated HNO_3 and take to near dryness on a hot plate. Remove from the hot plate and allow to cool.

6.3 Repeat Step 6.2.

6.4 Add approximately 2 ml 2M HNO_3 and 1 ml M NH_2HCl and swirl. Then transfer the beaker to a hot plate and heat to about 80°C for five minutes.

6.5 Transfer contents to a 15 ml screw cap culture tube and add 2 ml 1M $NaNO_2$. Mix and allow to stand until gas evolution ceases.

6.6 Extract into 4 ml of 0.5M TTA solution for ten minutes. Allow the phases to separate and draw off the organic phase with a disposable Pasteur tube and rubber bulb into a second screw cap culture tube.

6.7 Repeat the extraction twice, using 2 ml of 0.5M TTA solution. Allow the phases to separate. Draw off the organic phase and add to that obtained in Step 6.6. Discard the aqueous phase after the third extraction.

6.8 Wash the combined organic phases in the second tube with an equal volume of 1M HNO_3 for three minutes. Allow the phases to separate. Transfer the organic phase to a third culture tube.

6.9 Add 3 ml of 0.5M TTA solution to the second tube and mix for two or three minutes. Allow the phases to separate and add the organic phase to that obtained in Step 6.8. Discard the aqueous phase.

6.10 Extract the plutonium from the TTA into an equal volume of 10M HNO_3 for three minutes. Allow the phases to separate. Draw off the aqueous phase and transfer to a clean beaker.

6.11 Repeat Step 6.10 and add the aqueous phase to that obtained in Step 6.10.

6.12 Take the combined aqueous phases to dryness on a hot plate.

6.13 Add 2 ml of concentrated HNO_3 and approximately 100 mg of $NaNO_2$ crystals and swirl. Bring to a quick gentle boil on a hot plate and cool. Avoid prolonged heating.

6.14 Prepare a 1 cm column in a disposable Pasteur pipet of BioRad AG1X4 (200-400 mesh) resin. Pretreat the column with 25 ml of 0.4M HCl followed by 25 ml 10M HNO_3.

6.15 Transfer the sample to the column. Wash the column with 25 column volumes of 10M HNO_3 followed by 50 column volumes of concentrated HCl. Discard the wash solutions.

6.16 Strip the plutonium into a clean beaker with 50 column volumes of 0.4M HCl strip solutions.

Go to Step 9.1 of the Electrodeposition Procedure.

7.0 AMERICIUM, CURIUM SEPARATION

7.1 Transfer an aliquot of the sample into a glass centrifuge cone. The centrifuge cone must be free of scratches on the inside since HF will be used. Am-243 tracer may be [illegible] if this fraction is to be used for a quantitative measurement.

7.2 Dilute the sample to about 15 ml with water, 1/2 ml HCl, and four drops of Fe carrier. For samples which contain iron, the carrier may have to be omitted.

7.3 Heat to near boiling and add 20% NaOH to precipitate iron (pH 8-9). Add 1/2 ml excess 20% NaOH.

7.4 Centrifuge, pour off and discard the supernate. While the centrifuge cone is still inverted, wash the inside [illegible] the cone with water from a squirt bottle.

7.5 Dissolve the precipitate with minimum HNO_3 (+HCl if necessary) with high heat. Dilute with water to about 8 ml and add 1 ml of the Ce carrier. Add 1 ml of 10% hydroxylamine hydrochloride, heat, and place in a hot water bath for five minutes, then an ice bath for five minutes.

7.6 Add 0.5 ml HF, mix. Let stand for five minutes.

7.7 Filter with .45 HA filter. Discard the filtrate.

7.8 Pipet 1 ml of 10M HCl and eight drops of saturated boric acid into a 50 ml beaker. Place the filter containing the sample, precipitate side down, in the acid. Let stand 15 minutes to dissolve the sample off the filter.

7.9 Remove the filter, rinsing it with an addition 1 ml of 10M HCl.

7.10 Prepare a 2.5 cc resin column in a 5 ml disposable pipet using BioRad AG-1x4(200-400mesh) chloride form resin. Rinse the column with 5 ml of 10M HCl.

7.11 Transfer the sample to the column - use a long thin pipet and place the 2 ml sample directly onto the resin. Collect the effluent. This is the americium, curium fraction.

7.12 After the sample has passed through the column, rinse the column with 5 ml of 10M HCl. Add this effluent to the americium, curium fraction.

7.13 Go to Step 9.1 of the Electrodeposition Procedure.

8.0 URANIUM SEPARATION

8.1 Starting with the sample in solution form, take an aliquot and add an aliquote of standardized U-232 tracer. Run a blank along with the sample which contains the same U-232 tracer.

8.2 For small samples, dilute to about 10 ml with water.

8.3 Add 0.5 ml of cerium carrier (10 mgs Ce/ml) and 1 ml of 10% hydroxylamine hydrochloride.

8.4 Heat and add hydrofluoric acid to precipitate cerium.

8.5 Cool in an ice bath for five minutes, and centrifuge. Discard the precipitate. Filter if necessary.

8.6 Evaporate to dryness and redissolve in 2 ml of 10M HCl.

8.7 Prepare a 2.5 cc resin column in a 5 ml disposable pipet using BioRad AG-1x4(200-400 mesh) chloride form resin. Rinse the column with 10 ml of 10M HCl.

8.8 Transfer the sample to the column - use a long thin pipet and place 2 ml sample directly onto the resin.

8.9 After the sample has passed through the column, rinse the column with 20 ml of 10M HCl. Discard the effluent from the column.

8.10 Add 0.3 ml concentrated HI to 15 ml of 6M HCl and mix. Prepare fresh.

8.11 Rinse the column with the mix of Step 8.10. Discard the effluent.

8.12 Rinse the column with 5 ml of 6M HCl. Discard the effluent.

8.13 Elute the uranium with 15 ml of 1M HCl. Collect this fraction in a small beaker.

8.14 Go to Step 9.1 of the Electrodeposition Procedure.

9.0 ELECTRODEPOSITION PROCEDURE

9.1 Add about 1 ml of concentrated HCl to the sample off the column and evaporate to near dryness.

9.2 Take up in 0.5 ml of concentrated HCl and evaporate to dryness.

9.3 Dissolve the sample in about four drops of concentrated HCl and add 4 ml of 4M HCl. Add two drops of thymol blue indicator and add concentrated ammonium hydroxide dropwise until the color changes to yellow.

9.4 Add 2M HCl dropwise to a pink end point.

9.5 Transfer the sample to the electroplating cell and plate for 30 minutes at 1.5 amps.

NOTE: Using a Schlumberger-Heath Model SP-27A power supply, the following settings should give satisfactory electroplating:

- Voltage Scale - course 0.5-5
  fine about 3/4

- Current Scale - course 1.5 amps
  fine - adjust to give 1.5 amps on the meter

Other power supplies may be used which provide the required d.c. current.

9.6 At the end of the 30 minute plating period, add 1 ml of concentrated ammonium hydroxide and turn off the current after about 20 seconds. Disassembly the plating cell, rinse the planchet well with H_2O, and flame. Count the sample by alpha spectrometry.

10.0 ALPHA SPECTROMETRY

Count the samples on an alpha spectrometer and sum the counts in the channels of the tracer peak and the peaks of the isotopes to be measured.

11.0 CALCULATIONS

11.1 Sample Alpha Spectrum Data Reduction

The calculation of the alpha isotopes from the sample alpha spectrum requires that the Pu-239,240 and the Pu-238 peaks both are present. In addition, sample and blank plutonium separations (Pu-242 spiked) must be performed. Refer to Figure 1 for identification of the symbols used in the following calculations.

11.1.1 Background correct each of the peaks in the blank Pu fraction. When the net count of a peak is negative, set it equal to zero.

11.1.2 Calculate the plutonium isotopes from the Pu fraction as follows:

Pu-239,240 = Q*(P9-B9-(P2-B2)*T9/T2)/(P2-B2)/V/C

Pu-239,240 (2 sigma) = Q*2*SQR(P9+B9+(P2-B2)*T9/T2)/(P2-B2)/V/C

where:

P9 is the gross count in the Pu-239,240 peak in the sample Pu fraction.

B9 is the detector background in the Pu-239,240 peak.

P2 is the gross count in the Pu-242 (tracer) peak in the sample Pu fraction.

B2 is the detector background in the Pu-242 peak.

T9 is the background corrected count in the Pu-239,240 peak in the blank Pu fraction.

T2 is the background corrected count in the Pu-242 (tracer) peak in the blank Pu fraction.

V is the volume of the sample aliquot which was spiked with the Pu-242 tracer.

C is an activity conversion factor; C = 1 dpm/dpm, C = 2.22 dpm/picocurie, C = 2.22E6 dpm/microcurie, etc.

Pu-238 = Q*(P8-B8-(P2-B2)*T8/T2)/(P2-B2)/V/C

Pu-238(2 sigma) = Q*2*SQR(P8+B8+(P2-B2)*T8/T2)/(P2-B2)/V/C

where:

P8 is the gross count in the Pu-238 peak in the sample Pu fraction.

B8 is the detector background in the Pu-238 peak.

T8 is the background corrected count in the Pu-238 peak in the blank Pu fraction.

11.1.3 Calculate a calibration factor for the sample alpha spectrum.

K = (Pu-239,240 result from Step 11.1.2)/(G9-B9)

where:

K is the calibration factor in units of (activity per unit of sample volume)/(net count in the peak of an isotope).

G9 is the gross count in the Pu-239,240 peak in the sample alpha spectrum.

11.1.4 Calculate the number of counts due to Pu-238 which are in the 5.5 MeV peak in the sample alpha spectrum.

I = (G9-B9)*(P8-B8)/(P9-B9)

where:

I is the number of counts due to Pu-238 in the sample alpha spectrum at 5.5 MeV.

11.1.5 Calculate the Am-241, Cm-243,244, and Cm-242 as follows:

Am-241 = K*(G8-B8-I)

Am-241 (2 Sigma) = K*2*SQR(G8 + B8 + I)

where:

G8 is the gross count in the Pu-238 plus Am-241 peak in the sample alpha spectrum.

Cm-243,244 = K*(G4-B4)

Cm-243,244 (2 Sigma) = K*2*SQR(G4 + B4)

where:

G4 is the gross count in the Cm-243,244 peak in the sample alpha spectrum.

B4 is the detector background in the Cm-243,244 peak.

Cm-242 = K*(G42-B42)

Cm-242 (2 sigma) = K*2*SQR(G42+B42)

where:

G42 is the gross count in the Cm-242 peak in the sample alpha spectrum.

B42 is the detector background in the Cm-242 peak.

11.1.6 Calculate the Pu-242, AM-243, Np-237, U-238, U-235, U-234 activities with the following method. The peaks of these isotopes are normally very low or not detected. This method corrects for the continuum of counts, under the peaks, which are the result of higher energy peaks.

Pu-242 is used for an example in the following. the other isotopes are calculated in a similar manner.

Pu-242 = K*(G2-N*(A+B)/(N1+N2))

Pu-242 (2 Sigma) = K*2*SQR(G2+N*(A+B)/(N1+N2)

where:

G2 is the gross count in the Pu-242 peak in the sample alpha spectrum.

N is the number of channels in the region of G2.

A is the count in a band of channels on the lower side of the G2 region. (Typically ten channels.)

N1 is the number of channels in the A band.

B is the count in a band of channels on the higher side of the G2 region.

N2 is the number of channels in the B band.

11.2 Uranium Fraction Data Reduction

11.2.1 Background correct each of the peaks in the blank U fraction. When the net count of a peak is negative, set it equal to zero.

11.2.2 The U-233 and U-234 peak regions overlap with 60% of the U-233 counts falling into the U-234 region. Following the calculation of the U-233 activity, the count in the U-234 region is corrected for the interference due to U-233. See Figure 2. Calculate the U-233 activity as follows

U-233 = Q*(U3-B3-(U2-B2)*T3/T2)/0.4/V/C

U-233 (2 sigma) = Q*2*SQR(U3+B3+(U2-B2)*T3/T2)/0.4/V/C

where:

U3 is the U-233 gross count in the sample uranium fraction.

B3 is the detector background in the U-233 region.

U2 is the U-232 gross count in the sample uranium fraction.

B2 is the detector background in the U-232 region.

T3 is the background corrected U-233 count in the blank U fraction.

T2 is the background corrected U232 count in the blank U fraction.

0.4 is the fraction of the U-233 counts which fall in the region summed.

Calculate the U-234 activity as follows:

I3 = 1.5 *(U3-B3-(U2-B2)*T3/T2)
When I3 is negative, set it equal to zero.

where:

I3 is the number of counts due to U-233 in the U-234 region.

U-234 = Q*(U4-B4-I3-(U2-B2)*T4/T2)/V/C
U-234 (2 Sigma) = Q*2*SQR(U4+B4+I3+(U2-B2)*T4/T2)/V/C

where:

U4 is the U-234 gross count in the sample uranium fraction.
B4 is the detector background in the U-234 region.
T4 is the background corrected U-234 count in the blank U fraction.

11.2.3 U-235 Calculation:

U-235 = Q*(U5-B5-(U2-B2)*T5/T2)/.85/V/C
U-235 (2 sigma) = Q*2*SQR(U5+B5+(U2-B2)*T5/T2)/.85/V/C

where:

U5 is the U-235 gross count in the sample uranium fraction.

B5 is the detector background in the U-235 region.

T5 is the background corrected U-235 count in the blank U fraction.

0.85 is the fraction of the U-235 counts which fall into the region summed.

11.2.4 U-238 Calculation

U-238 = Q*(U8-B8-(U2-B2)*T8/T2)/V/C

U-238 (2 Sigma) = Q*2*SQR(U8+B8+(U2-B2)*T8/T2)/V/C

where:

U8 is the U-238 gross count in the sample uranium fraction.

B8 is the detector background in the U-238 region.

11.2.5 Americium, Curium and Plutonium Fractions Data Reduction

The calculation of the plutonium fraction is covered in Steps 11.1.1 through 11.1.2.

The calculations of the americum,curium fraction are performed in a similar manner as the plutonium fraction.

12.0 QUALITY CONTROL

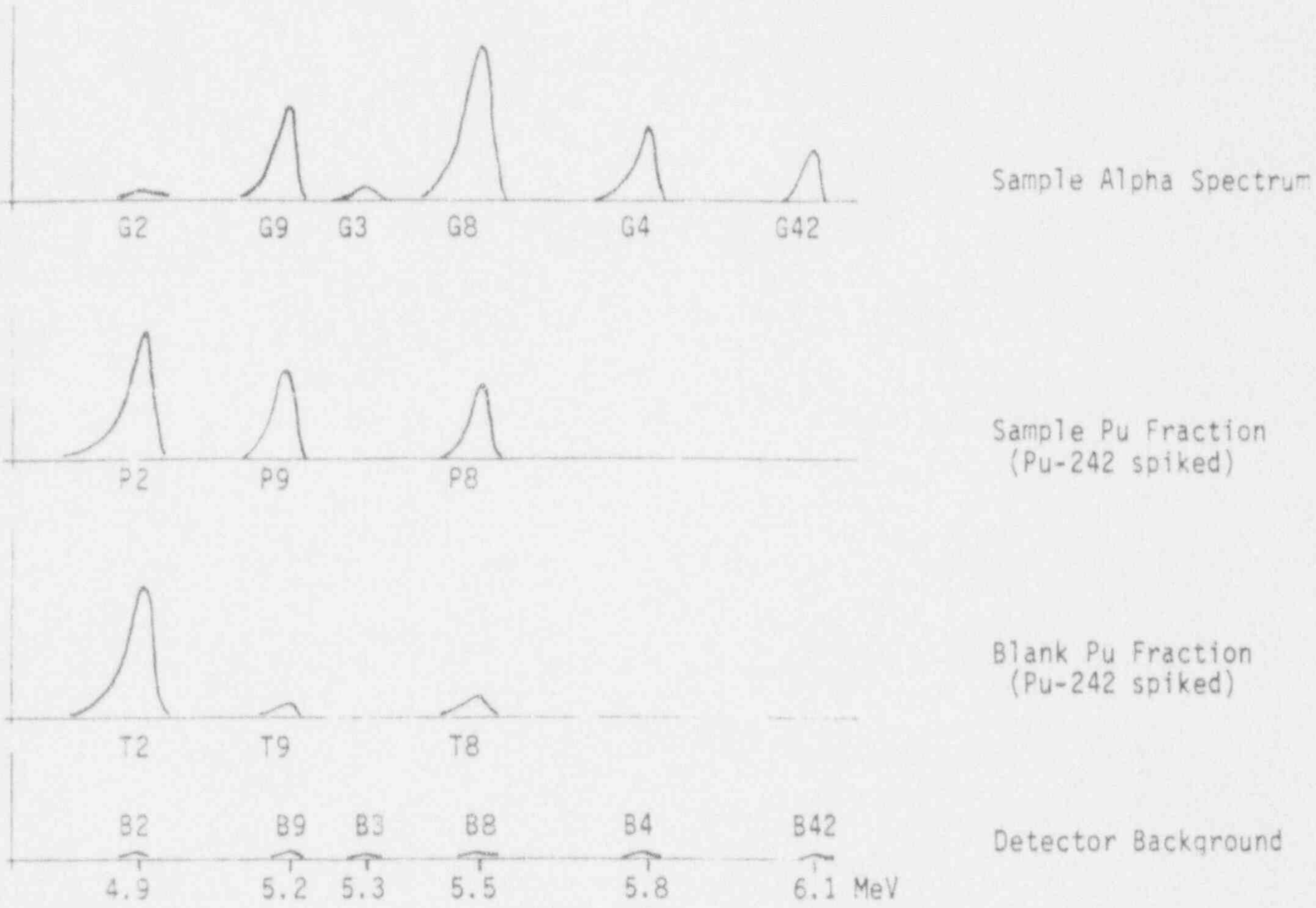
All analysis data shall become part of the permanent record and shall be consistent with the requirements of Procedure No. A-010. Periodic quality control samples in the form of:

- reagent blanks
- spiked samples
- counting efficiency qualifications

shall be performed on a regular basis to verify the accuracy of the analytical method at a frequency of not less than one every 20 samples. Periodic calibration checks of the counting equipment shall be performed per the requirements of Procedure A-523.

Figure 1

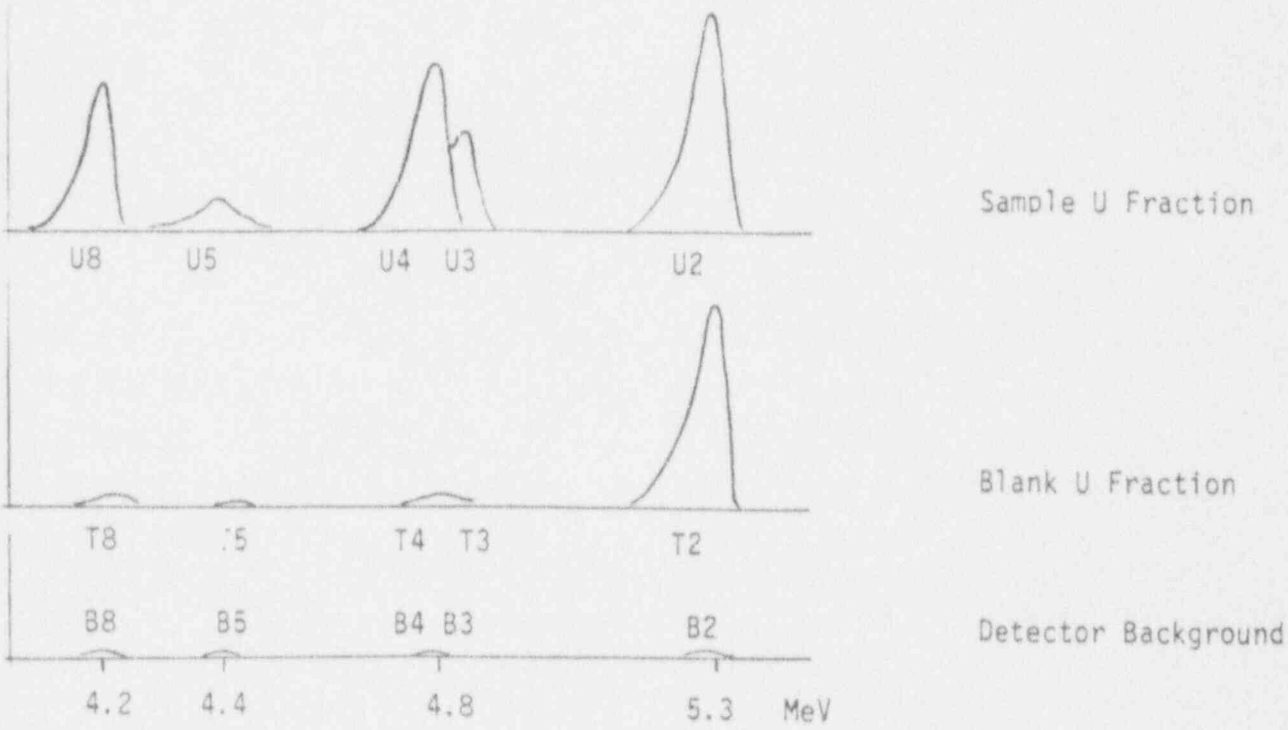
Alpha Spectra and Symbols Identification



MeV	Isotope
4.9	Pu-242
5.2	Pu-239+240
5.3	Am-243
5.5	Pu-238 plus Am-241
5.8	Cm-243 plus Cm-244
6.1	Cm-242

Figure 2

Uranium Fraction Alpha Spectra



MeV	Isotope
4.2	U-238
4.4	U-235
4.8	U-234, U-233
5.3	U-232

EXHIBIT 4

CI-86-4 Rev. 3, 6/22/89
Full Radionuclide Analysis of WIPP Samples

Appendix L
Dissolution of Soil and Sediment Samples

1.0 SCOPE

This procedure covers the dissolution of soil and sediment samples which have been dried and prepared for analysis. Appendix F is run on samples which have not been homogenized.

2.0 SUMMARY

A 10 gram aliquot of the sample is dissolved with a hydrofluoric and nitric acid mixture. The sample is evaporated to dryness and redissolved in a nitric and hydrochloric acid mixture, and finally diluted to a 50 ml stock solution.

3.0 PREPARATION OF STOCK SOLUTION

3.1 Weigh out a 10.0 gram aliquot of the sample into a Coors crucible and heat to 600 C for 1 hour.

3.2 Transfer the sample to a teflon beaker. Add 20 ml concentrated HF and 10 ml concentrated HNO_3. Heat and concentrate to near dryness.

3.3 Add 20 ml HF and 10 ml HNO_3 and heat to dryness.

3.4 Add 5 ml HNO_3 and 15 ml HCl to the residue and heat to redissolve.

3.5 Transfer the solution and any undissolved residue to a glass beaker. If residue remains fixed to the bottom of the teflon beaker, add a little HCl and scrape loose with a teflon spatula. Add this acid and residue to the sample in the glass beaker.

3.6 Heat to boiling and concentrate to about 10 ml. Add 10 ml water and 1 ml saturated boric acid, mix, and heat for 10 minutes.

3.7 Transfer the sample along with any residue to a plastic centrifuge tube which has a screw cap.

3.8 Make up to 50 ml with water and mix. Spin down any undissolved residue.

3.9 The stock solution is now ready for the various radiochemical separations.

EXHIBIT 5

WESTINGHOUSE ELECTRIC CORPORATION
ADVANCED ENERGY SYSTEMS DIVISION
TECHNOLOGY DEPARTMENT
ANALYTICAL LABORATORIES

Procedure No. A-524

Determination of Sample Activity by Gamma Spectrometry

Approved by: ______________________ 3/25/86
B. Minushkin, Manager
Test Engineering and
Analytical Laboratories
Date

Approved by: M. O. Smith 4/14/86
M. O. Smith, Manager
Quality Engineering and
Field Surveillance
Date

Approved by: C. R. Adkins 4/14/86
C. R. Adkins, Manager
Technology Department
Date

Westinghouse Electric Corporation
Advanced Energy Systems Division
P. O. Box 158
Madison, PA. 15663

WESTINGHOUSE ELECTRIC CORPORATION
ADVANCED ENERGY SYSTEMS DIVISION
TECHNOLOGY DEPARTMENT
ANALYTICAL LABORATORIES

Procedure No. A-524

Determination of Sample Activity by Gamma Spectrometry

1.0 SCOPE

This procedure covers the preparation and counting of samples by gamma-ray spectrometry using the ND-6620 system. Quantitative results are obtained for the gamma-ray emitting radionuclides in the sample. Instructions are given for the preparation of water, soil, smears, planchets, dosimeter wires, and filters. An outline of the sample counting process is included in this procedure. Detailed instructions for operation of the ND-6620 system and programs are contained in the manufacturer's manual.

2.0 SUMMARY

2.1 The three gamma detectors connected to the ND-6620 system have been calibrated for the measurement of the gamma emitting isotopes in seven standard sample types. A detailed description of the standard sample types and the method of calibration is contained in procedure A-521.

2.2 A sample to be measured must be prepared into one of these seven sample types to obtain a quantitative result when counted. Samples which cannot be prepared and counted in a standard type must be treated on an individual basis. Samples of resin, smears composities, and dosimeter wires are counted in this manner. Preparation of these samples and counting instructions are covered in Section 6.0.

2.3 The count rate of the sample measurement must be limited to minimize biasing the result low due to random coincidence losses. ADC 4 has pulse pileup correction circuits and can be operated at a higher counting rate than ADC 1 and 2. The counting rate limits are determined by the percent BUSY meters located on the ADCs. The limits for the three ADCs are given in Section 4.0.

2.4 Jobstreams have been established for the setup of the parameters for the counting of some routine samples, and for the data reduction of all samples counted. These jobstreams are identified in Section 5.0 when they apply.

3.0 REFERENCES

3.1 Nuclear Data-6600 Data Acquisition and Processing System Operator's Manual, 07-0084.

3.2 Procedure A-521, calibration of the ND-6620 Gammaray Spectrometer.

4.0 COUNT RATE LIMITS

Count rate limits are determined by the percent BUSY meter on the ADC.

4.1 As follows:

ADC #	% BUSY Maximum Limit
1 & 2	5%
4	10%

5.0 SAMPLE ANALYSIS

5.1 Prepare the sample in the same manner as the standard sample types described in the following Section 6 and in Section 3.1 through Section 3.7 of Procedure A-521, substituting the unknown sample for the related activity standard.

5.2 Place the sample at a calibrated position which will not produce an ADC percent BUSY greater than the following:

Detector #	Maximum % BUSY
1	5
2	5
4	10

The calibrated position for each sample type are define in procedure A-521 calibration of the Gamma-ray Spectrometer.

5.3 Set the Preset Live Time to the number of seconds specified in Section 6.0 and acquire the spectrum.

5.4 Define Logical Unit #11 with the efficiency file name for the selected counting geometry. The efficiency file names along with counting geometries are contained in Procedure A-521.

5.5 Define Logical Unit #10 with the filename which contains the background correction for the selected counting geometry (see Procedure A-521).

5.6 Run the program PARS and update the following parameters:

ID	Sample identification
TY	Sample type
GE	Counting geometry
QU	Sample quantity which will be divided into the measured activity.
SA	Sample date used by the software to make the decay correction.
AF	Activity factor. The software calculates the activity in microcuries; the activity factor is a multiplier used to convert microcuries to other units.
UA	Unit of activity calculated by the activity factor (AF).

5.7 Analyze the spectrum and print out a report when the count is complete. The job streams which produce the report are summarized in the following table. In each case, the number following the W must match the number of the user; 1, 2, or 4.

JOB STREAM

AUTO.W2R	Produces an analysis without a background correction. (No MDA printout)
AUTO.W2RMDA	Produces a background corrected report with a MDA report.
AUTO.W2RWTM	Produces a background corrected report with a MDA report followed by a weighted mean report.
AUTO.DOSE2	Produces a weighted mean report for stainless steel, colbalt/aluminum, iron, nickel, titanium, and silver/aluminum dosimeters.

6.0 SAMPLE PREPARATION

The following covers the preparation of specific samples which are routinely gamma counted in the analytical laboratory.

6.1 Environmental Soil and Silt Samples

- Dry the sample at room temperature or in an oven at about 100°C.
- Break up the dried sample and sieve the sample if necessary to remove sticks and stones.

- Fill a two ounce can (standard sample type D) and record the net weight of sample in the can.

- Seal the can with epoxy.

- Hold the sealed can for two weeks before counting.
  Note: The can only needs to be sealed with epoxy and held for two weeks when the radioactive daughters of Ra-226 or Th-228 are to be measured.

6.2 Water Samples

Water samples can be counted as received, diluted, or concentrated. The preparation will be determined for each sample by the sensitivity required for low level samples, or by analyzer count rate limits for high level samples.

6.2.1 Weir and Environmental Samples. Concentrate 1 liter and evaporate onto a stainless planchet (Standard Sample Type C) and count for 60,000 seconds at the planchet geometry for the detector being used.

6.2.2 Water Process Samples my be counted in the following standard forms:

- Marinelli beaker geometry (Standard Sample E) and counted 10,000 seconds or longer.

- 500-ml, or more, evaporated onto a stainless steel planchet (Standard Sample C) and counted 10,000 seconds or longer.

6.2.3 Observation Hole Samples:

- Count the planchets of 100 mls received from Health Physics at the contact geometry for 60,000 seconds.

- Count the special 500 ml planchets received from Health Physics at the contact geometry for 216,000 seconds.

6.3 Dosimeter Wires

Dosimeter wires one inch or less in length are cleaned, weighed, and counted at no closer than 5 cm. The long wires, which have been exposed external to the pressure vessel, are cut into sections and counted to give a fluence profile. The section length is specified by the submitter. For dosimeter wires or foils of such low activity that counting at 5 cm would be impractical, a special calibration can be performed in accordance with Procedure A-521. Unless otherwise specified by the submitter, dosimeter wires and foils are analyzed for dps/mg and decay corrected to a common date and time for the set.

6.3.1 Preparation of wires and foils one inch or less.

- Clean the sample as needed to obtain the weight of the dosimeter and remove any surface contamination activity. An acetone wipe is usually sufficient for clean looking samples and a brief nitric acid leach followed by water and acetone rinses for contaminated samples.

- Weigh the sample and mount it between polyester tape centered in a ring as Standard Sample B.

6.3.2 Preparation of long wires. These wires are usually cut into one foot sections for counting.

- Clean the wire by wiping with acetone or alcohol.

- Cut the one foot sections starting at the point specified by the submitter. Give each one foot section a unique sample identification and record it along with the distance from the starting point.

- Cut the one foot section into pieces 0.8 inches each.

- Weigh all the 0.8 inch pieces from the one foot section as a group.

- Mount all the 0.8 inch pieces from the one foot section into a simulated Sample Type B as follows: Place a ring on a piece of polyester tape, sticky side up. Place all the 0.8 inch pieces on the tape, side by side, forming a square about 0.8 inch x 0.8 inch. Seal in the pieces with a second piece of polyester tape, sticky side down.

6.4 Sludges, Residues, and Resins Samples

Samples of sludge or resin can be counted wet (as received), or dried, as specified by the submitter. Samples which are counted wet, or as received, are usually reported as microcuries per cubic centimeter, and dried samples reported as microcuries per gram.

- Transfer 10 cubic centimeters of the sample into a plastic vial used for Standard Sample A in Procedure A-521. Record the net weight of the sample.

6.5 Smear Composites

A smear composite of about one to three smears can be mounted in the sample type B arrangement and counted at one of the Sample Type B geometries. A large number of smears can be contained in a plastic petri disk or two ounce can, as needed, and counted at five or more centimeters. The sample should be placed so that the distance from the surface of detector to the mid point of the composite is the same as the distance for the Sample Type B efficiency being used.

EXHIBIT 6

ND6600 APPLICATIONS REFERENCE GUIDE

INTRODUCTION/SYSTEM OVERVIEW

The ND6600 is a sophisticated, computer-based laboratory data acquisition and analysis system which includes a comprehensive set of operating procedures. This Applications Guide details the operation, calibration, and maintenance procedures for ND6600 users. More detailed information describing these procedures is found in the ND6600 System Operational Instruction Documentation, supplied to users at system installation.

The ND6600 System contains four basic subsystems: 1) Main system hardware, including cabinet, power supplies, COMBUS enclosure, system central processor, memory management interface, and system memory; 2) Display and Acquisition Subsystem hardware, including DAS processor and interface, ND6600 Terminal with keyboard and display interfaces, ADC's, and ADC interfaces; 3) Peripheral Devices, including disk drives and interfaces, optional magnetic tape, optional computer terminals, line printers, and paper tape devices; 4) System Software, including the MIDAS or MIDAS+ operating system, the MIDAS display and acquisition subsystem, and the applications software.

The subsystems and components specifically explained in this guide are those in the ND6620 (Hard Disk) system. Where procedures described here differ from those for an ND6610 (Floppy Disk) system, the ND6610 procedures are also explained.

AUG 3 1993

License No. SNM-951 Docket No. 070-00997

Oak Ridge Institute For Science and Environment
ATTN: Michelle Landis
Environmental and Site Assessment Program
P. O. Box 117
Oak Ridge, Tennessee 37831-0117

Dear Ms. Landis:

Subject: WESTINGHOUSE ELECTRIC CORPORATION, LARGE, PENNSYLVANIA, SITE REMEDIAL ACTIONS AND FINAL SURVEY REPORTS

Enclosed are the final survey reports for the Westinghouse Electric Corporation (W) site at Large, Pennsylvania. These documents are provided to facilitate your preparation for the performance of a confirmatory radiological survey of this site. The reports are in addition to those furnished to you with our letter dated June 14, 1993. We are in contact with (W) to develop the information regarding the site which you requested in your letter dated July 23, 1993.

We request that you develop a survey plan and cost estimate for this site.

We would like to accomplish the survey as soon as possible and so will work with you by telephone to develop a schedule.

We appreciate your advice and assistance in this matter.

Sincerely yours,

Original Signed By:

John D. Kinneman, Chief
Research, Development, and
Decommissioning Section
Division of Radiation Safety
and Safeguards

OFFICIAL RECORD COPY - S:\PENDING\ORISE-WE.CTO - 08/02/93

ML 10

117646

Enclosures: As stated

cc: (w/o enclosures)
D. Tikinsky, NMSS
T. Mo, NMSS

bcc: (w/o enclosures)
Region I Docket Room (w/ concurrences)
J. Kinneman, RI
C. T. Oberg, RI

DRSS:RI	DRSS:RI
Oberg/smh	Kinneman
8/13/93	8/13/93

Enclosures

1. #001 EVALUATION OF RADIATION DOSIMETERS DISTRIBUTED ON THE SITE, NOVEMBER 2, 1992
2. #003 EVALUATION OF PORTIONS OF MONITORED DRAIN LINE SYSTEM ABANDONED IN PLACE, NOVEMBER 24,1992
3. #005 FINAL RADIOLOGICAL SURVEY OF INCINERATOR BUILDING, DECEMBER 11, 1992
4. #006 PRELIMINARY SURVEY OF SELECTED SITE BUILDINGS, DECEMBER 7, 1992
5. #008 FINAL RADIOLOGICAL SURVEY OF PIT BEHIND BUILDING 5, JANUARY 6, 1993
6. #010 FINAL RADIOLOGICAL SURVEY OF PIPE CHASE WITHIN BUILDING NUMBER 9, JANUARY 6, 1993
7. #011 FINAL RADIOLOGICAL SURVEY OF BUILDING NO. 8, (SURVEY SECTION 28E), JANUARY 26, 1993
8. #012 FINAL RADIOLOGICAL SURVEY OF THE FIRST FLOOR OF BUILDING NO. 7, (SURVEY SECTION 7), JANUARY 29, 1993
9. #013 FINAL RADIOLOGICAL SURVEY OF BUILDING NO. 7, SECOND FLOOR, (SURVEY SECTION 28D), FEBRUARY 4, 1993
10. #014 FINAL RADIOLOGICAL SURVEY OF BUILDING NO. 6A, (SURVEY SECTION 6), FEBRUARY 9, 1993
11. #015 FINAL RADIOLOGICAL SURVEY OF THE BASEMENT OF BUILDING NO. 4, (SURVEY SECTION 14), FEBRUARY 16,1993
12. #016 FINAL RADIOLOGICAL SURVEY OF THE PIT IN BUILDING NO.9, (SURVEY SECTION 9), MARCH 10, 1993
13. #017 FINAL RADIOLOGICAL SURVEY OF THE FIRST FLOOR OF BUILDING NO. 6, (SURVEY SECTION 4), MARCH 11, 1993

14. #018 FINAL RADIOLOGICAL SURVEY OF BUILDING NO. 11, (SURVEY SECTION 28I), MARCH 15, 1993

15. #019 FINAL RADIOLOGICAL SURVEY OF THE SECOND FLOOR OF BUILDING NO. 6, (SURVEY SECTION 5), MARCH 15, 1993

16. #020 FINAL RADIOLOGICAL SURVEY OF THE FIRST FLOOR OF BUILDING NO. 9, (SURVEY SECTION 10), MARCH 17, 1993

17. #021 FINAL RADIOLOGICAL SURVEY OF BUILDING NO. 10, (SURVEY SECTION 28H), MARCH 17, 1993

18. #022 FINAL RADIOLOGICAL SURVEY OF THE SECOND FLOOR OF BUILDING NO. 9, (SURVEY SECTION 28G), MARCH 17, 1993

19. #023 FINAL RADIOLOGICAL SURVEY OF THE SECOND FLOOR OF BUILDING NO. 5, (SURVEY SECTION 2), MARCH 30, 1993

20. #024 FINAL RADIOLOGICAL SURVEY OF THE THIRD FLOOR OF BUILDING NO. 5, (SURVEY SECTION 3), MARCH 31, 1993

21. #025 FINAL RADIOLOGICAL SURVEY OF THE FIRST AND SECOND FLOORS OF BUILDING NO. 4, (SURVEY SECTION 28A), APRIL 1, 1993

22. #026 FINAL RADIOLOGICAL SURVEY OF BUILDING NO. 5A, (SURVEY SECTION 28C), APRIL 5, 1993

23. #027 FINAL RADIOLOGICAL SURVEY OF THE FIRST FLOOR OF BUILDING NO. 12, (SURVEY SECTION 16), APRIL 5, 1993

24. #028 FINAL RADIOLOGICAL SURVEY OF THE SECOND FLOOR OF BUILDING NO. 12, (SURVEY SECTION 28L), APRIL 7, 1993

25. #029 FINAL RADIOLOGICAL SURVEY OF THE THIRD FLOOR OF BUILDING NO. 4, (SURVEY SECTION 15), APRIL 7, 1993

26. #030 FINAL RADIOLOGICAL SURVEY OF THE FOURTH FLOOR OF BUILDING NO. 5, (SURVEY SECTION 28B), APRIL 8, 1993

27. #031 FINAL BUILDING SURVEY OF THE FIRE HALL, (SURVEY SECTION 28J), APRIL 8, 1993

28. #032 FINAL RADIOLOGICAL SURVEY OF THE SECOND FLOOR OF BUILDING NO 8A, (SURVEY SECTION 28F), APRIL 8, 1993

29. #033 FINAL RADIOLOGICAL SURVEY OF THE HYDROGEN FACILITY, (SURVEY SECTION 11), MAY 10, 1993

30. #034 FINAL RADIOLOGICAL SURVEY OF THE FIRST FLOOR OF BUILDING NO. 5, (SURVEY SECTION 1), APRIL 20, 1993

31. #035 FINAL RADIOLOGICAL SURVEY OF THE FIRST FLOOR OF BUILDING NO. 8A, (SURVEY SECTION 8), MAY 5, 1993

32. #036 CALIBRATION RECORDS FOR REPORTS USED FOR RADIOLOGICAL SURVEYS, APRIL 22, 1993

33. #037 TECHNICAL DESCRIPTION OF INSTRUMENTS USED FOR RADIOLOGICAL SURVEYS, APRIL 30, 1993

34. #038 FINAL RADIOLOGICAL SURVEY OF THE BUILDING ROOFS, (SURVEY SECTION 29), JUNE 1, 1993

35. #039 FINAL RADIOLOGICAL SURVEY OF THE SITE GROUNDS, (SURVEY SECTION 30), JUNE 2, 1993

36. #040 RADIOLOGICAL SURVEY OF STREAMS ADJACENT TO THE SITE, (SURVEY SECTION 31)

37. #041 FINAL RADIOLOGICAL SURVEY OF THE STORM DRAIN SYSTEM ON THE SITE, (SURVEY SECTION 32), JUNE 8, 1993

38. #042 SUMMARY REPORT ON INFORMATION RELEVANT TO TERMINATION OF LICENSE NUMBER SNM-951, July 9, 1993

39. Letters, with enclosures, dated January 11, 1992, February 12, February 24, April 16, April 30, May 14, July 9, and July 20, 1993, from the licensee to the NRC, Region I.

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

ENERGY/ENVIRONMENT SYSTEMS DIVISION

August 3, 1993

John D. Kinneman, Chief
Research Development, and
Decommissioning Section
Division of Radiation Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

SUBJECT: ADDITIONAL COMMENT - LICENSE TERMINATION REPORTS FOR WESTINGHOUSE ELECTRIC CORPORATION, LARGE, PA

Dear Mr. Kinneman:

After review of the subject document, ESSAP provided a list of comments for your consideration in a letter from M.R. Landis (ORISE) to J.D. Kinneman (NRC), dated July 23, 1993. The following item should be added to that list:

- In Report #009, "General Information Relative to Radiological Surveys of Buildings", ESSAP is unable to verify the MDA calculations listed in Table 6. The instrument efficiency and background values listed in Tables 4 and 5 were used in these calculations. A clarification would be helpful.

Per conversation with Mr. Mark Roberts, the preliminary site visit is scheduled for August 9. If you have any questions or comments, please direct them to me at (615)576-3355 or Michele Landis at (615)576-2908.

Sincerely,

Armin J. Ansari
Project Leader
Environmental Survey and
Site Assessment Program

AJA:ttc

cc: T. Mo, NRC/NMSS, 6H3
D. Tiktinsky, NRC/NMSS, 6H3
J. Swift, NRC/NMSS, 6H3
M. Roberts, NRC/Region I
J. Berger, ORISE/ESSAP
M. Landis, ORISE/ESSAP
PMDA, 6E6
File/233

"OFFICIAL RECORD COPY"

ML 10

P. O. BOX 117, OAK RIDGE, TENNESSEE 37831-0117

Managed and operated by Oak Ridge Associated Universities for the U.S. Department of Energy

CONVERSATION RECORD

TIME 4:45 PM

DATE 8/12/93

TYPE

☐ VISIT ☐ CONFERENCE ☒ TELEPHONE

☐ INCOMING

☒ OUTGOING

Location of Visit/Conference:

ROUTING	
NAME/SYMBOL	INT

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU Dr. Aminul Ansari

ORGANIZATION (Office, dept., bureau, etc.) ORISE

TELEPHONE NO. 615-241-3497

SUBJECT W Large ~~Scale~~ Confirm. Survey Plan

SUMMARY

Survey Schedule for 3 days Starting 8/30/93 (8/30, 31 and 9/1/93). [illegible] Dr. Ansari and Eric Abelquist plus couple of technicians

Will have plan and cost estimate to RI by 8/19/93

Will want 20-30 samples for W inventory for analyses [illegible] (γ and some α anal.). RI will include some [illegible] [illegible] also.

Howard Johnson @ Pleasant Hills is best lodging.

Pittsburgh *2150 5300 Clairton Blvd.

Tel. 412-884-6000 (FAX 412-884-6009)

Route 51 ~~@~~ just north of Lebanon Church Rd.

(OVER)

ACTION REQUIRED

NAME OF PERSON DOCUMENTING CONVERSATION [illegible] & M. Roberts

SIGNATURE

DATE 8/12/93

ACTION TAKEN

SIGNATURE

TITLE

DATE

50271-101 ☆U.S. G.P.O. 1983-381-526/8346

CONVERSATION RECORD

OPTIONAL FORM 271 (12-76)
DEPARTMENT OF DEFENSE

"OFFICIAL RECORD COPY" ML 10

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

ENERGY/ENVIRONMENT SYSTEMS DIVISION

August 19, 1993

John D. Kinneman, Chief
Research Development, and Decommissioning Section
Division of Radiation Safety and Safeguards
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

SUBJECT: PROPOSED CONFIRMATORY SURVEY PLAN FOR BUILDINGS 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, 12 AND THE HYDROGEN FACILITY, WESTINGHOUSE ELECTRIC CORPORATION, LARGE, PA

Dear Mr. Kinneman:

Enclosed is a copy of the subject document for review and comment. The on-site activities are scheduled for August 30 through September 2, 1993, therefore, please provide comments by August 26, 1993 to ensure meeting this schedule. The scope of this proposed survey is reduced from that typically associated with the confirmatory process due to:

a) Survey of the Monitored Drain Line is limited to confirmatory samples analyses because it has been backfilled and covered with concrete. Any sampling at this time would result in significant increase in costs.

b) Many of the areas surveyed by the licensee are presently occupied and/or inaccessible to survey (e.g., new carpeting, equipment, etc.).

c) The majority of the facility has very low potential for contamination.

Please provide your comments and/or suggestions regarding the content and scope of this survey plan to me at (615) 576-3740 or Michele Landis at (615) 576-2908.

Sincerely,

Eric W. Abelquist

Eric W. Abelquist
Project Leader
Environmental Survey and
Site Assessment Program

EA:dc

Enclosure

cc: T. Mo, NRC/NMSS, 4E4
D. Tinktinsky, NRC/NMSS, 6H3
J. Swift, NRC/NMSS, 6H3
M. Roberts, NRC/Region I
M. Landis, ORISE/ESSAP
J. Berger, ORISE/ESSAP
A. Payne, ORISE/ESSAP
PMDA, 6E6
File/233

"OFFICIAL RECORD COPY"
ML 10

P. O. BOX 117, OAK RIDGE, TENNESSEE 37831-0117

Managed and operated by Oak Ridge Associated Universities for the U.S. Department of Energy

PROPOSED CONFIRMATORY SURVEY PLAN FOR BUILDINGS 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, 12 AND THE HYDROGEN FACILITY WESTINGHOUSE ELECTRIC CORPORATION LARGE, PENNSYLVANIA

SITE HISTORY AND DESCRIPTION

The Westinghouse Electric Corporation established the Astronuclear Laboratory in 1959 as part of the NERVA (Nuclear Engine for Rocket Vehicle Application) program and by late 1961, the program was moved to the Large Site where operations continued until the late 1960's. By 1972, this work had been completed and the process areas had been decommissioned. The fuel for this program was highly enriched uranium and this project represents the major use of radioactive material on the site.

Other programs that used radioactive material at the Large Site included SNAP 23A Isotope Powered Generation System (encapsulated Sr-90), Artificial Heart-Blood Pump (encapsulated Pu-238), and Heat Source Demonstration Project (encapsulated Co-60).

During the late 1970's through the 1980's, use of radioactive material on the site was very limited. In 1991, the decision was made to terminate the Nuclear Regulatory Commission (NRC) license (number SNM-951) on the site. Initial decommissioning efforts were directed towards the removal of the Monitored Drain Line System and this effort was successfully completed by late 1991. Following removal of the monitored drain line system, the trenches were backfilled and covered with concrete. Preliminary surveys of the buildings were conducted in early 1992 and the final survey of the buildings and site grounds was completed in June 1993.

Prepared by the Environmental Survey and Site Assessment Program, Energy/Environment Systems Division, Oak Ridge Institute for Science and Education, under interagency agreement (NRC Fin. No. A-9076) between the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy.

The Westinghouse Site is located in Large, Pennsylvania. Pennsylvania State Route 51 runs along the south side of the site. Two streams, Lewis Run and Peters Creek, run along the edge of the Large Site and join just south of the site. Peters Creek flows northward along the eastern side of the site. There are two storm sewer outfalls from the site into this creek. Lewis Run flows eastward along the southern side of the site and one storm sewer outfall from the site empties into this stream. The site is generally level with a slight downward slope towards Peters Creek. Behind the buildings is a steep embankment which rises well above the height of all the buildings.

Buildings 5, 5A, 6, 6A, 7, 8, 8A, and 9 are all interconnected and have been used for various operations throughout their history. The surveyed buildings constitute approximately 25,000 m^2 of floor space and the area of the site grounds included in the survey is approximately 50,000 m^2. A storm drain system, consisting of a long catch basin that spans the width of each building, runs beneath Buildings 5, 6, and 8. Most of the buildings are occupied and not all of the building areas are accessible to survey.

The Nuclear Regulatory Commission, Region I Office, has requested that the Environmental Survey and Site Assessment Program (ESSAP) of Oak Ridge Institute for Science and Education (ORISE) perform an independent confirmatory survey of the Westinghouse Large Site.

OBJECTIVES

The objectives of the confirmatory process are to provide independent document reviews and radiological data, for use by the NRC in evaluating the adequacy of the licensee's radiological status report, relative to established guidelines.

RESPONSIBILITY

Work described in this survey plan will be performed under the direction of Michele Landis, Project Manager and Eric Abelquist, Project Leader with ESSAP. The cognizant site supervisor has the authority to make appropriate changes to the survey procedures as deemed necessary.

After consultation with the NRC site representative, the scope of the survey may be altered based on findings as the survey progresses.

DOCUMENT REVIEW

ESSAP has reviewed the licensee's radiological survey data. Procedures and methods utilized by the licensee were reviewed for adequacy and appropriateness. The data were reviewed for accuracy, completeness and compliance with guidelines.[1,2]

PROCEDURES

Survey activities will be conducted in accordance with the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals. Specific survey procedures applicable to this survey are listed on Pages 7-9 of this survey plan. Deviations to the survey plan or procedures will be documented in the site log book.

SURVEY PROCEDURES: INTERIOR

General

The major emphasis of this survey will be on remediated areas and the building locations that have a history of unencapsulated radioactive materials use. Areas where historical information indicates that only sealed sources or no radioactive material had been used will be surveyed to a lesser extent. The extent of survey coverage may vary for each location, depending on survey findings, the licensee's data, and the operational history of the particular area. The remediated areas include the monitored drain line system, pipe chases in the floor of the first floor level of Building 9, and a portion of the storm sewer systems located beneath the process buildings.

Reference Grid

The reference grid systems established by the licensee will be utilized, when appropriate. Measurement and sampling locations on ungridded surfaces will be referenced using the licensee's identification system.

Surface Scans

Floor and lower wall surface scans will be performed using NaI scintillation and large-area gas proportional detectors. Scan of areas not accessible with the large area detectors will be performed using thin-window GM and ZnS scintillation hand-held detectors. A 100% scan of the floor and 25-50% scan of the lower wall surfaces in the remediated and unencapsulated radioactive materials use areas will be performed. Particular attention will be given to cracks and joints in the floor and walls, ledges, ducts, drains, and other locations where material may have accumulated. All detectors will be coupled to count rate meters or ratemeter-scalers with audible indicators. Locations of elevated direct radiation will be identified for further investigation.

Surface Activity Measurements

Direct measurements for total alpha and beta activity will be performed using ZnS scintillation and thin-window GM detectors, coupled with portable ratemeter-scalers. The frequency of these direct measurements in the remediated areas will be approximately one measurement per 30 m^2 area. Additional direct measurements will be performed at accessible storm drain catch basins, pipe chases, and at locations of elevated direct radiation, identified by surface scans.

Smear samples, for determining removable activity levels, will be collected from each direct measurement location.

Exposure Rate Measurements

Background exposure rates will be determined for the building interiors at a minimum of 6 locations of similar construction but without a history of radioactive materials use, using a pressurized ionization chamber (PIC). A minimum of two exposure rate measurements will be performed on every floor of each building and at locations of elevated gamma radiation, as identified by scans.

Miscellaneous Sampling

A minimum of twenty soil samples will be selected at random from the licensee's archived soil samples from the monitored drain line system remediation. At least two samples will be selected from the area where the monitored drain line went uphill and was pressurized.

At least one sediment sample will be collected from a storm drain outfall to one of the two adjacent streams. Residues may be collected from cracks, ledges, piping, ducts, and drains.

SURVEY PROCEDURES: EXTERIOR

Reference Grid

The reference grid systems established by the licensee will be utilized. Measurement locations on ungridded surfaces will be referenced to prominent site features or the existing grid.

Surface Scans

Exterior surfaces, including building rooftops, will be scanned using NaI scintillation detectors. Paved surfaces may also be scanned with a large-area gas proportional detector. Locations of elevated direct radiation will be identified for further investigation.

Exposure Rate Measurements

Exposure rates at 1 m above surface will be measured at a minimum of six locations using a PIC.

Soil Sampling

A minimum of six soil samples will be collected from randomly selected outdoor areas, including the storage area for radioactive waste drums. Background soil samples will be collected from a minimum of 6 off-site locations within a 0.5 to 10 km radius of the site.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and data will be returned to ORISE's ESSAP laboratory in Oak Ridge, TN for analysis and interpretation. Direct measurements for surface activity will be converted to units of disintegrations per minute per 100 cm^2 (dpm/100 cm^2). Smears will be analyzed for gross alpha and gross beta activity using a low background gas proportional counter, and the results will be converted to units of disintegrations per minute per 100 cm^2 (dpm/100 cm^2). Soil and any miscellaneous samples will be analyzed by gamma spectrometry and/or alpha spectrometry. The radionuclides of interest are U-235 and U-238; however, spectra will be reviewed for other identifiable photopeaks. Gamma spectrometry data will be reported in pCi/g. Exposure rates will be reported in μR/h. The data generated will be compared with the licensee's documentation and NRC guidelines established for release to unrestricted use. Results will be presented in a report and provided to the NRC.

GUIDELINES

The primary contaminant of concern for this site is enriched uranium. The applicable NRC guidelines for uranium surface activity levels are:[3]

5,000 dpm α/100 cm^2 total, averaged over a 1 m^2 area
15,000 dpm α/100 cm^2, total, maximum in a 100 cm^2 area
1,000 dpm α/100 cm^2, removable activity

Enriched uranium emits both alpha and beta radiation in varying proportions depending on the quantity of U-235 enrichment. Since rough or dirty surfaces may attenuate alpha radiation, both alpha and beta surface scans and measurements will be performed on the surfaces. The applicable soil concentration guideline for enriched uranium is 30 pCi/g.[4] The exposure rate guideline is 5 μR/h, above background.[5]

TENTATIVE SCHEDULE

Measurement and Sampling	August 30 - September 2, 1993
Sample Analysis/Interim Report	September 1993
Draft Report	October 1993

LIST OF CURRENT PROCEDURES

Applicable procedures from the ORISE ESSAP Survey Procedures Manual (Revision 7; May 31, 1992) include:

Section 5.0 Instrument Calibration and Operational Check-Out
- 5.1 General Information
- 5.2 Electronic Calibration of Ratemeters
- 5.3 Gamma Scintillation Detector Check-Out and Cross-Calibration
- 5.4 Alpha Scintillation Detector Calibration and Check-Out

- 5.5 GM Detector Calibration and Check-Out
- 5.6 Proportional Detector Calibration and Check-Out
- 5.7 Pressurized Ionization Chamber Calibration and Check-Out
- 5.9 Floor Monitor Check-Out
- 5.13 Field Measuring Tape Calibration

Section 6.0 Site Preparation

- 6.2 Reference Grid System

Section 7.0 Scanning and Measurement Techniques

- 7.1 Surface Scanning
- 7.3 Alpha Radiation Measurement
- 7.4 Beta Radiation Measurement
- 7.5 Gamma Radiation (Exposure Rate) Measurement

Section 8.0 Sampling Procedures

- 8.1 Surface Soil Sampling
- 8.2 Subsurface Soil Sampling
- 8.7 Determination of Removable Activity
- 8.8 Miscellaneous Sampling
- 8.9 Sample Identification Labeling

Section 9.0 Integrated Survey Procedures

- 9.1 Background Measurements and Baseline Sampling
- 9.2 General Survey Approaches and Strategies

Section 10.0 Health and Safety Control of Cross Contamination

Section 11.0 Quality Assurance and Quality Control

Applicable procedures from the ORISE/ESSAP Quality Assurance Manual (Revision 6; July 30, 1993) include:

Section 5	Training and Certification
Section 6	Equipment and Instrumentation
Section 7	Quality Control
Section 8	Sample Chain-of-Custody
Section 9	Data Management
Section 10	Data Review and Validation
Section 11	Records Handling and Storage

REFERENCES

1. Oak Ridge Institute for Science and Education, Letter from M.R. Landis to J.D. Kinneman, Region I, U.S. NRC, "License Termination Reports #002, #004, #007, and #009 for Westinghouse Electric Corporation, Large, PA", July 23, 1993.

2. Oak Ridge Institute for Science and Education, Letter from A.J. Ansari to J.D. Kinneman, Region I, U.S. NRC, "Additional Comment - License Termination Reports for Westinghouse Electric Corporation, Large, PA", August 3, 1993.

3. U.S. Nuclear Regulatory Commission, Division of Fuel Cycle and Material Safety, Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material, Washington, D.C., August 1987.

4. U.S. Nuclear Regulatory Commission, Disposal or Onsite Storage Thorium and Uranium Wastes from Past Operations, Washington, D.C., October 23, 1991.

5. U.S. Nuclear Regulatory Commission, Office of Nuclear Safety and Safeguards, Review Plan: Evaluating Decommissioning Plans for Licensees Under 10 CFR Parts 30, 40, and 70, Washington, D.C., 1991.

APPENDIX A
COST ESTIMATE
PROPOSED CONFIRMATORY SURVEY PLAN FOR BUILDINGS 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, 12 AND THE HYDROGEN FACILITY
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

Survey Preparation - $9.4 K

Survey preparation includes the following activities: Document reviews, preliminary site visit, survey plan, the cost and time estimates, and trip planning and preparation (equipment calibration and packing).

On-Site Activities - $13.0 K

On-site activities will include 12 man-days at the site performing the following: surface scans, surface activity measurements, smear sampling, soil and miscellaneous sampling, and exposure rate measurements. The on-site expenses also include unpacking equipment and logging in samples upon return to Oak Ridge, TN.

Travel - $11.6 K

Travel expenses include, transportation to and from the site (airlines, government and rental vehicles), hotel expenses, and per diem.

Samples Analysis - $5.1 K

Includes analyses of smears for gross alpha and beta activity, and alpha and gamma spectrometry analysis of soil samples.

Report Preparation - $8.1 K

The report preparation will include the following activities: tabulation of data, illustrations, writing and reviewing the draft and final reports, word processing and reproduction.

Total Cost Estimate - $47.2 K

Estimates are for survey activities described in this survey plan. Reduction or increase in the scope of the survey would result in changes in the original estimate in the "on-site activities" and "sample analysis" categories. Major changes to the scope of the survey, if necessary, will be made only after consultation with the NRC site representative.

AUG 23 1993

Docket No. 070-00997 License No. SNM-951

Westinghouse Electric Corporation
ATTN: A. Joseph Nardi
Manager, Regulatory Services
Post Office Box 355
Pittsburgh, Pennsylvania 15230

Dear Mr. Nardi:

SUBJECT: Large, Pennsylvania

As we have discussed regarding the Westinghouse, Large, Pennsylvania site, we understand that it is your intent to: (1) complete the decommissioning and decontamination of that facility; (2) request that the entire facility be released for unrestricted use; and (3) request that license SNM-951 be terminated.

The review of your request to release the Large, Pennsylvania site for unrestricted use will include technical review by NRC staff and confirmatory surveys by an NRC contractor, Oak Ridge Institute for Science and Environment (ORISE). In accordance with 10 CFR Part 170, licensing actions and inspections of licenses authorizing decommissioning, decontamination, reclamation, or site restoration activities will be charged the full Nuclear Regulatory Commission (NRC) cost of such reviews. The costs of the review include both the costs associated with that survey and the charges for NRC staff time.

The process for conducting a confirmatory survey utilizing ORISE includes: (1) NRC identification of the need for a contractor survey; (2) ORISE review of relevant documentation on the site; (3) an ORISE site visit; (4) ORISE preparation of a survey plan; (5) NRC review, modification (if needed), and approval of the plan; (6) ORISE execution of the survey and preparation of a draft report, and NRC review and comment; (7) revision and NRC issuance of the report to the licensee.

During the survey phase, NRC and ORISE are in close contact, so that survey findings can be quickly evaluated and the survey effort modified, as necessary. The purpose of this independent survey is to help evaluate whether your survey accurately reflects the conditions of the facility and to provide additional documentation that the facility meets current criteria for release for unrestricted use.

ML 10

The NRC objective is to obtain a satisfactory confirmatory survey at the lowest possible cost. Your willingness to provide ORISE access to the facility and provide such equipment as may be required should contribute to a reduction in the billed cost for this work.

We will finalize the schedule for the survey of the Large, Pennsylvania site as soon as we have negotiated an acceptable survey plan with ORISE.

Your cooperation in this matter is appreciated.

Sincerely,

Original Signed By:

John D. Kinneman, Chief
Research, Development and
Decommissioning Section
Division of Radiation Safety
and Safeguards

bcc:
T. Mo, NMSS
D. Tiktinsky, NMSS

DRSS:RI	DRSS:RI
Oberg/smh	Kinneman
08/3/93	08/17/93

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION
ENERGY/ENVIRONMENT SYSTEMS DIVISION

August 24, 1993

John D. Kinneman, Chief
Research Development, and
 Decommissioning Section
Division of Radiation Safety
 and Safeguards
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

SUBJECT: ADDITIONAL COMMENT - LICENSE TERMINATION REPORTS FOR WESTINGHOUSE ELECTRIC CORPORATION, LARGE, PA

Dear Mr. Kinneman:

ESSAP has reviewed the subject documents and offers the attached information for your consideration. If you have any questions or comments, please direct them to me at (615) 576-3740 or Michele Landis at (615) 576-2908.

Sincerely,

for EWA

Eric W. Abelquist
Project Leader
Environmental Survey and
 Site Assessment Program

EWA:ttc

Attachment

cc: T. Mo, NRC/NMSS, 4E4
D. Tiktinsky, NRC/NMSS, 6H3
J. Swift, NRC/NMSS, 6H3
M. Roberts, NRC/Region I
J. Berger, ORISE/ESSAP
M. Landis, ORISE/ESSAP
PMDA, 6E6
File/233

"OFFICIAL RECORD COPY"

P. O. BOX 117, OAK RIDGE, TENNESSEE 37831-0117
Managed and operated by Oak Ridge Associated Universities for the U.S. Department of Energy

ML 10

As described in Appendix A of License Termination Report #042, the licensee provided information on the manner in which the total alpha and total beta activity were determined:

> *"This measurement was made by integrating the counts from the Ludlum Floor Monitor for a period of one minute with the instrument held stationary at the survey point location."* *(p.3)*

The active surface area of the detector is reported as 434 cm^2, with a beta detection efficiency of 0.303 counts per disintegration. ESSAP questions the appropriateness of using the described floor monitor to demonstrate compliance with the maximum allowable contamination guidelines (i.e., for uranium, 15,000 dpm/100 cm^2 applied to an area of not more than 100 cm^2). The activity of small areas of contamination, i.e., areas less than 100 cm^2, may be underestimated by using the floor monitor to perform direct measurements.

The following hypothetical example is offered for clarification:

Given:
Area of contamination = 100 cm^2,
Beta background radiation = 1525 cpm,
Gross beta radiation at survey point = 8000 counts, and
Survey location count time = 1 min

Total beta activity using licensee's calculational model:

$$\frac{dpm}{100cm^2} = \left(\frac{8000 - 1525}{0.303}\right)\left(\frac{100}{434}\right) = 4900.$$

For this example, the actual surface contamination level is underestimated due to the "over-averaging" effect of the large area detector. The maximum contamination guideline applies to an area of not more than 100 cm^2 and averaging the contamination over a larger area is not in compliance with the surface contamination guidelines. The contamination level in this example should be calculated (if the floor monitor is to be used to perform direct measurements):

$$\frac{dpm}{100cm^2} = \left(\frac{8000 - 1525}{0.303}\right)\left(\frac{100}{100}\right) = 21,000.$$

ESSAP recognizes that the gross beta radiation levels may not have approached the value used in the above example. However, the calculational model used by the licensee to report total alpha and total beta activity from floor monitor direct measurements may not reflect the conditions at the site or demonstrate compliance with the guidelines.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406

AUG 25 1993

License No. SNM-951 Docket No. 070-00997

Oak Ridge Institute for
Science and Education
Environmental Survey and Site
Assessment Program
ATTN: Michele Landis
Project Manager
P. O. Box 117
Oak Ridge, Tennessee 37831-0117

Dear Ms. Landis:

Subject: Proposed Confirmatory Survey Plan for Westinghouse Electric Corporation, Large, Pennsylvania

We have reviewed the subject document dated August 19, 1993, and found it to be thorough and complete. We do, however, have some additional items that we would like incorporated into the plan. These are as follows:

1. Analysis of soil from beneath the pit behind Building No. 5, samples #444 and #447 (Westinghouse Electric Corporation (W), Large Site Archive Sample Nos. 92-2809 and 92-2812), including alpha spectrometry.

2. Analysis of soil from beneath overflow drain line from the pit behind Building No. 5, sample #468 (W, Large Site Archive Sample No. 92-2842), including alpha spectrometry.

3. Analysis of MDL soil samples #20-14-20, #169-15-66, #244-16-175, #388-20-124, and #417-25-04 (W, Large Site Archive Sample Nos., respectively, 92-1408, 92-1645, 92-1945, 92-2418, and 92-2653);

4. Collection and analysis of at least one sludge sample from the storm drain system catch basins (vaults) beneath buildings 5, 6, and 8.

5. Collection and analysis of a soil sample from location No. 7 in the east parking lot area where packaged radioactive waste was staged.

We understand that this will increase the cost of the confirmatory survey, but we believe that these samples are necessary to assist in the verification of the licensee's remedial action and closeout survey. If you are willing to add these items, this letter constitutes our approval and acceptance of the plan.

"OFFICIAL RECORD COPY"

ML 10

We have informed Westinghouse representatives, that ORISE will conduct the confirmatory survey between August 30 and September 2, 1993. They will be available to provide assistance and make available reports, archive samples and information for your use. M. Roberts and T. Oberg, from this office, will visit the site during the survey.

Thank you for your cooperation and assistance.

Sincerely,

John D. Kinneman, Chief
Research, Development, and
Decommissioning Section
Division of Radiation Safety
and Safeguards

cc:
Eric W. Abelquist, ORISE/ESSAP
D. Tinktinsky, NMSS
T. Mo, NMSS

bcc:
Region I Docket Room
M. C. Roberts, RI
C. T. Oberg, RI

NOV 1 8 1993

License No. SNM-951
Docket No. 070-00997
Control No. 117646

Oak Ridge Institute for Science and Education
Environmental Survey and Site Assessment Program
Attn: Eric W. Abelquist
Project Leader
P. O. Box 117
Oak Ridge, Tennessee 37831-0117

Dear Dr. Abelquist:

Subject: COMMENTS ON THE DRAFT REPORT - CONFIRMATORY SURVEY OF BUILDINGS 5, 5A, 6, 6A, 7, 8, 8A, 9, 11 AND 12, WESTINGHOUSE ELECTRIC CORPORATION, LARGE, PENNSYLVANIA

Thank you for the Draft Report -- Confirmatory Survey of Buildings 5, 5A, 6, 6A, 7, 8, 8A, 9, 11 And 12, Westinghouse Electric Corporation, Large, Pennsylvania. Comments from the Region I staff are marked on the enclosed copy of the report.

We would appreciate the prompt preparation of the final report so that we can complete our actions on the license. Please let our office know when a final report is expected. Please contact Mark Roberts of my staff at (215) 337-5094 if you have any questions concerning our comments.

Thank you for your assistance and cooperation in this matter.

Sincerely,

Original Signed By:

John D. Kinneman, Chief
Site Decommissioning Section
Division of Radiation Safety
and Safeguards

Enclosure:
Copy of Draft Confirmatory Survey Report
with NRC Region I Comments

OFFICIAL RECORD COPY

ML 10

cc w/o encl:
Michelle Landis, ORISE, ESSAP
James Berger, ORISE, ESSAP

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

ENERGY/ENVIRONMENT SYSTEMS DIVISION

December 15, 1993

John D. Kinneman, Chief
Site Decommissioning Section
Division of Radiation Safety and Safeguards
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

SUBJECT: **FINAL REPORT—CONFIRMATORY SURVEY OF BUILDINGS 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, AND 12, WESTINGHOUSE ELECTRIC CORPORATION, LARGE, PA [DOCKET NO. 70-997]**

Dear Mr. Kinneman:

Enclosed are five bound copies of the subject document. Please direct any questions that you may have to me at (615) 576-3740 or Michele Landis at (615) 576-2908.

Sincerely,

Eric W. Abelquist

Eric W. Abelquist
Project Leader
Environmental Survey and
Site Assessment Program

EA:rde

Enclosure

cc:
T. Mo, NRC/NMSS, 4E4
D. Tiktinsky, NRC/NMSS, 6E6
J. Swift, NRC/NMSS, 6H3
M. Roberts, NRC/Region I
M. Landis, ORISE/ESSAP
J. Berger, ORISE/ESSAP
PMDA
File/233

ML 10

"OFFICIAL RECORD COPY"

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION
ENERGY/ENVIRONMENT SYSTEMS DIVISION

November 23, 1993

John D. Kinneman, Chief
Site Decommissioning Section
Division of Radiation Safety and Safeguards
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406-1415

SUBJECT: **FINAL REPORT—CONFIRMATORY SURVEY OF BUILDINGS 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, AND 12, WESTINGHOUSE ELECTRIC CORPORATION, LARGE, PA [DOCKET NO. 70-997]**

Dear Mr. Kinneman:

Enclosed are two unbound copies of the subject document. Comments from the Region I staff have been incorporated into the final report. Bound copies of the subject report will be sent to you in approximately two weeks.

Please direct any questions that you may have to me at (615) 576-3740 or Michele Landis at (615) 576-2908.

Sincerely,

Eric W. Abelquist

Eric W. Abelquist
Project Leader
Environmental Survey and
Site Assessment Program

EA:rde

Enclosure

J.P.C.

cc: T. Mo, NRC,NMSS 4F4
D. Tiktinsky, NRC/NMSS, 6E6
J. Swift, NRC/NMSS, 6H3
M. Roberts, NRC/Region I
M. Landis, ORISE/ESSAP
J. Berger, ORISE/ESSAP
PMDA
File/233

"OFFICIAL RECORD COPY"

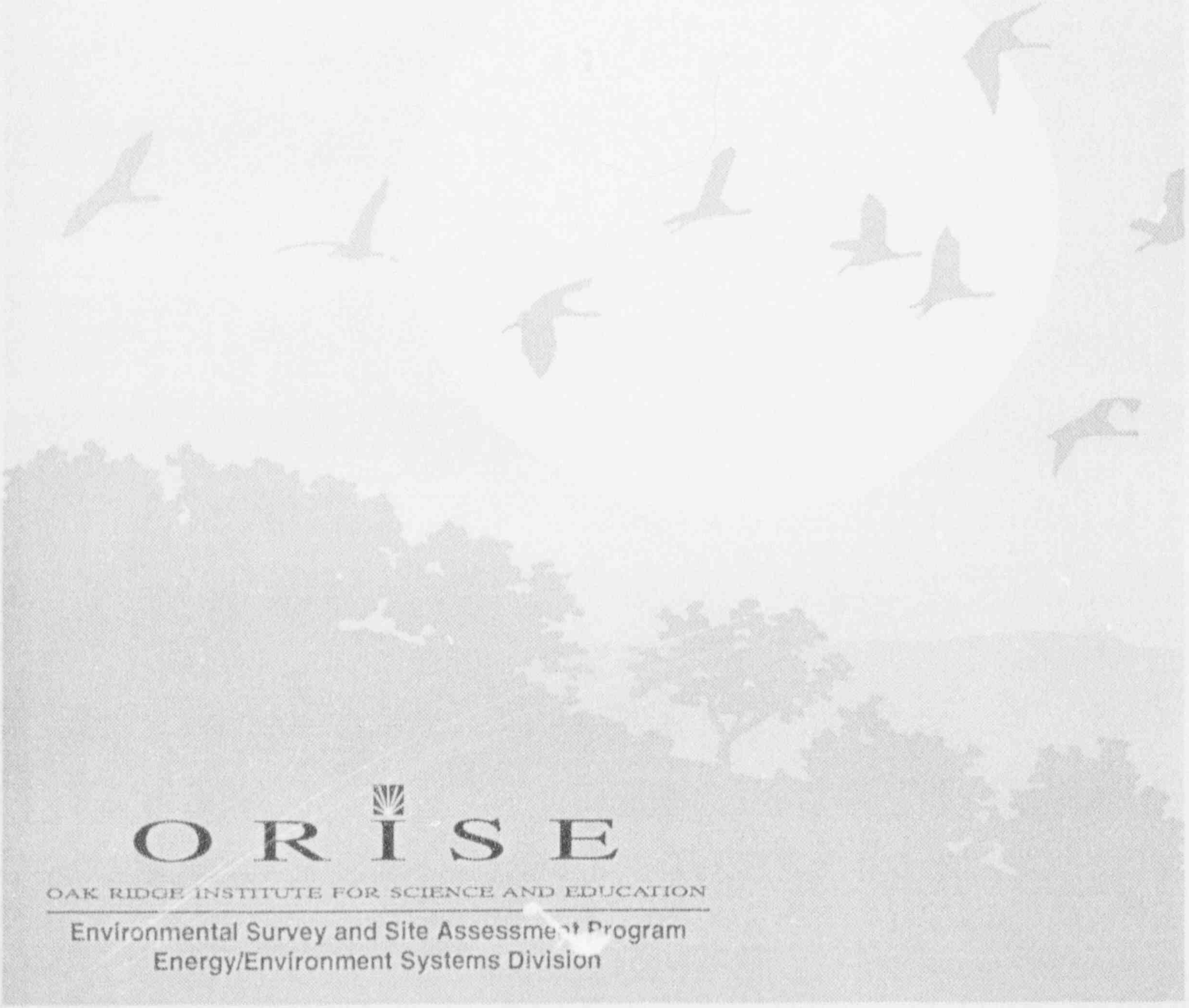
ML 10

CONFIRMATORY SURVEY OF BUILDINGS 5,5A,6,6A,7,8,8A,9,11, AND 12 WESTINGHOUSE ELECTRIC CORPORATION LARGE, PENNSYLVANIA

[DOCKET 70-997]

E. W. ABELQUIST

Prepared for the
U.S. Nuclear Regulatory Commission
Region I Office



ORISE

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

Environmental Survey and Site Assessment Program
Energy/Environment Systems Division

CONFIRMATORY SURVEY
OF BUILDINGS 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, AND 12
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

Prepared by

E. W. Abelquist

Environmental Survey and Site Assessment Program
Energy/Environment System Division
Oak Ridge Institute for Science and Education
Oak Ridge, Tennessee 37831-0117

Prepared for the

U.S. Nuclear Regulatory Commission
Region I Office

Sponsored by the

Office of Nuclear Materials Safety and Safeguards

NOVEMBER 1993

FINAL REPORT

This report is based on work performed under an Interagency Agreement (NRC Fin. No. A-9076) between the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy. Oak Ridge Institute for Science and Education performs complementary work under contract number DE-AC05-76OR00033 with the U.S. Department of Energy.

CONFIRMATORY SURVEY OF BUILDINGS 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, AND 12 WESTINGHOUSE ELECTRIC CORPORATION LARGE, PENNSYLVANIA

Prepared by: Eric W. Abelquist Date: 11/23/93
E. W. Abelquist, Project Leader
Environmental Survey and Site Assessment Program

Reviewed by: WLBeck Date: 11/23/93
W. L. Beck, Acting Laboratory Manager
Environmental Survey and Site Assessment Program

Reviewed by: Michele R. Landis Date: 11/23/93
M. R. Landis, Project Manager
Environmental Survey and Site Assessment Program

Reviewed by: Ann T. Payne Date: 11/23/93
A. T. Payne, Quality Assurance Officer
Environmental Survey and Site Assessment Program

Reviewed by: James D. Berger Date: 11/23/93
J. D. Berger, Program Director
Environmental Survey and Site Assessment Program

ACKNOWLEDGEMENTS

The author would like to acknowledge the significant contributions of the following staff members:

FIELD STAFF

A. J. Ansari
E. H. Bjelland
G. R. Foltz

LABORATORY STAFF

R. D. Condra
J. S. Cox
R. L. Epperson
M. J. Laudeman
S. T. Shipley

CLERICAL STAFF

T. T. Claiborne
D. A. Cox
R. D. Ellis
K. E. Waters

ILLUSTRATORS

T. D. Herrera
E. A. Powell

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES (continued)

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

ASME	American Society of Mechanical Engineers
cm	centimeter
cm^2	square centimeter
cpm	counts per minute
dpm/100 cm^2	disintegrations per minute/100 square centimeters
EML	Environmental Measurement Laboratory
EPA	Environmental Protection Agency
ESSAP	Environmental Survey and Site Assessment Program
ft	foot
GM	Geiger-Mueller
km	kilometer
m	meter
m^2	square meter
MDA	minimum detectable activity
MDL	Monitored Drain Line
NaI	sodium iodide
NERVA	Nuclear Engine for Rocket Vehicle Application
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
ORISE	Oak Ridge Institute for Science and Education
pCi/g	picocuries per gram
PIC	Pressurized Ionization Chamber
SNAP	Space Nuclear Advanced Propulsion
μR/h	microroentgen per hour
ZnS	zinc sulfide

CONFIRMATORY SURVEY
OF BUILDINGS 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, AND 12
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

INTRODUCTION AND SITE HISTORY

The Westinghouse Electric Corporation established the Astronuclear Laboratory in 1959 as part of the NERVA (Nuclear Engine for Rocket Vehicle Application) program, and, by late 1961, the program was moved to the Large Site, where operations continued until the late 1960's. By 1972, this work had been completed and the process areas had been decontaminated. The fuel for this program was highly enriched uranium (93% U-235, by weight) and this project represents the major use of radioactive material on the site.

Other programs that used radioactive material at the Large Site include the SNAP 23A Isotope Powered Generation System (encapsulated Sr-90), the Artificial Heart-Blood Pump (encapsulated Pu-238), and the Heat Source Demonstration Project (encapsulated Co-60).

During the late 1970's through the 1980's, use of radioactive material on the site was very limited. In 1991, the decision was made to terminate the Nuclear Regulatory Commission (NRC) License No. SNM-951 [Docket No. 70-997] on the site. Initial decommissioning efforts were directed towards the removal of the Monitored Drain Line (MDL) system and this effort was successfully completed by late 1991. Following removal of the Monitored Drain Line system, the trenches were backfilled and covered as appropriate. Preliminary surveys of the buildings were conducted in early 1992 and the final survey of the buildings and site grounds was completed in June 1993.

The results of the licensee's final radiological survey were submitted to the NRC from January through July 1993 as surveys were completed for a given section of the facility. At the request of the NRC's Region I Office, the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute of Science and Education (ORISE) conducted an independent confirmatory survey of Buildings 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, and 12 and outdoor areas, during the period of August 30 through September 2, 1993. This report summarizes the procedures and results of the survey.

SITE DESCRIPTION

The Westinghouse Site is located in Large, Pennsylvania (Figure 1). Pennsylvania State Route 51 runs along the south side of the site. Two streams, Lewis Run and Peters Creek, run along the edge of the Large Site and join just south of the site. Peters Creek flows northward along the eastern side of the site. There are two storm sewer outfalls from the site into this creek. Lewis Run flows eastward along the southern side of the site and one storm sewer outfall from the site empties into this stream. The site is generally level with a slight downward slope towards Peters Creek. Behind the buildings is a steep embankment which rises well above the height of all the buildings.

Buildings 5, 5A, 6, 6A, 7, 8, 8A, and 9 (Figure 2) are all interconnected and have been used for various operations throughout their history. Building 11 is located south of Building 5 and there has been no known use of radioactive material in this building. Building 12 is adjacent to Building 5A and is currently being used as a machine shop. The surveyed buildings constitute approximately 25,000 m^2 of floor space and the area of the site grounds included in the survey is approximately 50,000 m^2. A storm drain system, consisting of a long catch basin that spans the width of each building, runs beneath Buildings 5, 6, and 8. The first floor of Building 9 contains a system of concrete trenches (pipe chases) in the floor covered by steel plates. These pipe chases contained various service and process piping lines, including the MDL piping for the building. Most of the buildings are occupied and not all of the building areas were accessible to survey.

OBJECTIVE

The objective of the confirmatory survey is to provide independent document reviews and radiological data for use by the NRC in evaluating the adequacy and accuracy of the licensee's radiological status report relative to established guidelines.

DOCUMENT REVIEW

ESSAP reviewed the licensee's documentation associated with the decommissioning survey and analytical procedures and methods utilized by the licensee were reviewed for adequacy and appropriateness.[1] The post-remedial action data were reviewed for accuracy and completeness.

PROCEDURES

During the period from August 30 through September 2, 1993, ESSAP performed a confirmatory survey of Buildings 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, and 12 and the outdoor areas. The survey was conducted in accordance with a survey plan that was submitted to and approved by the NRC, Region I Office.[2] The hydrogen facility was not surveyed because it had been demolished and paved over prior to ESSAP's arrival. The survey of outdoor areas included the main storm drain catch basin (east parking lot), storm drain outfall to Peters Creek, and areas adjacent to the fenceline that surrounds the site.

INTERIOR

ESSAP used the following procedures for the interior portions of the survey.

Reference Grid

The existing 1 m^2 reference grid established by the licensee was used by ESSAP for survey reference. The licensee's reference system included (1) a section identifier that specifically located the survey area by building and floor, and (2) survey unit and subunit identifiers that specified a particular room or building area. The point of origin for floors and ceilings was the northwest corner of the surface and the upper left corner for walls. The survey point locations were measured from the point of origin and given X and Y dimensions (in meters) with the same signs as the standard Cartesian coordinate system (e.g., typical survey point locations were positive in the X direction and negative in the Y direction).

The measurement and sampling locations for the Monitored Drain Line system and pipe chases were consistently numbered by defining the zero point to be the north or east end of that section. Distances (in meters) were then measured from that point towards the south or west as appropriate.

Surface Scans

Floor and lower wall surfaces were scanned for alpha, beta, and gamma activity using large-area gas proportional and NaI scintillation detectors. A 100% floor scan was performed on the first floors of Buildings 5, 6, 6A, 7, 8A, and 9 and the tank pit in Building 9. Scans of the pipe chases and other areas not accessible with the large-area detectors were performed using smaller hand-held detectors. All detectors were coupled to ratemeter-scalers or ratemeters with audible indicators. Locations of elevated direct radiation identified by surface scans were marked for further investigation.

Surface Activity Measurements

Measurements to determine total alpha and beta surface activity levels were performed on randomly selected grid locations on the floor and lower walls in each of the areas surveyed. Approximately 500 direct measurements were performed in the surveyed areas. Direct measurements were performed using ZnS scintillation and thin-window GM detectors, coupled to ratemeter-scalers. A smear sample for determining removable activity was obtained at each direct measurement location. Measurement and sampling locations for total and removable activity are illustrated in Figures 3 through 22.

Exposure Rate Measurements

Background exposure rate measurements at 1 m above the surface, were obtained from locations within Building 4 and the Firehouse. These buildings exhibit similar construction as the surveyed buildings and their site history indicates no use of radiological materials. Exposure rate measurements were performed at one meter above surfaces at 23 interior locations using a pressurized ionization chamber (PIC). Measurement locations are shown in Figures 3 through 22.

Miscellaneous Sampling

Twenty soil samples were selected for confirmatory analysis from those collected and archived by the licensee from the monitored drain line system remediation (Figure 23).

A smear sample was collected by passing cloth media through a section of pipe running between Buildings 6 and 6A. This pipe was from a section of the MDL that was left in place. A section of this pipe, approximately one foot long, was cut in half by the licensee and provided to ESSAP for survey measurements (i.e., direct measurements and smears).

EXTERIOR

ESSAP used the following procedures for outdoor portions of the survey area.

Reference Grid

ESSAP measurement and sampling locations were referenced to prominent site features and recorded on appropriate drawings.

Surface Scans

Surface scans of outdoor locations were performed using NaI scintillation detectors, coupled to ratemeters with audible indicators. Areas of elevated direct radiation, suggesting the presence of surface or near surface contamination, were marked for further investigation.

Exposure Rate Measurements

Background exposure rate measurements were made at 6 off-site locations within 0.5 to 10 km of the site using a PIC. Measurement locations are indicated on Figure 24.

Exposure rate measurements were performed at 1 meter above the surface at each soil sampling location using a PIC. Measurement locations are indicated on Figure 25.

Soil Sampling

Background soil samples were collected from 6 off-site locations within 0.5 to 10 km of the site. Measurement locations are indicated on Figure 24.

Surface soil (0-15 cm) samples were collected from 6 randomly selected locations around the site (Figure 25). Additionally, an archived soil sample was selected from the east parking lot area where packaged radioactive waste was staged.

Miscellaneous Sampling

Sediment samples were collected from the main storm drain outfall to Peters Creek and from the storm drain catch basin in the east parking lot. Sampling locations are shown in Figure 25.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ESSAP Oak Ridge laboratory for analyses and interpretation. Smears were analyzed for gross alpha and gross beta activity. Direct measurement and smear data were converted to units of disintegrations per minute per 100 cm^2 (dpm/100 cm^2), and exposure rate measurements were reported in microroentgens per hour (μR/h). Soil and miscellaneous samples were analyzed by gamma spectrometry and/or alpha spectrometry. Spectra were reviewed for U-235, U-238, and any other identifiable photopeaks. Soil sample results were reported in units of picocuries per gram (pCi/g). Additional information concerning major instrumentation, sampling equipment, and analytical procedures is provided in Appendices A and B. Results were compared to NRC guidelines which are provided in Appendix C.

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP reviewed the licensee's radiological survey data and comments were provided to the NRC.[3,4,5] The licensee provided the NRC with a response to those comments made in references 3 and 4. The ESSAP comments expressed in Reference 5 were forwarded to NRC Headquarters for resolution. In ESSAP's opinion, the licensee's documents provide an adequate description of the radiological condition of the facility relative to the NRC guidelines for release to unrestricted use.

INTERIOR

Surface Scans

Surface scans identified two locations of elevated direct radiation at the following locations: the floor on the first floor of Building 6 (13,000 beta dpm/100 cm^2) and adjacent to the pipe chase in Room 10-3-1 of Building 9 (23,000 beta dpm/100 cm^2). The licensee remediated each location by scabbling. ESSAP then performed post-remedial action scans and direct measurements to confirm the decontamination.

Surface Activity Levels

Results of total and removable surface activity levels are summarized in Table 1. Total activity measurements ranged from <69 dpm/100 cm^2 to 3000 dpm/100 cm^2 for alpha and <1400 dpm/100 cm^2 to 4800 dpm/100 cm^2 for beta. Grid block averages were determined for the two direct measurements within the pipe chases that exceeded 5000 dpm/100 cm^2 beta activity. The grid block averages for alpha were 260 and 1000 dpm/100 cm^2, and for beta activity were 2700 and 2900 dpm/100 cm^2. Removable activity ranged from <12 to 300 dpm/100 cm^2 for alpha and from <16 to 67 dpm/100 cm^2 for beta.

Exposure Rate Measurements

The background exposure rates averaged 9 μR/h.

Exposure rate measurements are summarized in Table 2. The measurements ranged from 7 μR/h to 13 μR/h.

Uranium Concentrations in Archived MDL Soil Samples

Concentrations of U-235, U-238, and total uranium measured by ESSAP in MDL soil samples (collected by the licensee and provided to ESSAP for confirmatory analysis) ranged from 0.1 to 2.3 pCi/g, 0.1 to 3.2 pCi/g, and 3.0 to 69.0 pCi/g, respectively (Table 3). Based on a paired comparison *t*-test, there are no statistically significant differences ($p = 0.6$) between the licensee's and the ESSAP gamma spectrometry data for U-235 (licensee U-238 concentrations were not available for all soil samples).

Four MDL soil samples were analyzed by alpha spectrometry to evaluate the appropriateness of the total-uranium-to-U-235 ratio established by the licensee (Table 4). The uranium activity in these samples was not sufficient to establish such a ratio. The ratio of total uranium to U-235 (30) established by the licensee appears to be a reasonable value in calculating total uranium concentrations based on knowledge of the material used and the ESSAP limited soil results.

Miscellaneous Samples

Results of gross alpha and gross beta activity on the smear taken from inside the section of pipe between Buildings 6 and 6A was <12 dpm/100 cm^2 for alpha and <16 dpm/100 cm^2 for beta.

Review of the gamma spectrometry data resulted in no identifiable photopeaks other than those from naturally occurring radionuclides.

Direct measurements on fragments removed from the pipe were <78 and <1400 cpm/100 cm^2, for alpha and beta activity, respectively. Removable activity on the pipe fragments was <12 dpm/100 cm^2 for alpha and <16 dpm/100 cm^2 for beta.

EXTERIOR

Surface Scans

Surface scans for gamma activity were within the range of ambient background levels.

Exposure Rate Measurements

Background exposure rates for outdoor areas ranged from 8 to 9 μR/h and averaged 9 μR/h (Table 5).

Exposure rate measurements for on-site outdoor areas are presented in Table 6. On-site exposure rates ranged from 9 to 11 μR/h.

Uranium Concentrations in Soil Samples

Total uranium concentration in background soil samples ranged from 2.4 to 4.8 pCi/g (Table 5).

Uranium concentrations in soil samples collected from around the site are presented in Table 7. Concentrations of U-235, U-238, and total uranium in samples collected from the site area ranged from 0.1 to 0.3 pCi/g, 1.1 to 2.9 pCi/g, and 3.0 to 9.0 pCi/g, respectively.

Miscellaneous Samples

The uranium concentrations in the two sediment samples were 1.2 pCi/g for U-238 for both samples, 0.2 to 0.4 pCi/g for U-235, and 6.0 and 12.0 pCi/g for total uranium. Since only two samples were collected, the results do not appear in a separate table.

COMPARISON OF RESULTS WITH GUIDELINES

The NRC guidelines for surface contamination and residual concentrations of radionuclides in soil, established for license termination or release of a facility for unrestricted use are presented in Appendix C. The primary contaminant of concern at this site is enriched uranium. The surface contamination guidelines for natural uranium, U-235, U-238 and associated decay products are:[6]

Total Activity

5,000 α dpm/100 cm^2, averaged over a 1 m^2 area

15,000 α dpm/100 cm^2, maximum in a 100 cm^2 area

Removable Activity

1,000 α dpm/100 cm^2

Surface activity measurements for total and removable activity in all interior areas surveyed were within these guidelines.

The soil concentration guideline for enriched uranium is 30 pCi/g above natural background.[7] With one exception (MDL pit behind Building 5, NW corner; 69.0 pCi/g), the uranium concentrations in soil samples collected were within this limit. This same soil sample was also analyzed by alpha spectrometry and determined to have a total uranium concentration of 21.3 pCi/g (Table 4). The reason for this difference is unknown; however, it is believed to be the result of incomplete sample homogenization prior to alpha spectroscopy analysis.

The NRC guideline for exposure rate at 1 m above the surface is 5 μR/h above background.[8] All interior and exterior exposure rates were within this limit.

SUMMARY

During the period August 30 through September 2, 1993, at the request of the NRC Region I Office, the Environmental Survey and Site Assessment Program of ORISE performed a confirmatory survey of Buildings 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, and 12 and outdoor areas at the Westinghouse Electric Corporation in Large, Pennsylvania. The interior survey activities consisted of surface scans of the floor and lower wall surfaces for alpha, beta, and gamma activity, measurements of total and removable activity, exposure rate measurements, soil and miscellaneous sampling. Exterior survey activities included gamma surface scans, exposure rate measurements, and soil and sediment sampling.

Total and removable surface activity measurements were all below the guideline values. Interior and exterior exposure rate measurements were all within the 5 μR/h above background criterion.

The total uranium concentration in soil and sediment samples, with one exception, was below the guideline value of 30 pCi/g. The total uranium concentration in the soil sample collected below the northwest corner of the MDL pit was determined to be 69.0 pCi/g by gamma spectrometry.

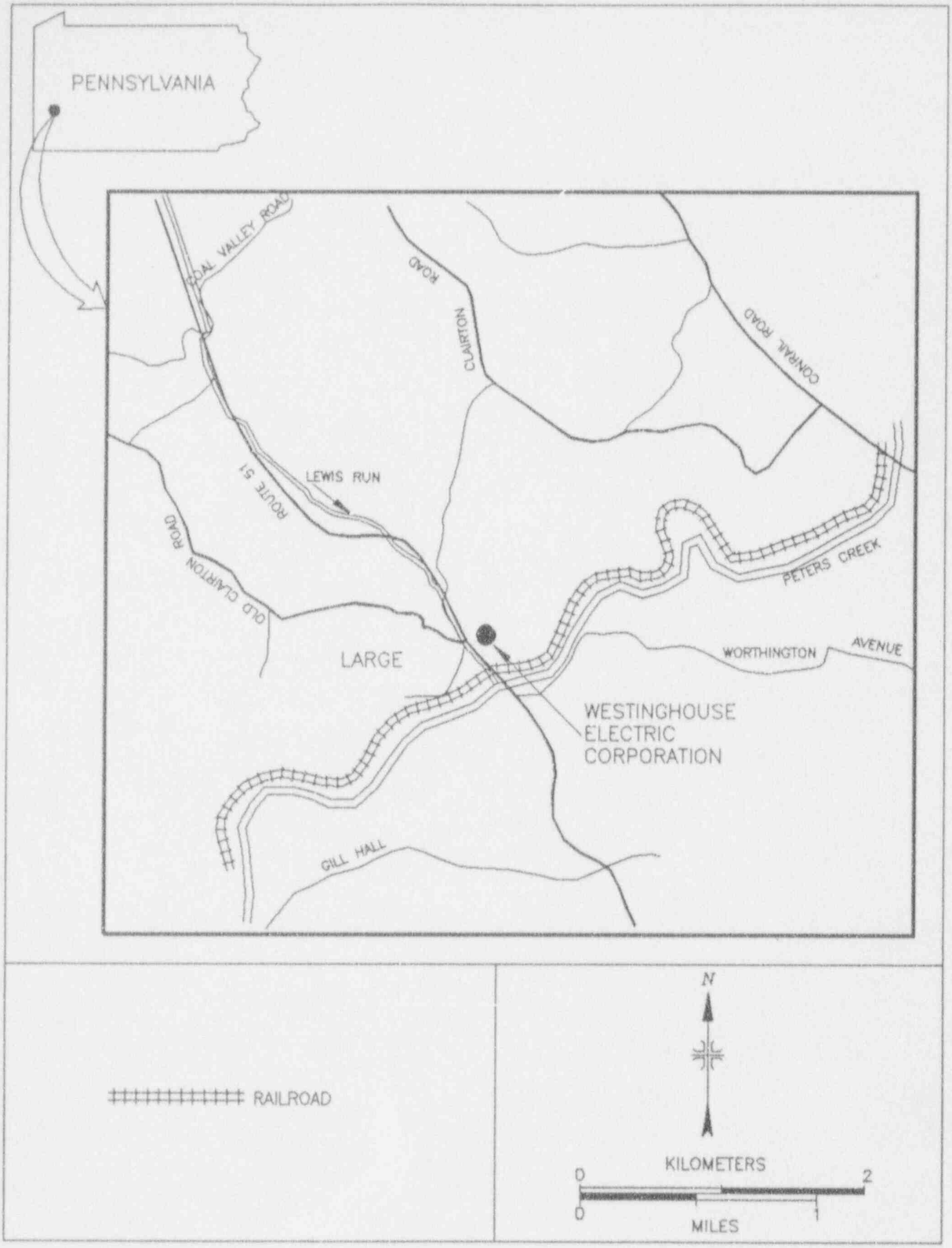


FIGURE 1: Location of the Westinghouse Electric Corporation, Large, Pennsylvania

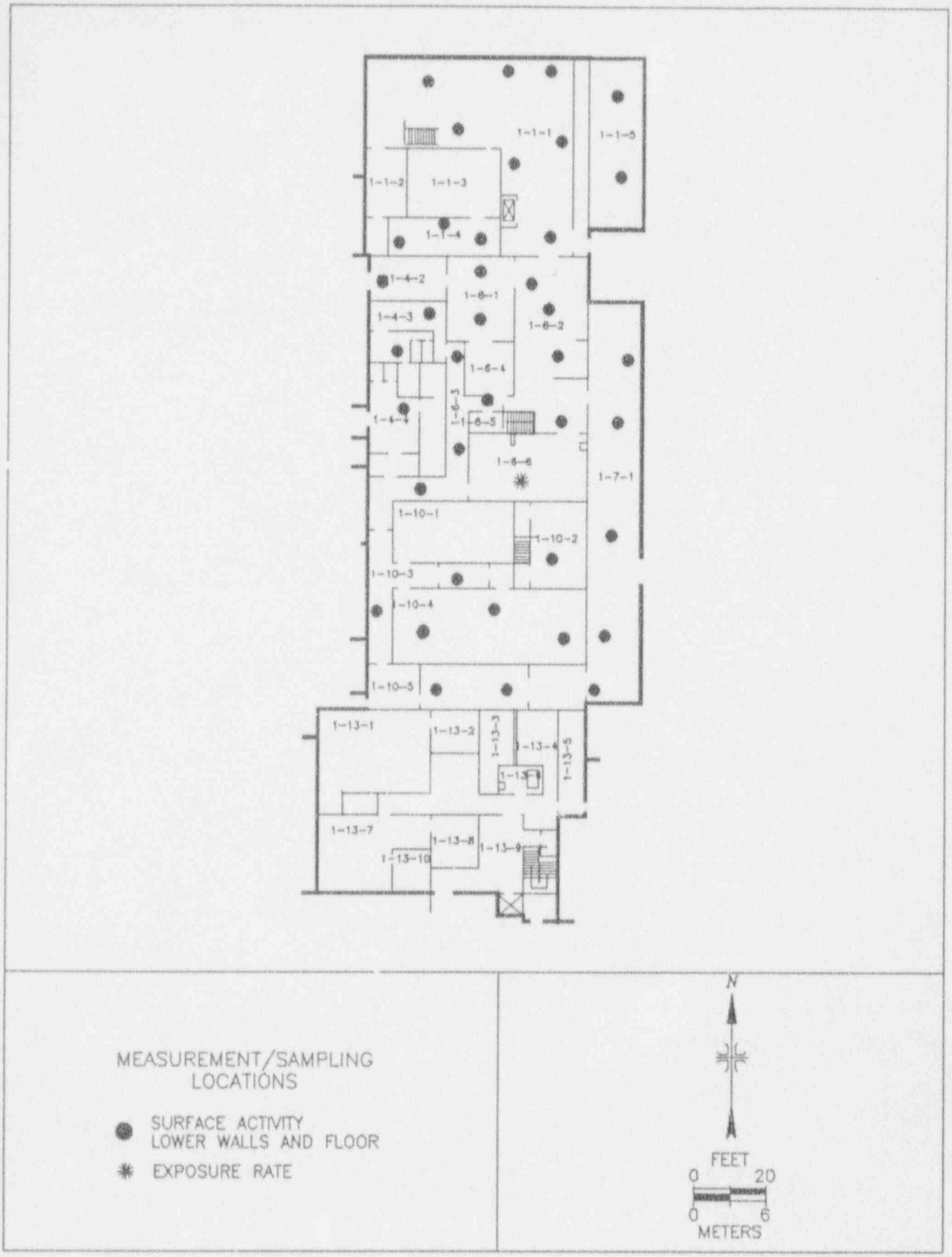


FIGURE 3: Building 5, First Floor, Eastern Portion – Measurement and Sampling Locations

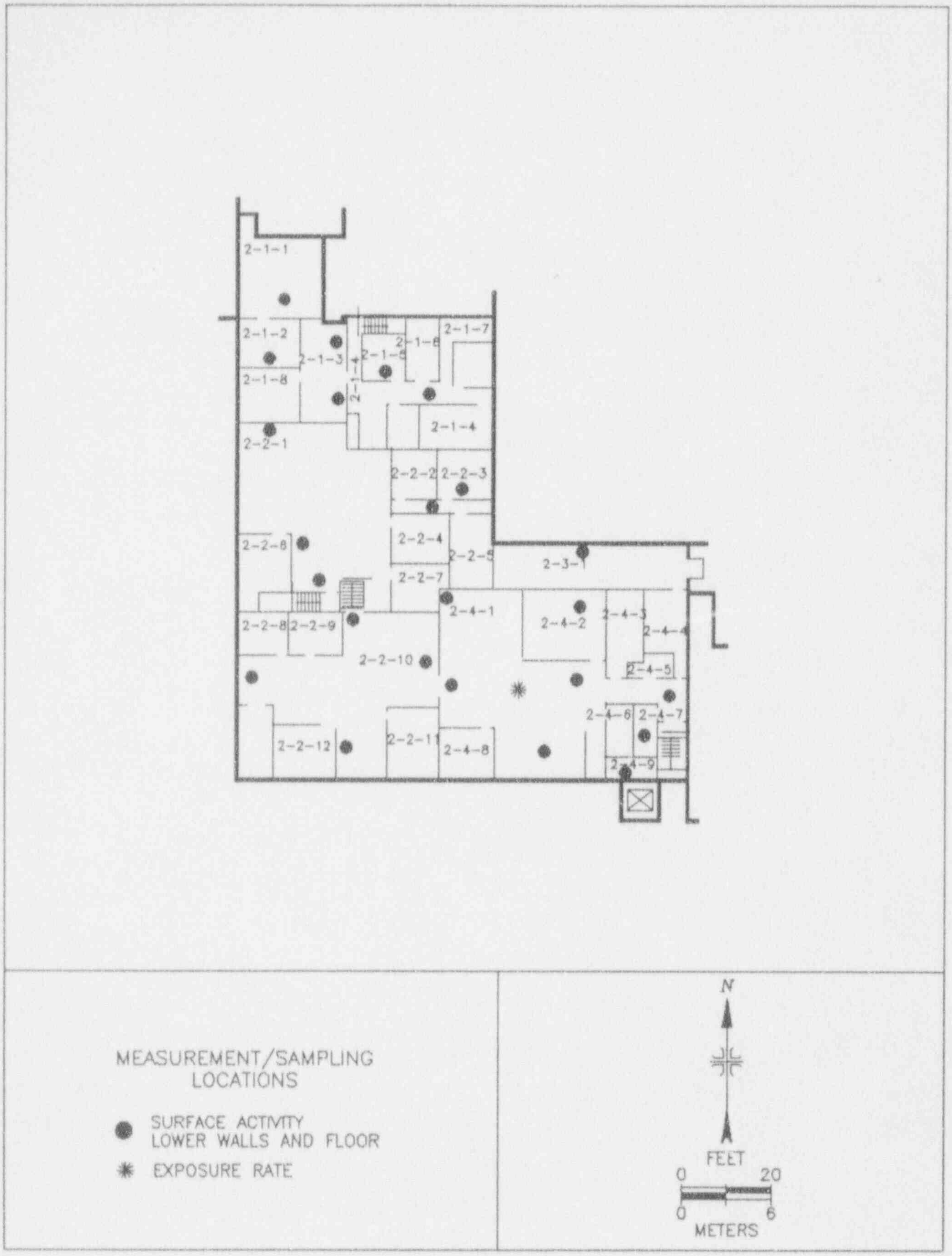


FIGURE 5: Building 5, Second Floor – Measurement and Sampling Locations

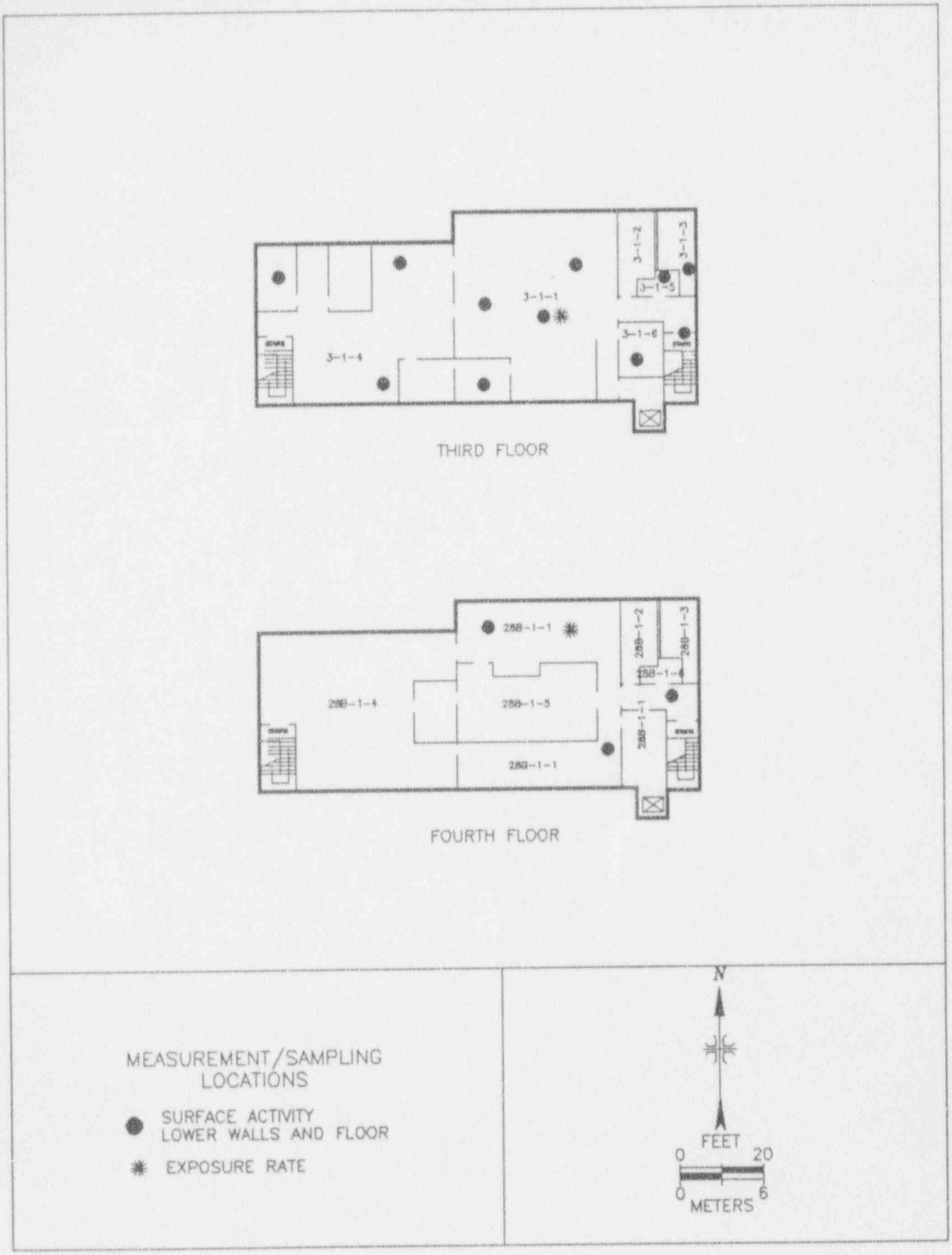


FIGURE 6: Building 5, Third and Fourth Floors — Measurement and Sampling Locations

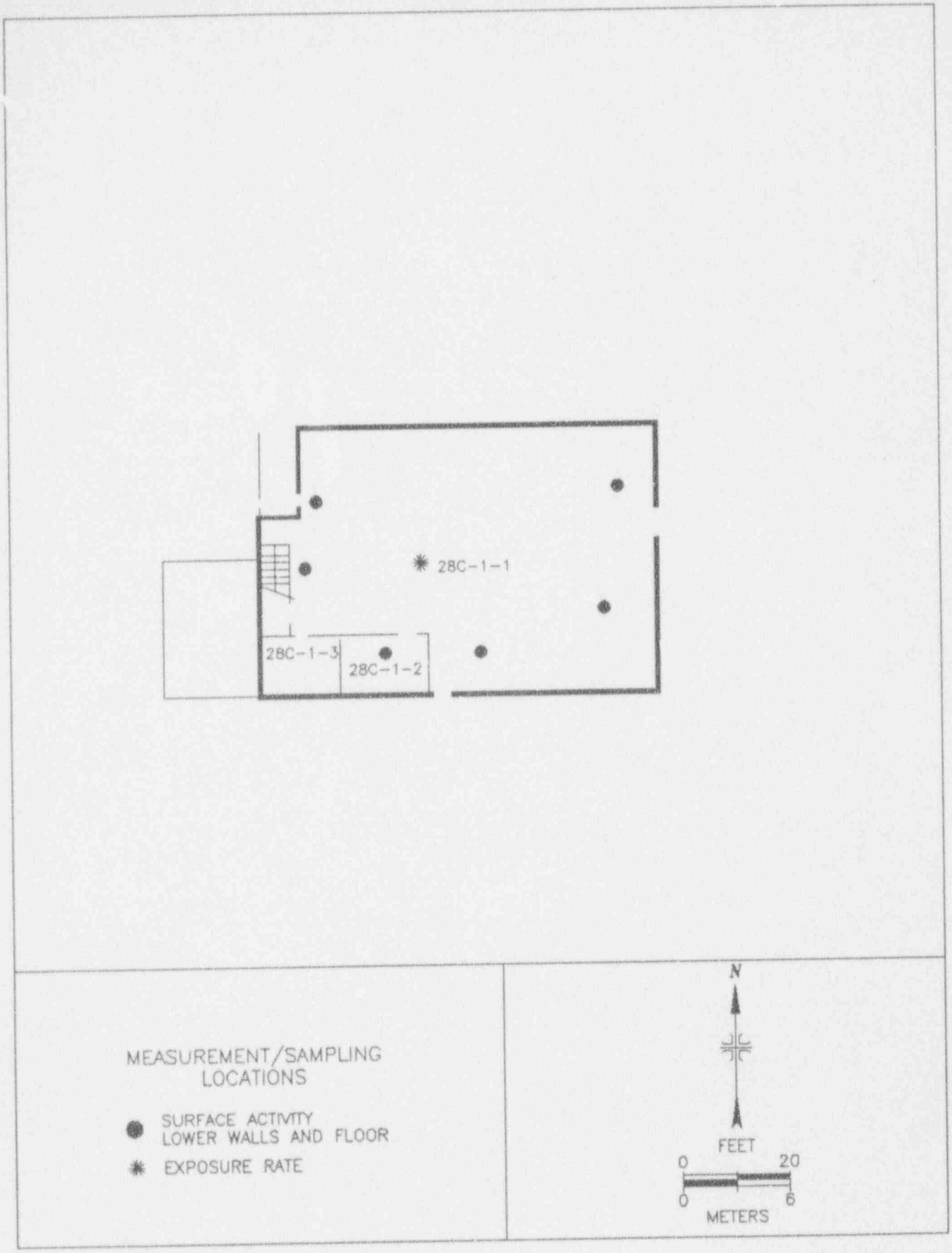


FIGURE 7: Building 5A, First Floor – Measurement and Sampling Locations

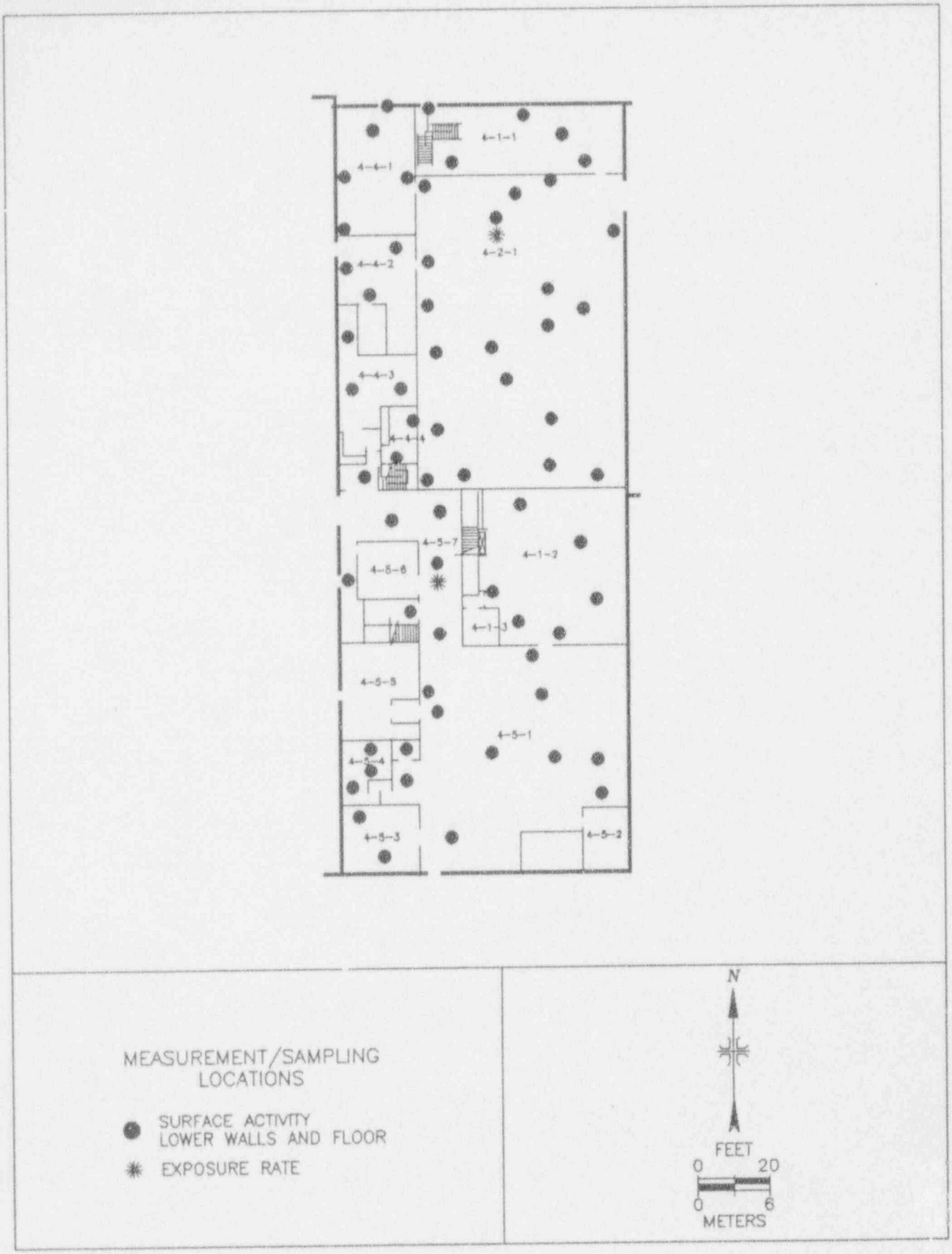


FIGURE 8: Building 6, First Floor — Measurement and Sampling Locations

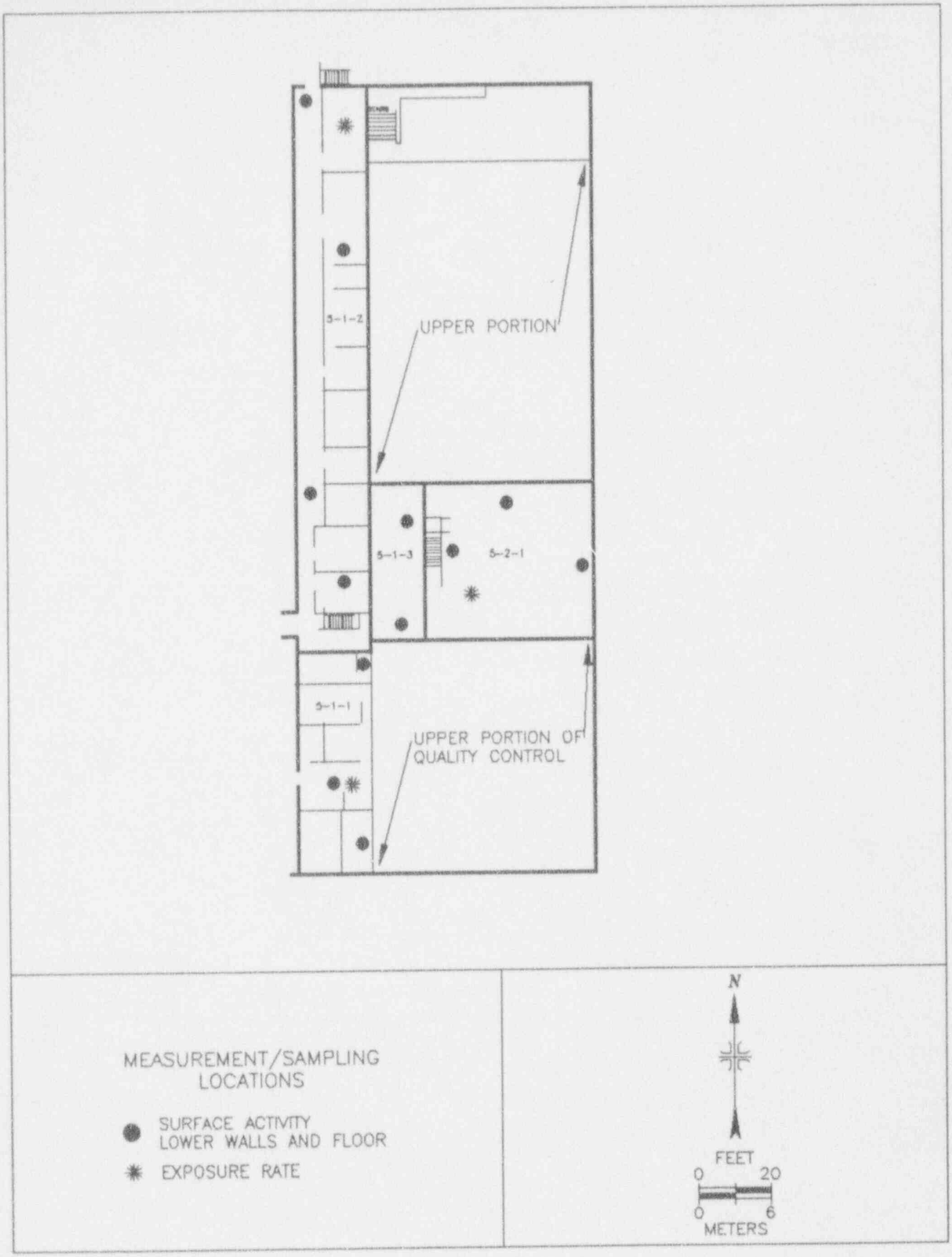


FIGURE 9: Building 6, Second Floor — Measurement and Sampling Locations

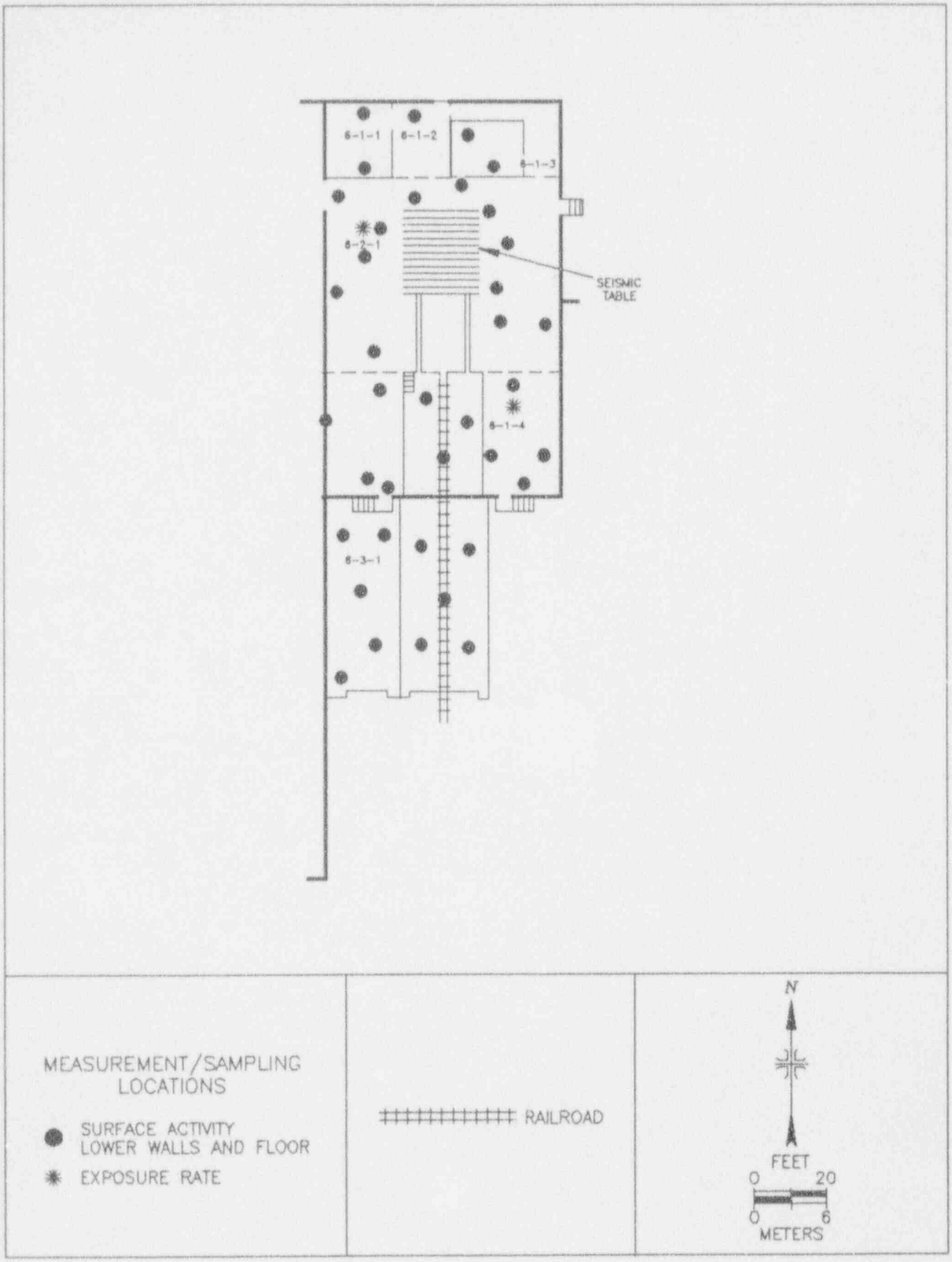


FIGURE 10: Building 6A, First Floor – Measurement and Sampling Locations

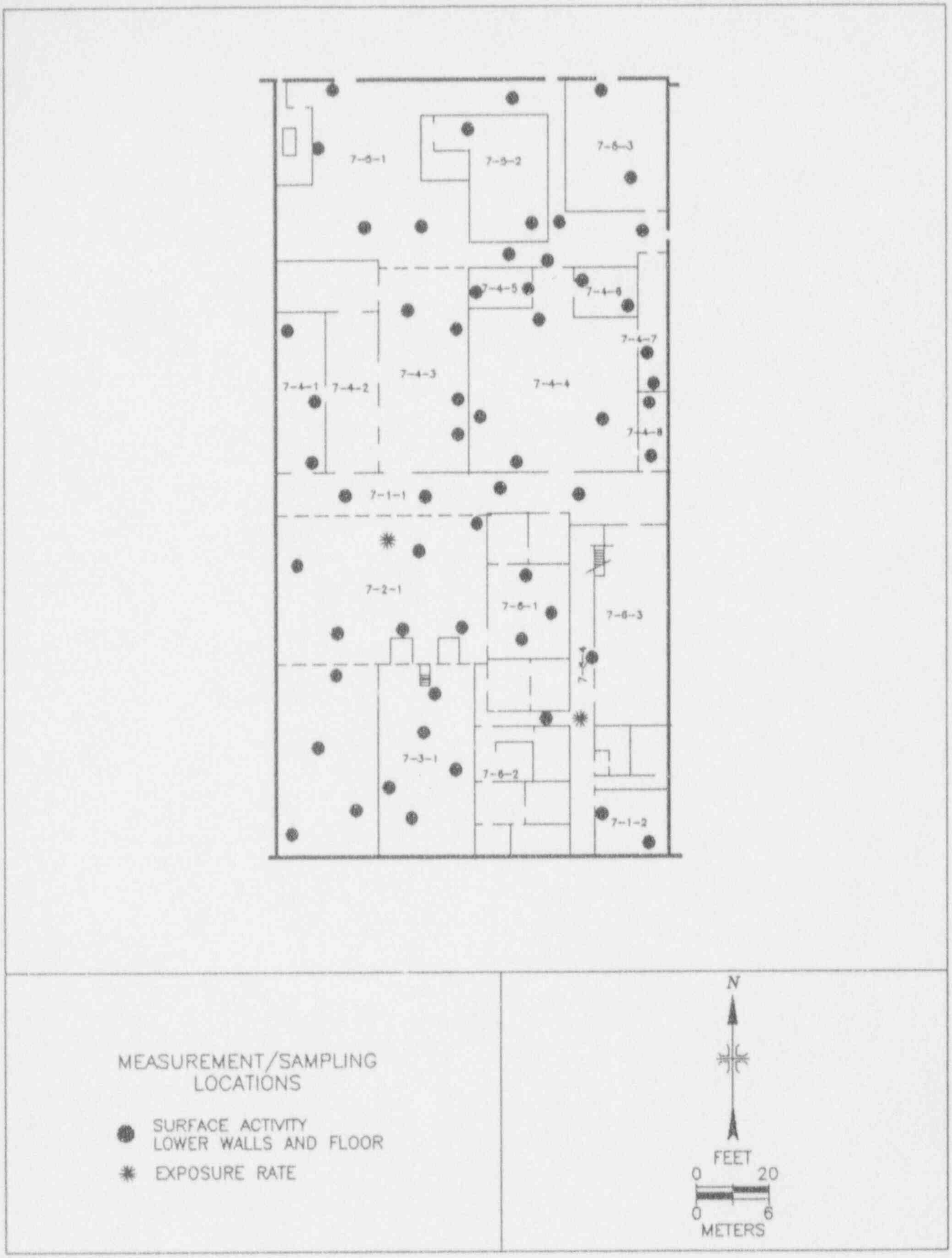


FIGURE 11: Building 7, First Floor — Measurement and Sampling Locations

WLP19

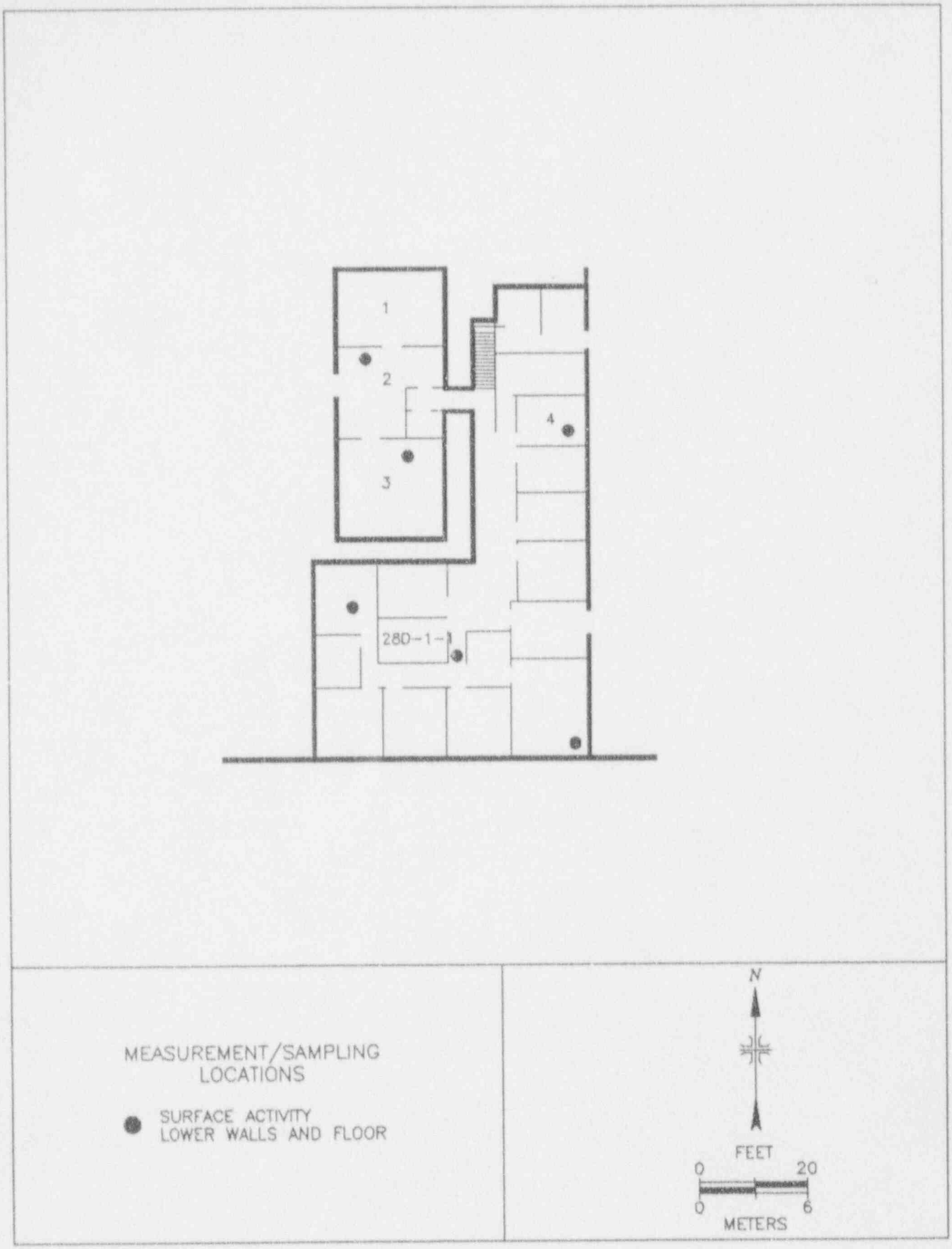


FIGURE 12: Building 7, Second Floor – Measurement and Sampling Locations

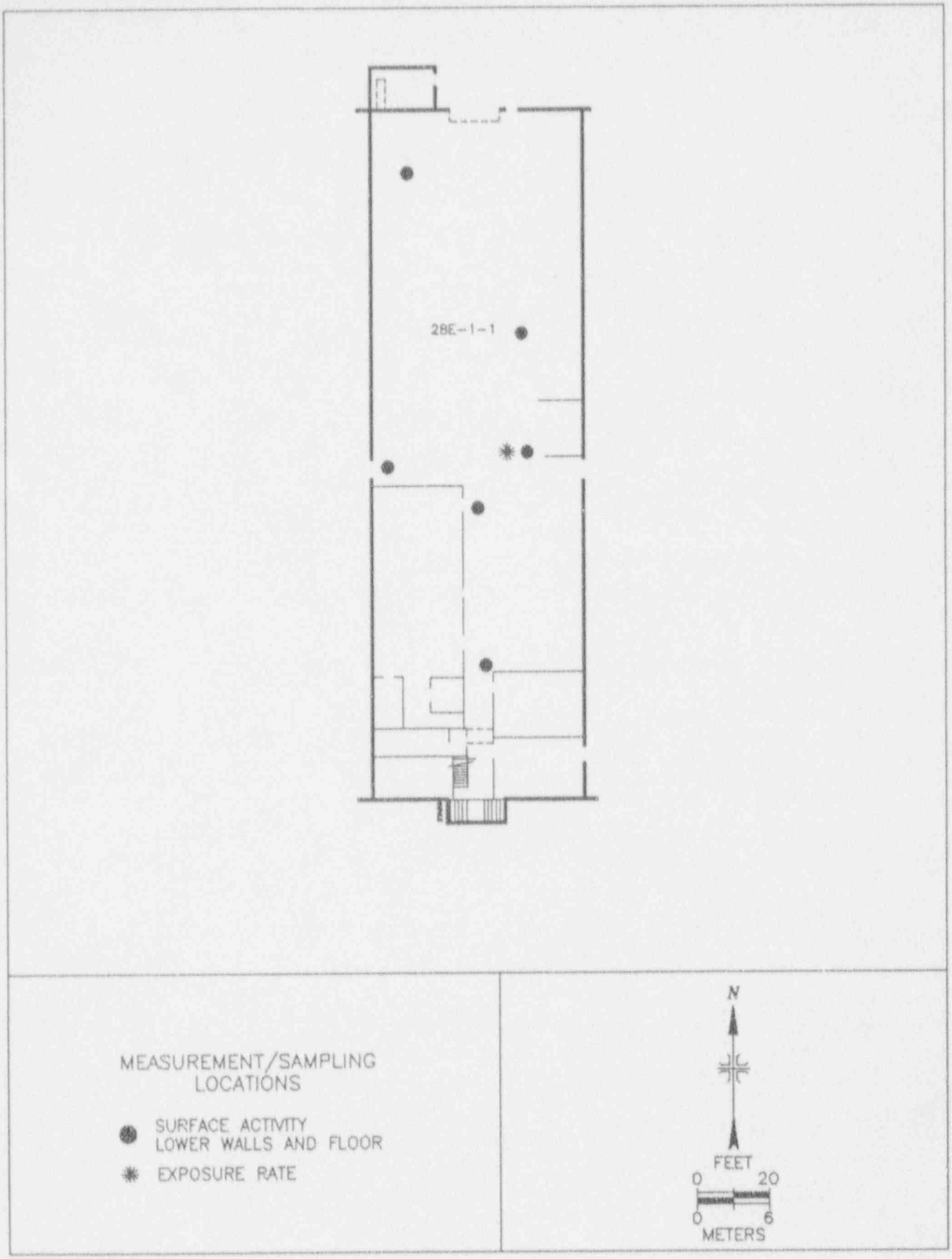


FIGURE 13: Building 8, First Floor – Measurement and Sampling Locations

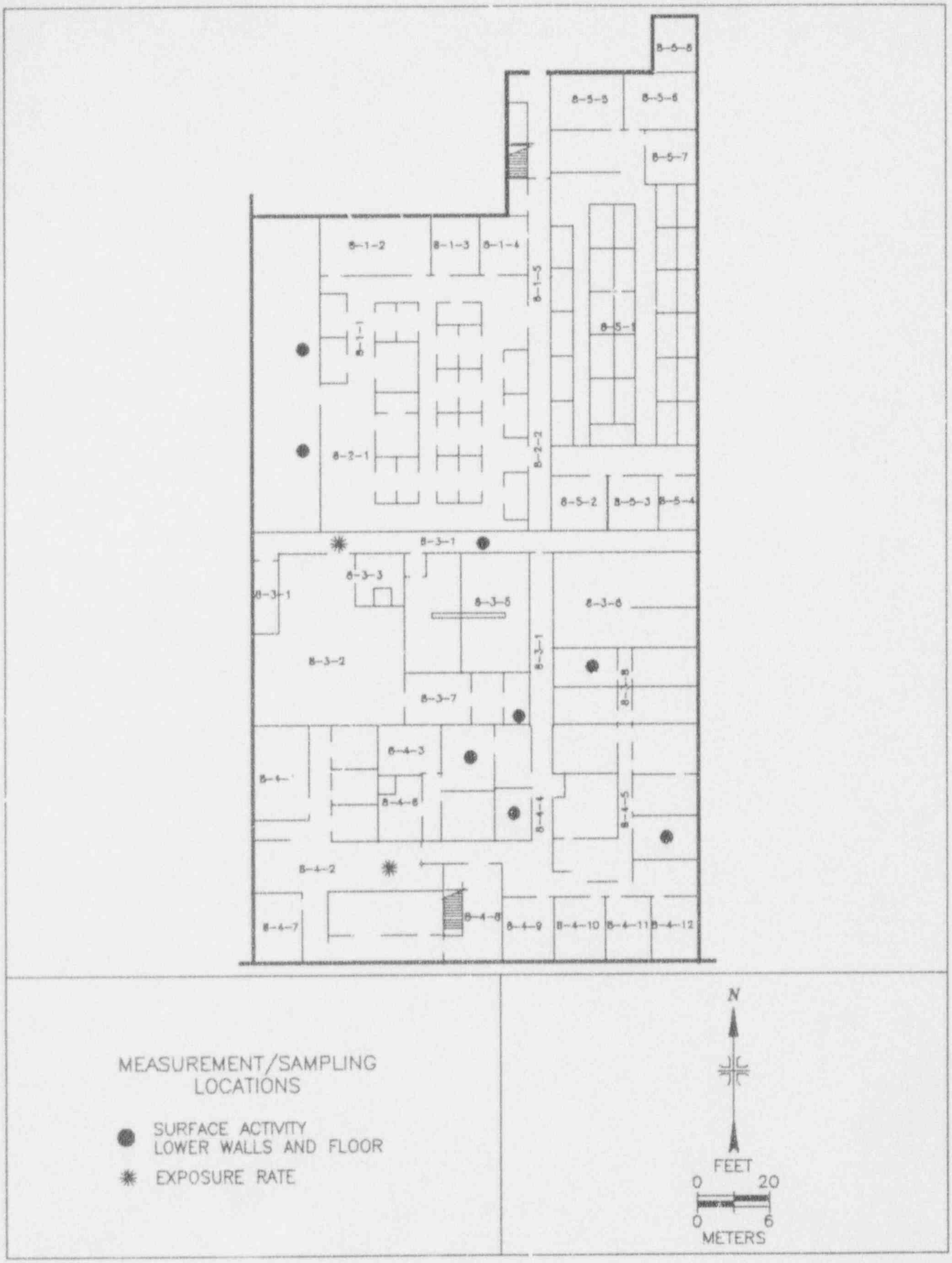


FIGURE 14: Building 8A, First Floor – Measurement and Sampling Locations

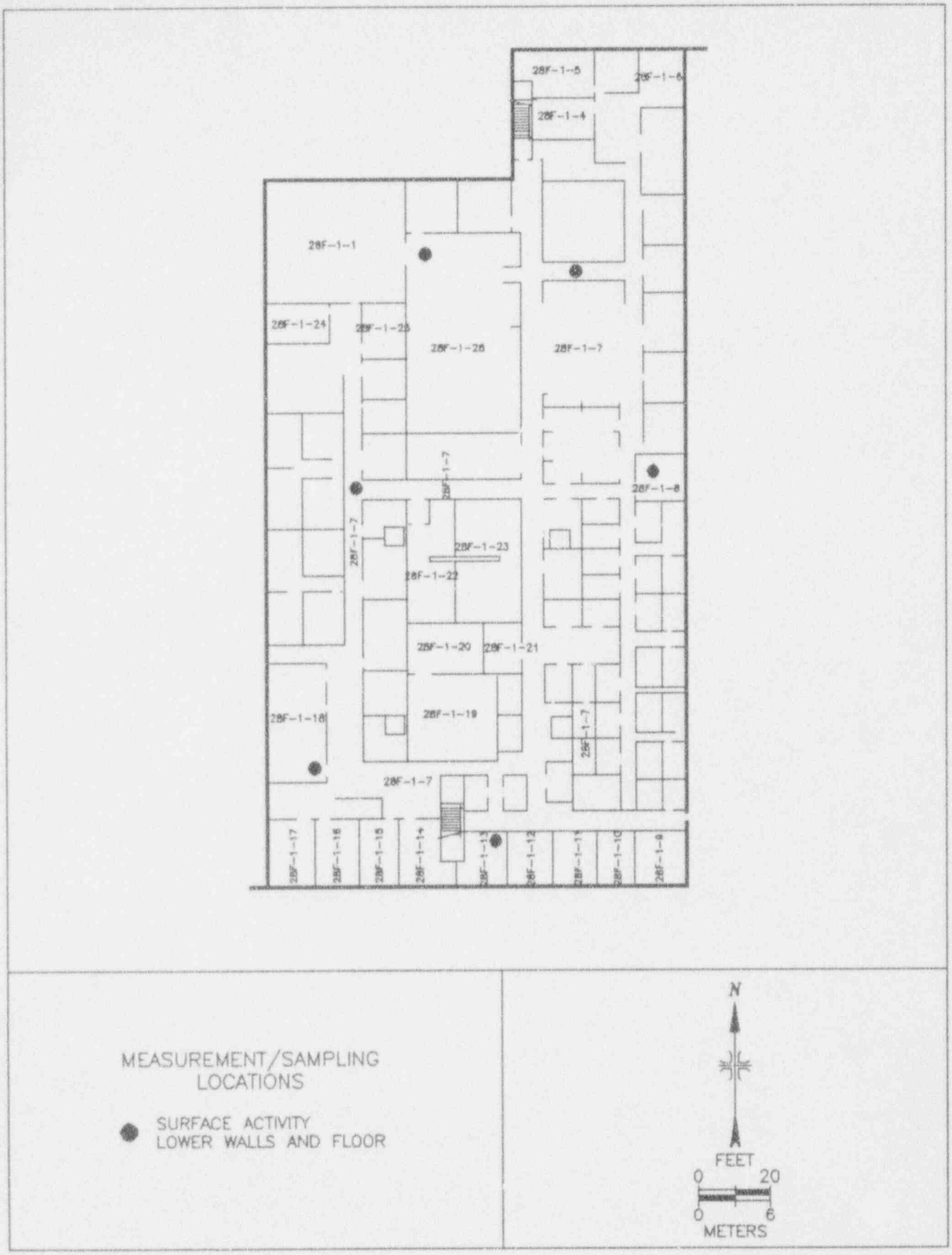


FIGURE 15: Building 8A, Second Floor – Measurement and Sampling Locations

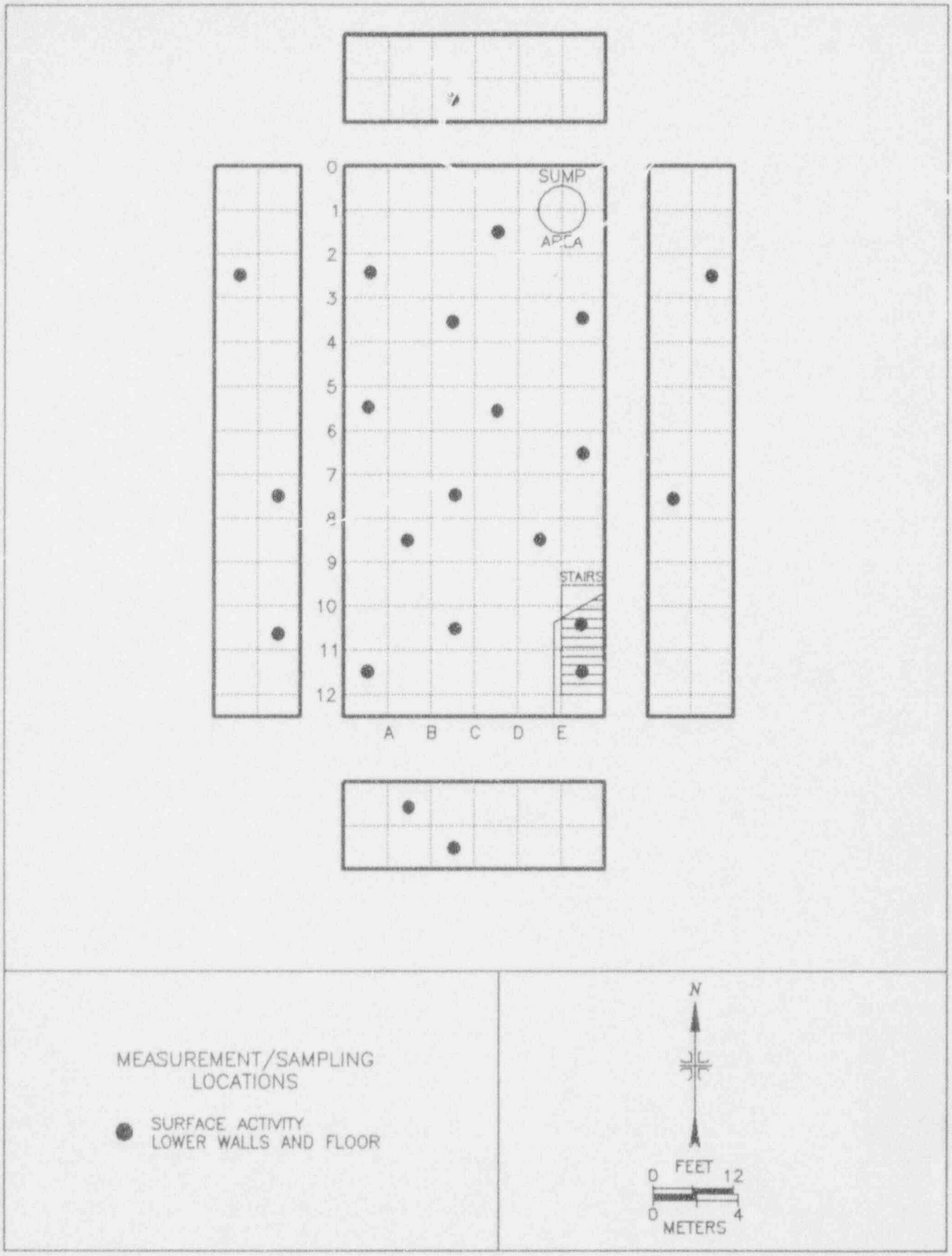


FIGURE 16: Building 9, Tank Pit – Measurement and Sampling Locations

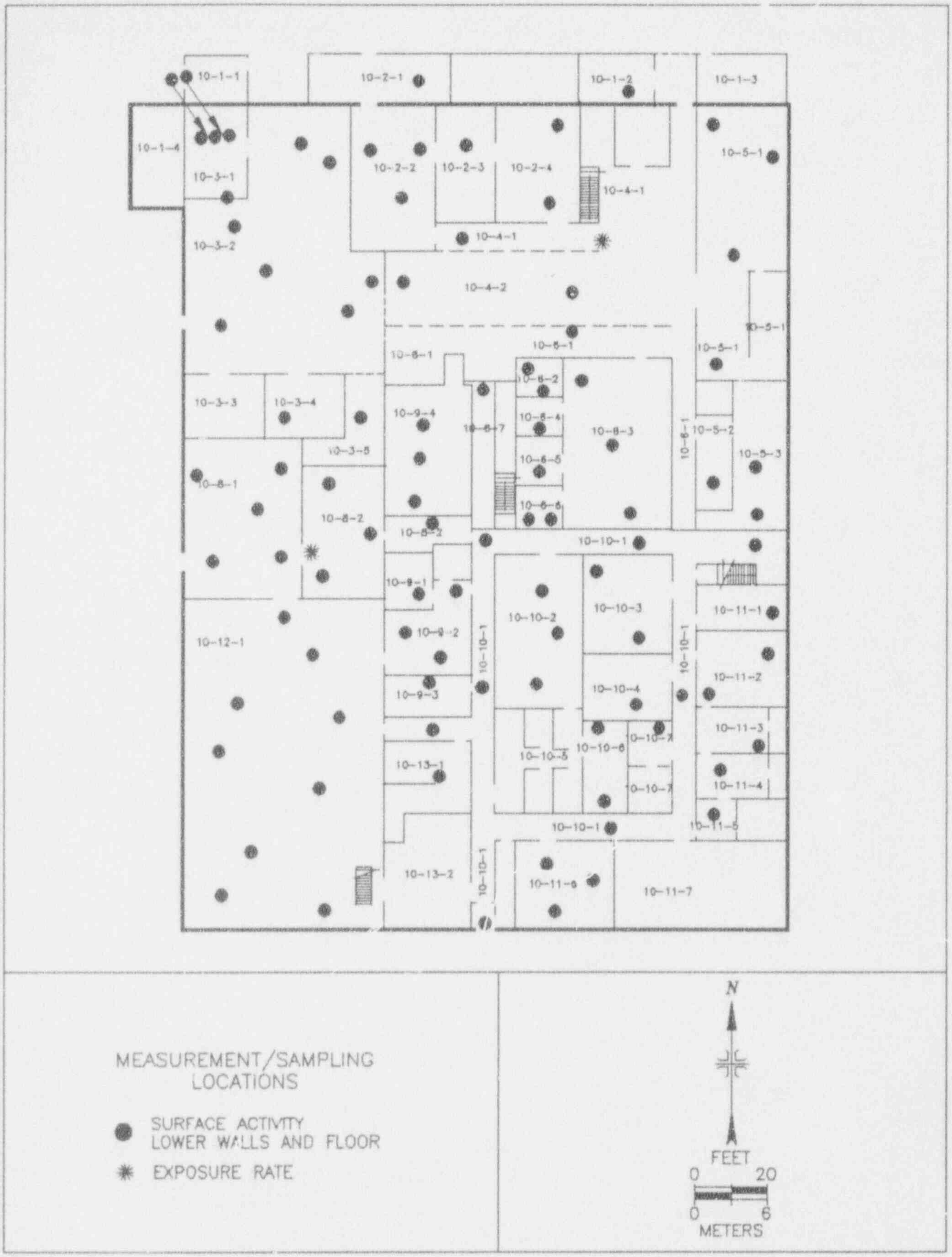


FIGURE 17: Building 9, First Floor – Measurement and Sampling Locations

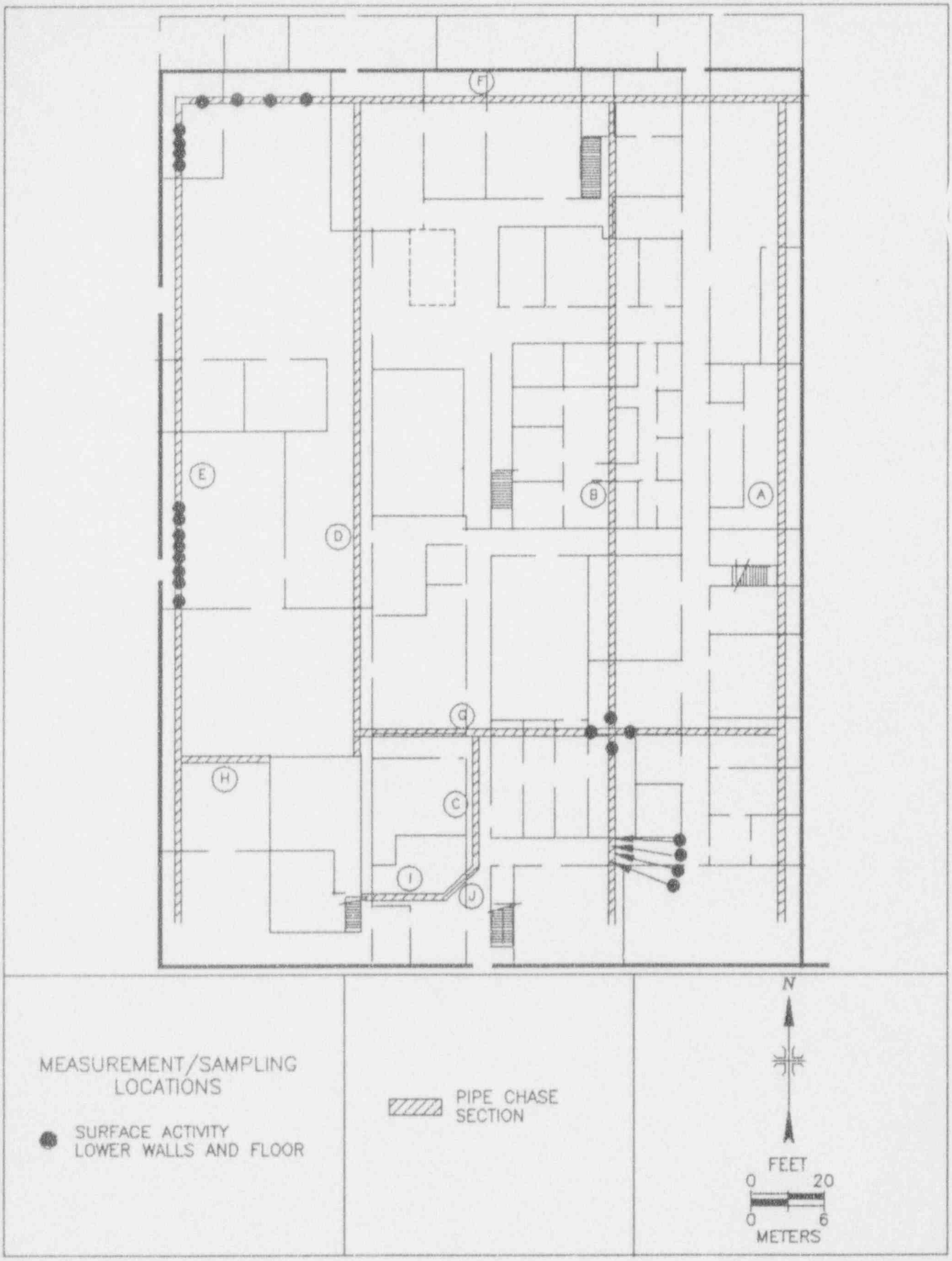


FIGURE 18 Building 9, First Floor Pipe Chases – Measurement and Sampling Locations

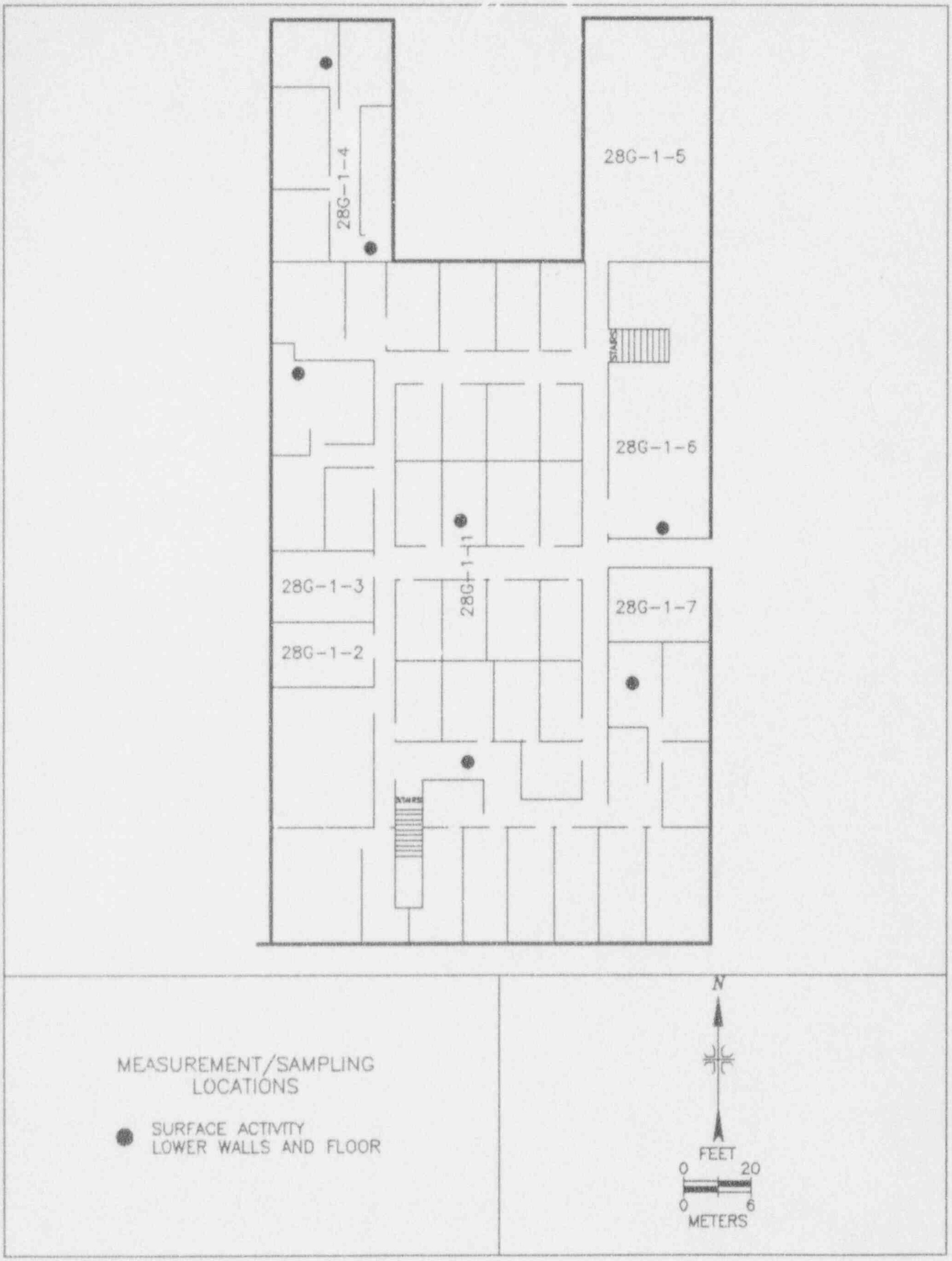


FIGURE 19: Building 9, Second Floor – Measurement and Sampling Locations

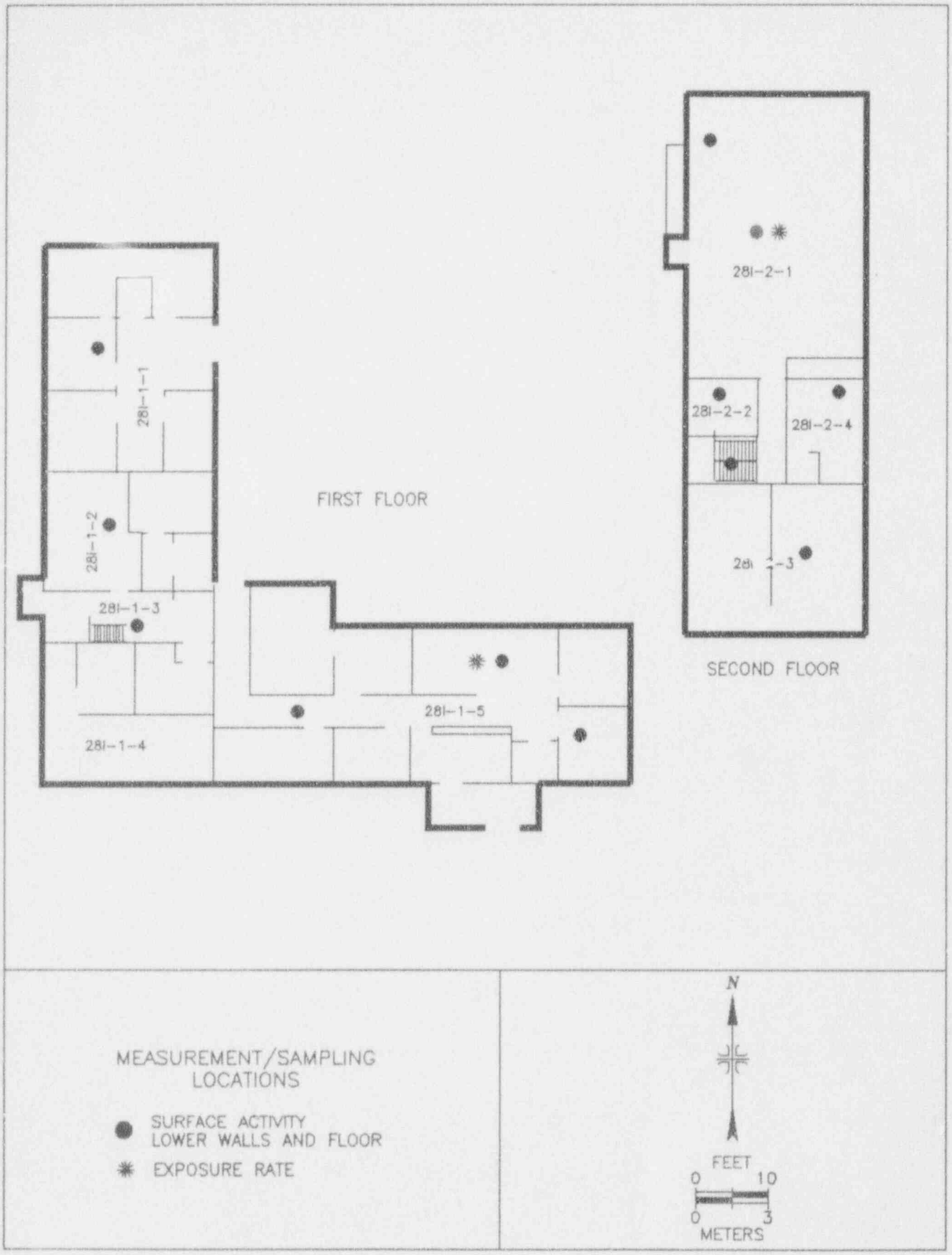


FIGURE 20: Building 11, First and Second Floors – Measurement and Sampling Locations

WLP14

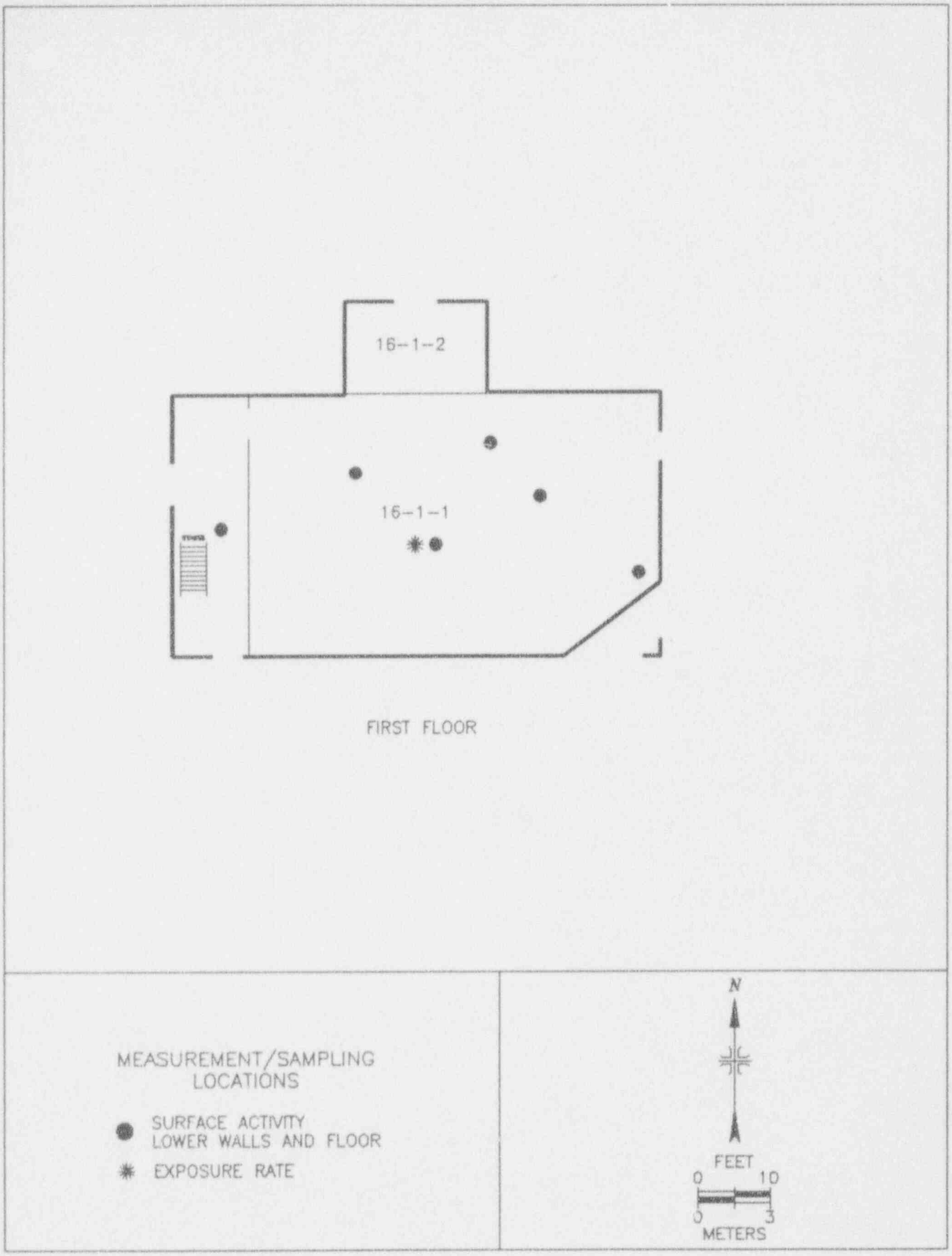


FIGURE 21: Building 12, First Floor – Measurement and Sampling Locations

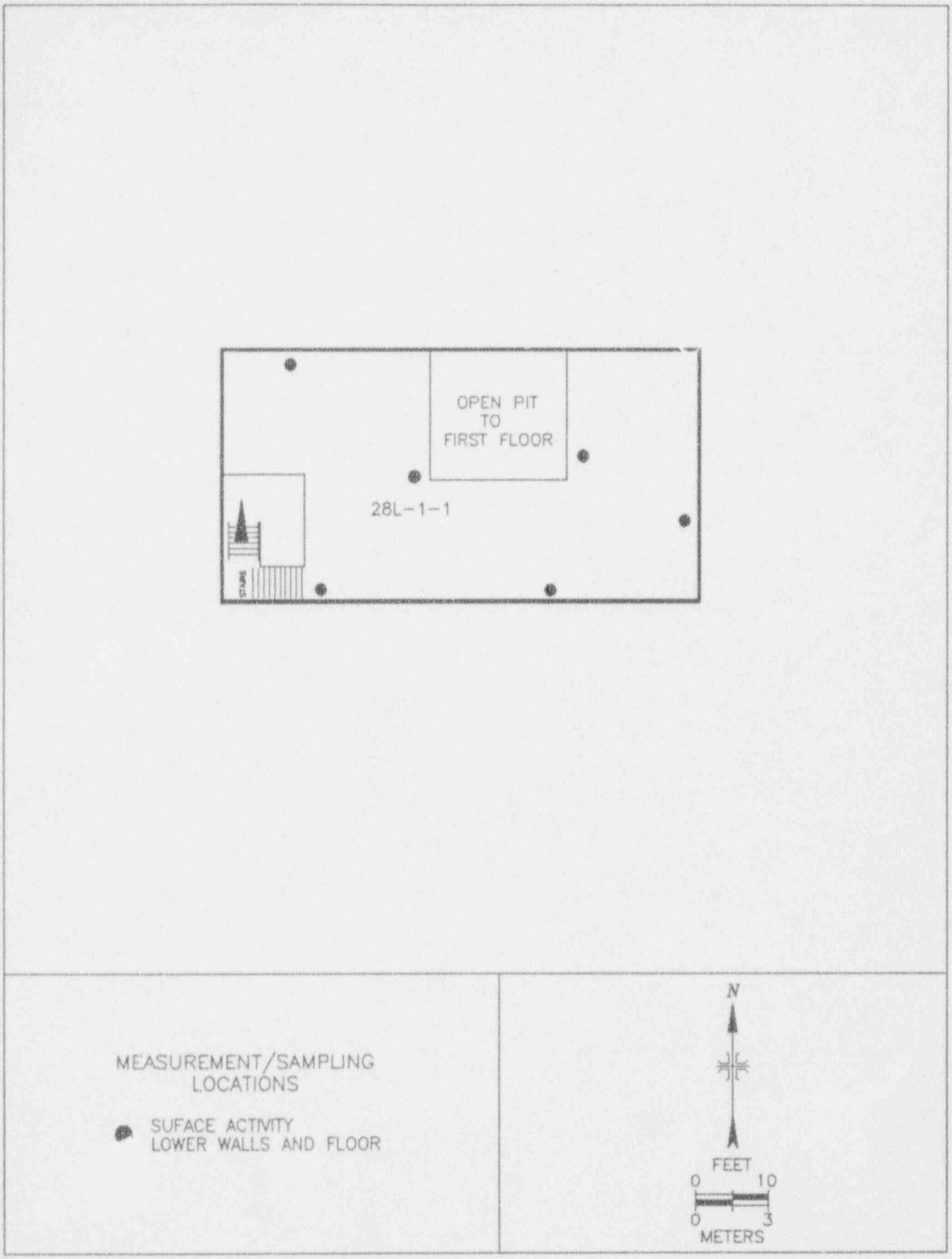


FIGURE 22: Building 12, Second Floor — Measurement and Sampling Locations

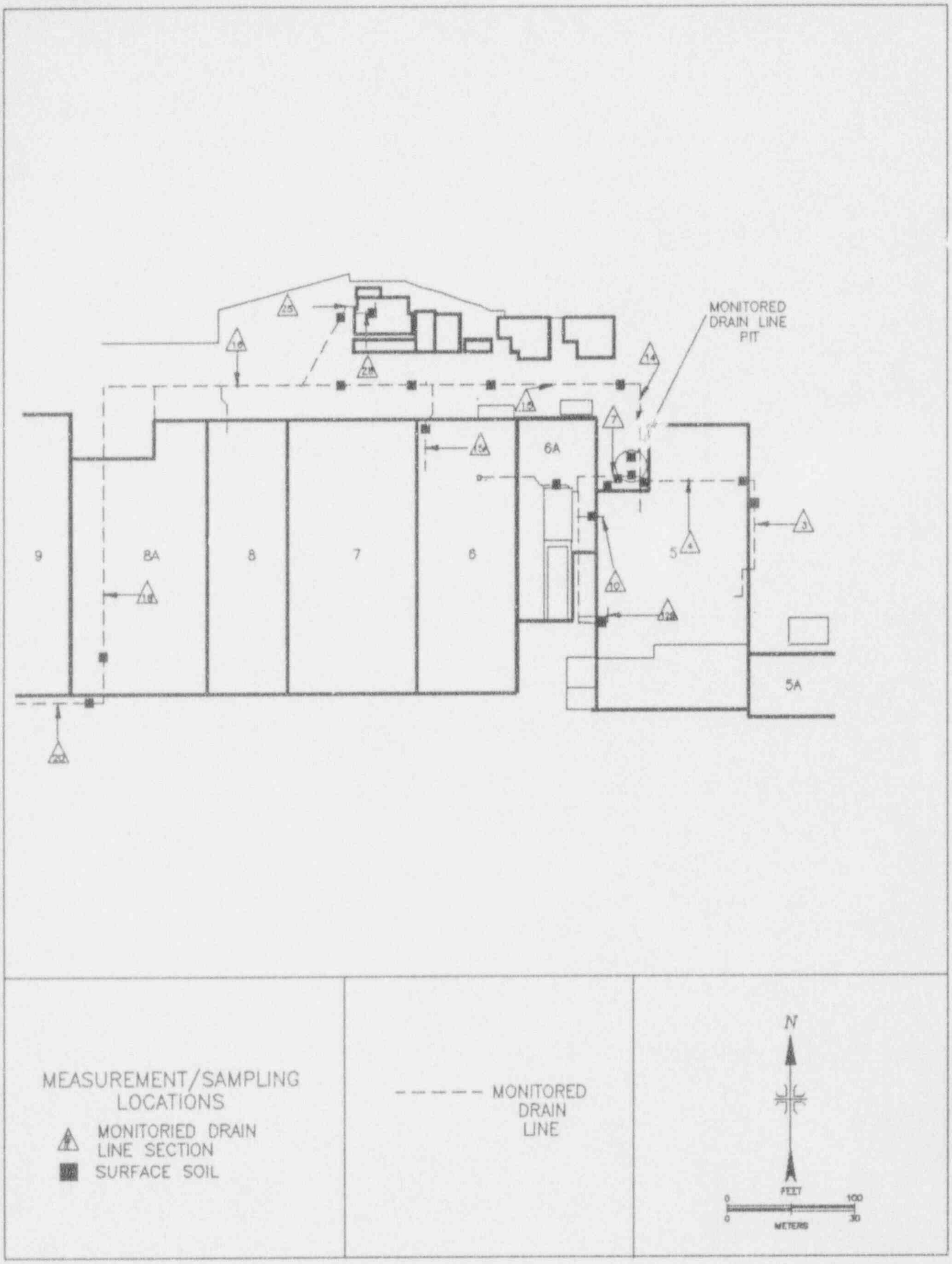


FIGURE 23: Monitored Drain Line – Sampling Locations

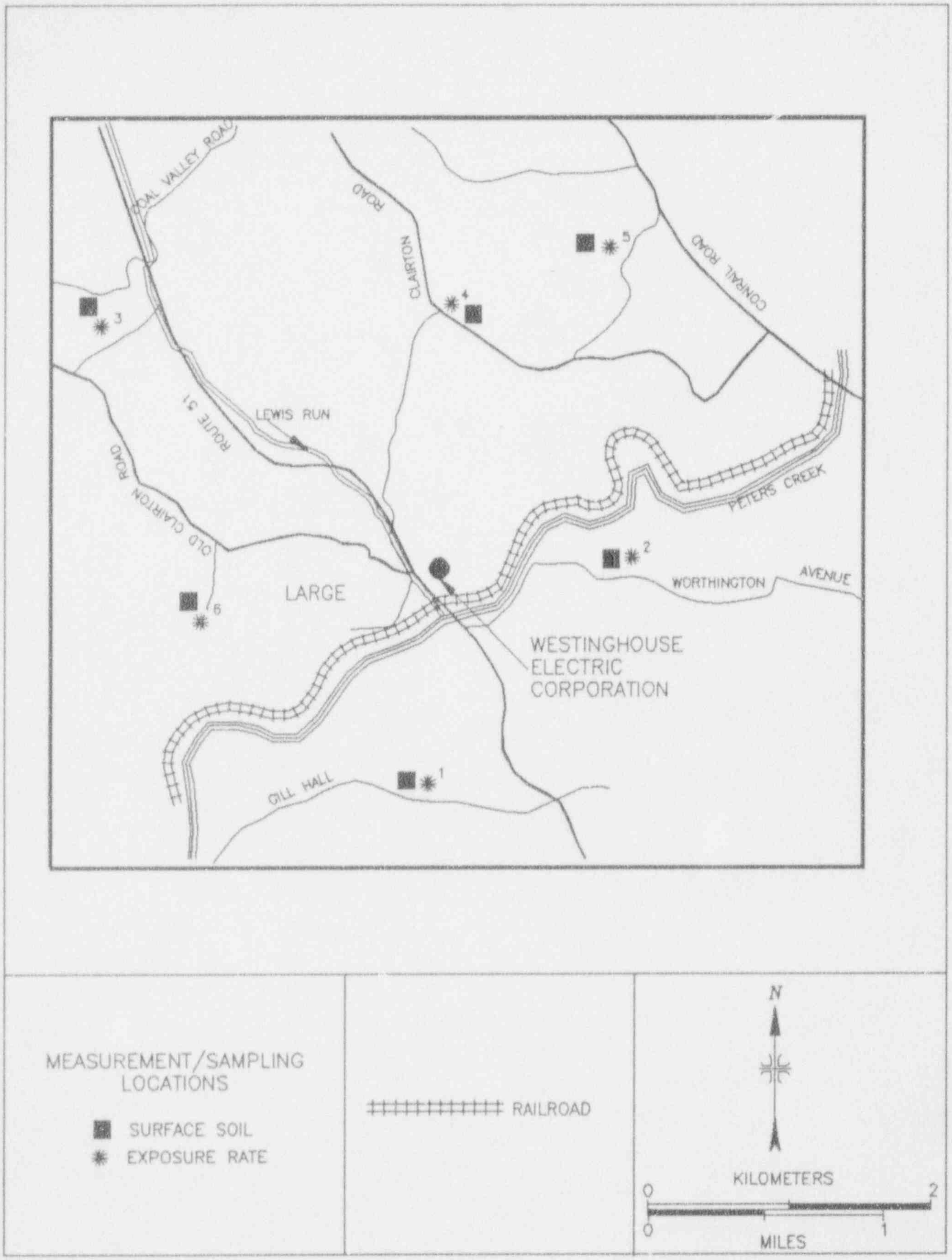


FIGURE 24: Backgroud Exposure Rate Measurement and Soil Sampling Locations

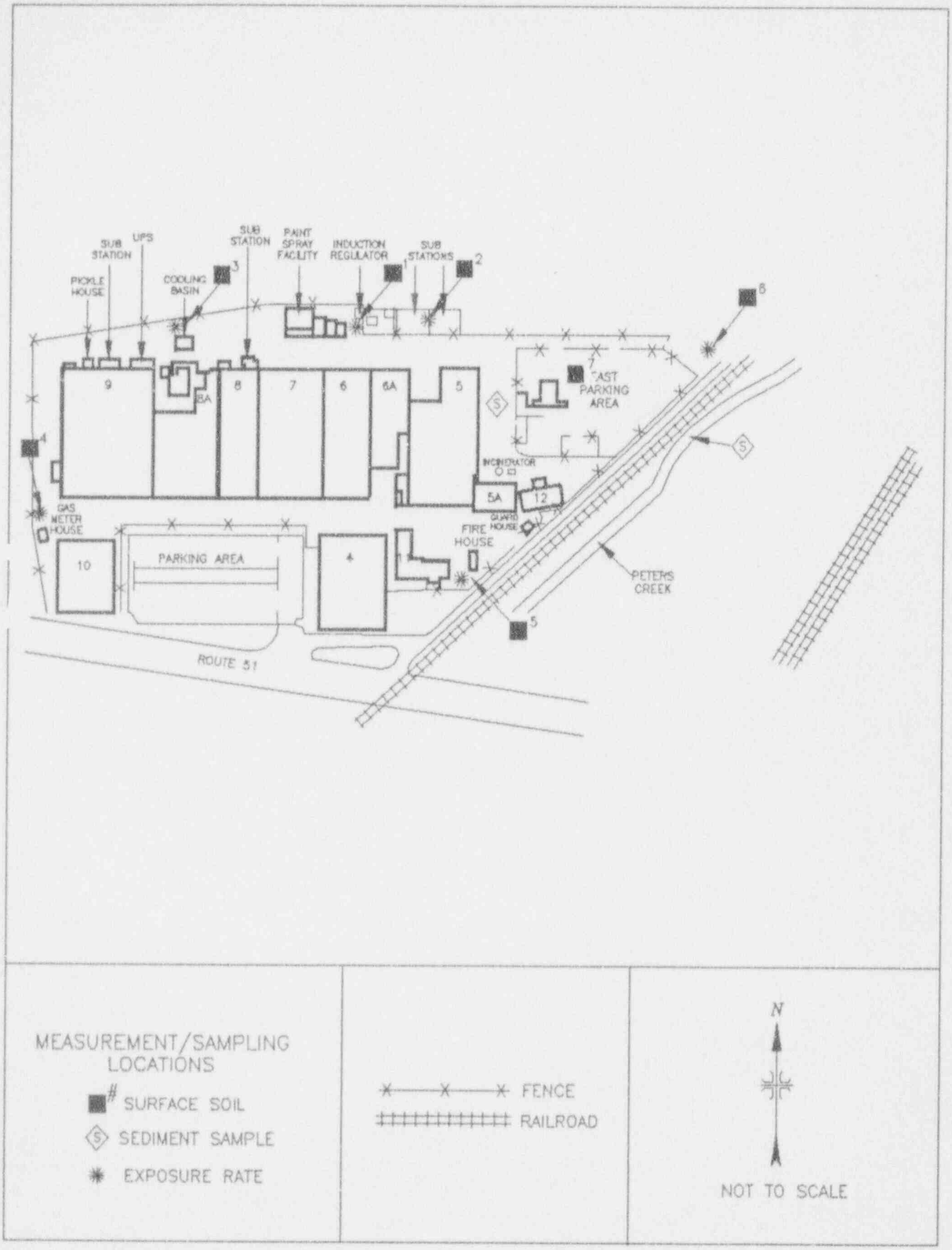


FIGURE 25: Exterior Exposure Rate Measurements and Soil and Sediment Sampling Locations

TABLE 1

SUMMARY OF SURFACE ACTIVITY MEASUREMENTS
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

Location	Figure(s)	Number of Individual Measurements	Range of Total Activity (dpm/100 cm^2)		Range of Removable Activity (dpm/100 cm^2)	
			Alpha	Beta	Alpha	Beta
Building 5 1st Floor	3,4	67	73	<1500-1900	<12	<16
Building 5 2nd Floor	5	24	<78-1400	<1400	<12-160	<16-38
Building 5 3rd Floor	6	11	<78	<1400	<12	<16
Building 5 4th Floor	6	3	<78	<1400	<12	<16
Building 5A 1st Floor	7	6	<78	<1400	<12	<16
Building 6 1st Floor	8	66	<73	<1400-4800	<12	<16
Building 6 2nd Floor	9	12	<78	<1400	<12	<16
Building 6A 1st Floor	10	38	<73	<1500	<12	<16
Building 7 1st Floor	11	58	<73	<1500	<12	<16
Building 7 2nd Floor	12	6	<78	<1400	<12	<16
Building 8 1st Floor	13	6	<78	<1400	<12	<16
Building 8A 1st Floor	14	8	<69	<1400	<12	<16

TABLE 3

URANIUM CONCENTRATIONS IN ARCHIVED MDL SOIL SAMPLES
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

Location[a]	Uranium Concentration (pCi/g)			
	U-235	U-238	Total Uranium[b]	Licensee U-235[c]
MDL Pit, NW Corner	2.3 ± 0.2	1.7 ± 1.4	69.0	1.48 ± 0.24
MDL Pit, SW Corner	0.3 ± 0.1	1.6 ± 0.9	9.0	0.586 ± 0.18
Beneath Clay Pipe From MDL Pit	0.1 ± 0.1	0.9 ± 0.5	3.0	<0.19
MDL Section 3, 16.5	0.2 ± 0.1	1.7 ± 1.6	6.0	0.127 ± 0.067
MDL Section 4, 62.0	0.4 ± 0.1	1.4 ± 1.2	12.0	<0.25
MDL Section 7, 23.0	0.2 ± 0.1	1.7 ± 1.6	6.0	<0.40
MDL Section 10, 8.0	0.2 ± 0.1	1.3 ± 1.1	6.0	0.381 ± 0.22
MDL Section 12B, 3.0	0.2 ± 0.1	2.1 ± 0.8	6.0	0.190 ± 0.084
MDL Section 14, 20.0	0.2 ± 0.1	3.2 ± 1.8	6.0	<0.16
MDL Section 14, 51.0	0.1 ± 0.1	2.5 ± 2.0	3.0	<0.40
MDL Section 15, 66.0	0.3 ± 0.1	1.7 ± 1.1	9.0	0.237 ± 0.22
MDL Section 15, 149.0	0.2 ± 0.1	1.2 ± 0.7	6.0	<0.26
MDL Section 15A, 44.0	0.2 ± 0.1	1.7 ± 1.2	6.0	<0.40
MDL Section 16, 175.0	0.2 ± 0.1	2.5 ± 1.3	6.0	<0.27
MDL Section 16, 248.0	0.3 ± 0.1	1.4 ± 1.2	9.0	0.311 ± 0.23
MDL Section 18, 128.0	0.2 ± 0.1	1.6 ± 0.9	6.0	0.204 ± 0.17
MDL Section 20, 124.0	0.1 ± 0.1	0.7 ± 0.5	3.0	0.281 ± 0.13
MDL Section 25, 4.0	0.2 ± 1.0	1.3 ± 1.1	6.0	<0.15
MDL Section 28, 12.0	0.3 ± 0.1	0.7 ± 0.6	9.0	<0.34
MDL Piping Remaining Beneath Bldg 6A	<0.3	0.1 ± 1.9	<9.0	<0.44

[a] Refer to Figure 23.

[b] Total uranium concentrations are calculated based on a total uranium to U-235 ratio of 30, as established by the licensee.

[c] U-235 concentration reported by the licensee.

TABLE 4

URANIUM CONCENTRATIONS IN ARCHIVED MDL SOIL SAMPLES (DETERMINED BY ALPHA SPECTROMETRY) WESTINGHOUSE ELECTRIC CORPORATION LARGE, PENNSYLVANIA

Location[a]	Uranium Concentration (pCi/g)			
	U-234	U-235	U-238	Total Uranium[b]
MDL Pit, NW Corner	19.5 ± 0.6	1.2 ± 0.2	0.7 ± 0.1	21.3
MDL Pit, SW Corner	3.3 ± 0.2	0.2 ± 0.1	0.8 ± 0.1	4.3
Beneath Clay Pipe From MDL Pit	1.4 ± 0.2	0.1 ± 0.1	1.0 ± 0.1	2.4
MDL Section 4, 62.0	4.4 ± 0.3	0.3 ± 0.1	1.1 ± 0.2	5.8

[a] Refer to Figure 23.

[b] Total uranium concentrations are calculated based on the sum of the U-234, U-235 and U-238 concentrations, as determined by alpha spectrometry.

TABLE 5

BACKGROUND EXPOSURE RATES AND URANIUM CONCENTRATIONS IN SOIL WESTINGHOUSE ELECTRIC CORPORATION LARGE, PENNSYLVANIA

Measurement Location[a]	Exposure Rate (μR/h) at 1 m Above Surface	Total Uranium Concentration (pCi/g)[b]
1 Scotia Pump Station, Ridge Rd.	9	3.4
2 St. Clares Cemetery	8	4.8
3 Elliot Rd Across from Drive-In	9	3.6
4 Hwy 885 and Clairton Rd.	9	2.5
5 Wall Rd and Wall Ave.	9	2.4
6 End of Red Cliff Dr.	8	2.5

[a] Refer to Figure 24.

[b] Total uranium concentrations are calculated based on natural isotopic abundances of U-234 and U-238.

TABLE 6

EXTERIOR EXPOSURE RATE MEASUREMENTS
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

Location[a]	Exposure Rate at 1 m Above Surface (μR/h)
1 15 m N. of Building 6A	9
2 33 m N. of Building 5	11
3 Fenceline N. of Building 8A	11
4 Fenceline N. of Gas Meter House	10
5 Fenceline S. of Firehouse	11
6 N. E. Perimeter of East Parking Lot	10

[a] Refer to Figure 25.

TABLE 7

URANIUM CONCENTRATIONS IN SOIL SAMPLES, EXTERIOR LOCATIONS
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

Location[b]	Uranium Concentration (pCi/g)[a]			
	U-235	U-238	Total Uranium[c]	
Gamma Spectrometry				
1 15 m N. or Building 6A	0.3 ± 0.1	2.7 ± 1.3	9.0	
2 33 m N. of Building 5	0.1 ± 0.1	1.1 ± 0.9	3.0	
3 Fenceline N. of Building 8A	0.2 ± 0.1	2.2 ± 1.3	6.0	
4 Fenceline N. of Gas Meter House	0.2 ± 0.1	1.1 ± 0.7	6.0	
5 Fenceline S. of Firehouse	0.2 ± 0.1	2.3 ± 1.2	6.0	
6 N. E. Perimeter of East Parking Lot	0.3 ± 0.1	2.9 ± 1.6	9.0	
7 East Parking Lot[e]	0.3 ± 0.1	1.7 ± 1.3	9.0	
Alpha Spectrometry	U-234	U-235	U-238	Total U[d]
7 East Parking Lot[e]	2.3 ± 0.3	0.1 ± 0.1	2.0 ± 0.3	4.4

[a] Uncertainties represent the 95% confidence level, based only on counting statistics.

[b] Refer to Figure 25.

[c] Total uranium concentrations are calculated based on a total uranium to U-235 ratio of 30, as established by the licensee.

[d] Total uranium concentrations are calculated based on the sum of the U-234, U-235 and U-238 concentrations.

[e] Archived sample, originally collected by the licensee.

REFERENCES

1. Westinghouse Electrical Corporation, License Termination Reports # 001 - #042, dated from November 2, 1992 to July 9, 1993.

2. Oak Ridge Institute for Science and Education, "Proposed Confirmatory Survey Plan for Buildings 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, 12 and the Hydrogen Facility, Westinghouse Electric Corporation, Large, PA," August 19, 1993.

3. Oak Ridge Institute for Science and Education, letter from M. R. Landis to J. D. Kinneman, Region I, U.S. NRC, "License Termination Reports #002, #004, #007, and #009 for Westinghouse Electric Corporation, Large, PA," July 23, 1993.

4. Oak Ridge Institute for Science and Education, letter from A. J. Ansari to J. D. Kinneman, Region I, U.S. NRC, "Additional Comment—License Termination Reports for Westinghouse Electric Corporation, Large, PA," August 3, 1993.

5. Oak Ridge Institute for Science and Education, letter from E. W. Abelquist to J. D. Kinneman, Region I, U.S. NRC, "Additional Comment—License Termination Reports for Westinghouse Electrical Corporation, Large, PA," August 24, 1993.

6. U.S. Nuclear Regulatory Commission, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Materials," August, 1987.

7. U.S. Nuclear Regulatory Commission, "Disposal of Onsite Storage of Thorium and Uranium Wastes from Past Operations," 46 FR 52061, Washington, D.C., October 23, 1981.

8. U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, "Review Plan: Evaluating Decommissioning Plans for Licenses Under 10 CFR Parts 30, 40, and 70," Washington, D.C., 1991.

APPENDIX A

MAJOR INSTRUMENTATION

APPENDIX A

MAJOR INSTRUMENTATION

The display of a specific product is not to be construed as an endorsement of the product or its manufacturer by the authors or their employers.

DIRECT RADIATION MEASUREMENT

Instruments

Eberline Pulse Ratemeter
Model PRM-6
(Eberline, Santa Fe, NM)

Eberline "Rascal" Ratemeter-Scaler
Model PRS-1
(Eberline, Santa Fe, NM)

Ludlum Floor Monitor
Model 239-1
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Ludlum Ratemeter-Scaler
Model 2221
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Detectors

Eberline GM Detector
Model HP-260
Effective Area, 15.5 cm^2
(Eberline, Santa Fe, NM)

Eberline ZnS Scintillation Detector
Model AC-3-7
Effective Area, 59 cm^2
(Eberline, Santa Fe, NM)

APPENDIX A

MAJOR INSTRUMENTATION

The display of a specific product is not to be construed as an endorsement of the product or its manufacturer by the authors or their employers.

DIRECT RADIATION MEASUREMENT

Instruments

Eberline Pulse Ratemeter
Model PRM-6
(Eberline, Santa Fe, NM)

Eberline "Rascal" Ratemeter-Scaler
Model PRS-1
(Eberline, Santa Fe, NM)

Ludlum Floor Monitor
Model 239-1
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Ludlum Ratemeter-Scaler
Model 2221
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Detectors

Eberline GM Detector
Model HP-260
Effective Area, 15.5 cm^2
(Eberline, Santa Fe, NM)

Eberline ZnS Scintillation Detector
Model AC-3-7
Effective Area, 59 cm^2
(Eberline, Santa Fe, NM)

Ludlum Gas Proportional Detector
Model 43-37
Effective Area, 550 cm^2
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Reuter-Stokes Pressurized Ion Chamber
Model RSS-111
(Reuter-Stokes, Cleveland, OH)

Victoreen NaI Scintillation Detector
Model 489-55
3.2 cm x 3.8 cm Crystal
(Victoreen, Cleveland, OH)

LABORATORY ANALYTICAL INSTRUMENTATION

Alpha Spectrometry System
Tennelec Electronics Model
(Tennelec, Oak Ridge, TN)
Used in conjunction with:
Surface Barrier and Ion Implanted Detectors
(Canberra, Meriden, CT and
Tennelec, Oak Ridge, TN) and
Multichannel Analyzer
3100 Vax Workstation
(Canberra, Meriden,CT)

High Purity Extended Range Intrinsic Detectors
Model No: ERVDS30-25195
(Tennelec, Oak Ridge, TN)
Used in conjunction with:
Lead Shield Model G-11
(Nuclear Lead, Oak Ridge, TN) and
Multichannel Analyzer
3100 Vax Workstation
(Canberra, Meriden, CT)

High-Purity Germanium Detector
Model GMX-23195-S, 23% Eff.
(EG&G ORTEC, Oak Ridge, TN)
Used in conjunction with:
Lead Shield Model G-16
(Gamma Products, Palos Hills, IL) and
Multichannel Analyzer
3100 Vax Workstation
(Canberra, Meriden, CT)

LABORATORY ANALYTICAL INSTRUMENTATION (Continued)

Low Background Gas Proportional Counter
Model LB-5100-W
(Oxford, Oak Ridge, TN)

APPENDIX B

SURVEY AND ANALYTICAL PROCEDURES

APPENDIX B

SURVEY AND ANALYTICAL PROCEDURES

SURVEY PROCEDURES

Surface Scans

Surface scans were performed by passing the probes slowly over the surface; the distance between the probe and the surface was maintained at a minimum - nominally about 1 cm. A large surface area, gas proportional floor monitor was used to scan the floors of the surveyed areas. Other surfaces were scanned using small area (15.5 cm^2 or 59 cm^2) hand-held detectors. Identification of elevated levels was based on increases in the audible signal from the recording and/or indicating instrument. Combinations of detectors and instruments used for the scans were:

Alpha — ZnS scintillation detector with ratemeter-scaler
— gas proportional detector with ratemeter-scaler

Beta — thin-window GM detector with ratemeter-scaler
— gas proportional detector with ratemeter-scaler

Gamma — NaI scintillation detector with ratemeter

Surface Activity Measurements

Measurements of total alpha and total beta activity levels were performed using ZnS scintillation and thin-window GM detectors with ratemeter-scalers.

Count rates (cpm), which were integrated over 1 minute in a static position, were converted to activity levels (dpm/100 cm^2) by dividing the net rate by the 4π efficiency and correcting for the active area of the detector. The alpha activity background count rates for the ZnS scintillation detectors averaged 1 cpm for each detector. Alpha efficiency factors averaged 0.17 for the ZnS scintillation detectors. The beta activity background count rates for the GM detectors averaged 50 cpm. Beta efficiency factors ranged from 0.15 - 0.17 for the GM detectors. The effective windows for the ZnS scintillation and GM detectors were 59 cm^2 and 15.5 cm^2, respectively.

Removable Activity Measurements

Removable activity levels were determined using numbered filter paper disks, 47 mm in diameter. Moderate pressure was applied to the smear and approximately 100 cm^2 of the surface was wiped. Smears were placed in labeled envelopes with the location and other pertinent information recorded.

Exposure Rate Measurements

Measurements of gamma exposure rates were performed at 1 m above the surface, using a pressurized ionization chamber (PIC).

Miscellaneous Samples

Soil Samples

Approximately 1 kg of soil was collected at each sample location. Collected samples were placed in a plastic bag, sealed, and labeled in accordance with ESSAP survey procedures.

Sediment Samples

Approximately 1 kg of sediment was collected at each sample location. Collected samples were placed in a plastic container sealed and labeled in accordance with ESSAP survey procedures.

ANALYTICAL PROCEDURES

Removable Activity

Gross Alpha/Beta

Smears were counted on a low background gas proportional system for gross alpha and gross beta activity.

Miscellaneous Samples

Gamma Spectrometry

Samples of soil and sediment were dried, mixed, crushed, and/or homogenized as necessary, and a portion sealed in 0.5-liter Marinelli beaker or other appropriate container. The quantity placed in the beaker was chosen to reproduce the calibrated counting geometry. Net material weights were determined and the samples counted using intrinsic germanium detectors coupled to a pulse height analyzer system. Background and Compton stripping, peak search, peak identification, and concentration calculations were performed using the computer capabilities inherent in the analyzer system. Energy peaks used for determination of radionuclides of concern were:

U - 235	0.186 MeV
U - 238	0.063 MeV or 0.093 MeV from Th-234*

*Secular equilibrium assumed.

Spectra were also reviewed for other identifiable photopeaks.

Alpha Spectrometry

Soil samples were crushed, homogenized and analyzed for isotopic uranium. Samples were dissolved by potassium fluoride and pyrosulfate fusion and the elements of interest were precipitated with barium sulfate. Barium sulfate precipitate was redissolved and the specific elements of interest were individually separated by liquid-liquid extraction and re-precipitated with a cerium fluoride carrier. The precipitate was then counted using surface barrier and ion implanted detectors (Tennelec and Canberra), alpha spectrometers (Tennelec and Canberra), and a multichannel analyzer (Canberra).

UNCERTAINTIES AND DETECTION LIMITS

The uncertainties associated with the analytical data presented in the tables of this report represent the 95% confidence level for that data based only on counting statistics. Additional uncertainties associated with sampling and measurement procedures, have not been propagated into the data presented in this report.

Detection limits, referred to as minimum detectable activity (MDA), were based on 2.71 plus 4.66 times the standard deviation of the background count. When the activity was determined to be less than the MDA of the measurement procedure, the result was reported as less than MDA. Because of variations in background levels, measurement efficiencies, and contributions from other radionuclide in samples, the detection limits differ from sample to sample and instrument to instrument.

CALIBRATION AND QUALITY ASSURANCE

Analytical and field survey activities were conducted in accordance with procedures from the following ESSAP documents:

- Survey Procedures Manual, Revision 7 (May 1992)
- Laboratory Procedures Manual, Revision 8 (July 1993)
- Quality Assurance Manual, Revision 6 (July 1993)

The procedures contained in these manuals were developed to meet the requirements of DOE Order 5700.6C and ASME NQA-1 for Quality Assurance and contain measures to assess processes during their performance.

Calibration of all field and laboratory instrumentation was based on standards/sources, traceable to NIST, when such standards/sources were available. In cases where they were not available, standards of an industry recognized organization was used. Calibration of pressurized ionization chambers was performed by the manufacturer.

Quality control procedures include:

- Daily instrument background and check-source measurements to confirm that equipment operation is within acceptable statistical fluctuations.
- Participation in EPA and EML laboratory Quality Assurance Programs.
- Training and certification of all individuals performing procedures.
- Periodic internal and external audits.

APPENDIX C

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE OR SPECIAL NUCLEAR MATERIALS

AND

GUIDELINES FOR RESIDUAL CONCENTRATIONS OF THORIUM AND URANIUM WASTES IN SOIL

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE, OR SPECIAL NUCLEAR MATERIALS

U.S. Nuclear Regulatory Commission
Division of Fuel Cycle & Material Safety
Washington, D.C. 20555

August 1987

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on a case-by-case basis.

1. The licensee shall make a reasonable effort to eliminate residual contamination.

2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.

3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces or premises, equipment, or scrap which are likely to be contaminated, but are such size, construction, or location as to make the surface inaccessible for purposes of measurement, shall be presumed to be contaminated in excess of the limits.

4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to special circumstances such as razing of buildings, transfer from premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:

    a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.

    b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment, or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of the survey report shall be filed with the Division of Fuel Cycle, Medical, Academic, and Commercial Use Safety, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:

a. Identify the premises.

b. Show that reasonable effort has been made to eliminate residual contamination.

c. Describe the scope of the survey and general procedures followed.

d. State the findings of the survey in units specified in the instruction.

Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

TABLE 1
ACCEPTABLE SURFACE CONTAMINATION LEVELS

Nuclides[a]	Average[b,c,f]	Maximum[b,d,f]	Removable[b,e,f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm^2	3,000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1,000 dpm $\beta\gamma$/100 cm^2

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

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h at 1 cm and 1.0 mrad/h at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

Guidelines for Residual Concentrations of Thorium and Uranium Wastes in Soil

On October 23, 1981, the Nuclear Regulatory Commission published in the Federal register a notice of Branch Technical Position on "Disposal or Onsite Storage of Thorium and Uranium Wastes from Past Operations." This document established guidelines for concentrations of uranium and thorium in soil, that will limit maximum radiation received by the public under various conditions of future land usage. These concentrations are as follows:

Material	Maximum Concentrations (pCi/g) for various options			
	1[a]	2[b]	3[c]	4[d]
Natural Thorium (Th-232 + Th-228) with daughters present and in equilibrium	10	50	--	500
Natural Uranium (U-238 + U-234) with daughters present and in equilibrium	10	--	40	200
Depleted Uranium:				
Soluble	35	100	--	1,000
Insoluble	35	300	--	3,000
Enriched Uranium:				
Soluble	30	100	--	1,000
Insoluble	30	250	--	2,500

[a] Based on EPA cleanup standards which limit radiation to 1 mrad/yr to lung and 3 mrad/yr to bone from ingestion and inhalation and 10 μR/h above background from direct external exposure.

[b] Based on limiting individual dose to 170 mrem/yr.

[c] Based on limiting equivalent exposure to 0.02 working level or less.

[d] Based on limiting individual dose to 500 mrem/yr and in case of natural uranium, limiting exposure to 0.02 working level or less.

CONFIRMATORY SURVEY OF BUILDINGS 5,5A,6,6A,7,8,8A,9,11, AND 12 WESTINGHOUSE ELECTRIC CORPORATION LARGE, PENNSYLVANIA

[DOCKET 70-997]

E. W. ABELQUIST

Prepared for the
U.S. Nuclear Regulatory Commission
Region I Office

ORISE

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

Environmental Survey and Site Assessment Program
Energy/Environment Systems Division

"OFFICIAL RECORD COPY"

ML 10

The **Oak Ridge Institute for Science and Education** (ORISE) was established by the U.S. Department of Energy to undertake national and international programs in science and engineering education, training and management systems, energy and environment systems, and medical sciences. ORISE and its programs are operated by Oak Ridge Associated Universities (ORAU) through a management and operating contract with the U.S. Department of Energy. Established in 1946, ORAU is a consortium of 65 colleges and universities.

NOTICES

The opinions expressed herein do not necessarily reflect the opinions of the sponsoring institutions of Oak Ridge Associated Universities.

This report was prepared as an account of work sponsored by the United States Government. Neither the United States Government nor the U.S. Department of Energy, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe on privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, mark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement or recommendation, or favor by the U.S. Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the U.S. Government or any agency thereof.

CONFIRMATORY SURVEY OF BUILDINGS 5,5A,6,6A,7,8,8A,9,11, AND 12 WESTINGHOUSE ELECTRIC CORPORATION LARGE, PENNSYLVANIA

[DOCKET 70-997]

E. W. ABELQUIST

Prepared for the
U.S. Nuclear Regulatory Commission
Region I Office

ORISE

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

Environmental Survey and Site Assessment Program
Energy/Environment Systems Division

"OFFICIAL RECORD COPY"

ML 10

The **Oak Ridge Institute for Science and Education** (ORISE) was established by the U.S. Department of Energy to undertake national and international programs in science and engineering education, training and management systems, energy and environment systems, and medical sciences. ORISE and its programs are operated by Oak Ridge Associated Universities (ORAU) through a management and operating contract with the U.S. Department of Energy. Established in 1946, ORAU is a consortium of 65 colleges and universities.

ORISE 93/K-143

CONFIRMATORY SURVEY
OF BUILDINGS 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, AND 12
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

Prepared by

E. W. Abelquist

Environmental Survey and Site Assessment Program
Energy/Environment System Division
Oak Ridge Institute for Science and Education
Oak Ridge, Tennessee 37831-0117

Prepared for the

U.S. Nuclear Regulatory Commission
Region I Office

Sponsored by the

Office of Nuclear Materials Safety and Safeguards

NOVEMBER 1993

FINAL REPORT

This report is based on work performed under an Interagency Agreement (NRC Fin. No. A-9076) between the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy. Oak Ridge Institute for Science and Education performs complementary work under contract number DE-AC05-76OR00033 with the U.S. Department of Energy.

"OFFICIAL RECORD COPY" ML 10

CONFIRMATORY SURVEY
OF BUILDINGS 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, AND 12
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

Prepared by: Eric W. Abelquist Date: 11/23/93
E. W. Abelquist, Project Leader
Environmental Survey and Site Assessment Program

Reviewed by: W L Beck Date: 11/23/93
W. L. Beck, Acting Laboratory Manager
Environmental Survey and Site Assessment Program

Reviewed by: Michele R. Landis Date: 11/23/93
M. R. Landis, Project Manager
Environmental Survey and Site Assessment Program

Reviewed by: Ann T. Payne Date: 11/23/93
A. T. Payne, Quality Assurance Officer
Environmental Survey and Site Assessment Program

Reviewed by: James D. Berger Date: 11/23/93
J. D. Berger, Program Director
Environmental Survey and Site Assessment Program

ACKNOWLEDGEMENTS

The author would like to acknowledge the significant contributions of the following staff members:

FIELD STAFF

A. J. Ansari
E. H. Bjelland
G. R. Foltz

LABORATORY STAFF

R. D. Condra
J. S. Cox
R. L. Epperson
M. J. Laudeman
S. T. Shipley

CLERICAL STAFF

T. T. Claiborne
D. A. Cox
R. D. Ellis
K. E. Waters

ILLUSTRATORS

T. D. Herrera
E. A. Powell

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES (continued)

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

ASME	American Society of Mechanical Engineers
cm	centimeter
cm^2	square centimeter
cpm	counts per minute
dpm/100 cm^2	disintegrations per minute/100 square centimeters
EML	Environmental Measurement Laboratory
EPA	Environmental Protection Agency
ESSAP	Environmental Survey and Site Assessment Program
ft	foot
GM	Geiger-Mueller
km	kilometer
m	meter
m^2	square meter
MDA	minimum detectable activity
MDL	Monitored Drain Line
NaI	sodium iodide
NERVA	Nuclear Engine for Rocket Vehicle Application
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
ORISE	Oak Ridge Institute for Science and Education
pCi/g	picocuries per gram
PIC	Pressurized Ionization Chamber
SNAP	Space Nuclear Advanced Propulsion
μR/h	microroentgen per hour
ZnS	zinc sulfide

CONFIRMATORY SURVEY
OF BUILDINGS 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, AND 12
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

INTRODUCTION AND SITE HISTORY

The Westinghouse Electric Corporation established the Astronuclear Laboratory in 1959 as part of the NERVA (Nuclear Engine for Rocket Vehicle Application) program, and, by late 1961, the program was moved to the Large Site, where operations continued until the late 1960's. By 1972, this work had been completed and the process areas had been decontaminated. The fuel for this program was highly enriched uranium (93% U-235, by weight) and this project represents the major use of radioactive material on the site.

Other programs that used radioactive material at the Large Site include the SNAP 23A Isotope Powered Generation System (encapsulated Sr-90), the Artificial Heart-Blood Pump (encapsulated Pu-238), and the Heat Source Demonstration Project (encapsulated Co-60).

During the late 1970's through the 1980's, use of radioactive material on the site was very limited. In 1991, the decision was made to terminate the Nuclear Regulatory Commission (NRC) License No. SNM-951 [Docket No. 70-997] on the site. Initial decommissioning efforts were directed towards the removal of the Monitored Drain Line (MDL) system and this effort was successfully completed by late 1991. Following removal of the Monitored Drain Line system, the trenches were backfilled and covered as appropriate. Preliminary surveys of the buildings were conducted in early 1992 and the final survey of the buildings and site grounds was completed in June 1993.

The results of the licensee's final radiological survey were submitted to the NRC from January through July 1993 as surveys were completed for a given section of the facility. At the request of the NRC's Region I Office, the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute of Science and Education (ORISE) conducted an independent confirmatory survey of Buildings 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, and 12 and outdoor areas, during the period of August 30 through September 2, 1993. This report summarizes the procedures and results of the survey.

SITE DESCRIPTION

The Westinghouse Site is located in Large, Pennsylvania (Figure 1). Pennsylvania State Route 51 runs along the south side of the site. Two streams, Lewis Run and Peters Creek, run along the edge of the Large Site and join just south of the site. Peters Creek flows northward along the eastern side of the site. There are two storm sewer outfalls from the site into this creek. Lewis Run flows eastward along the southern side of the site and one storm sewer outfall from the site empties into this stream. The site is generally level with a slight downward slope towards Peters Creek. Behind the buildings is a steep embankment which rises well above the height of all the buildings.

Buildings 5, 5A, 6, 6A, 7, 8, 8A, and 9 (Figure 2) are all interconnected and have been used for various operations throughout their history. Building 11 is located south of Building 5 and there has been no known use of radioactive material in this building. Building 12 is adjacent to Building 5A and is currently being used as a machine shop. The surveyed buildings constitute approximately 25,000 m^2 of floor space and the area of the site grounds included in the survey is approximately 50,000 m^2. A storm drain system, consisting of a long catch basin that spans the width of each building, runs beneath Buildings 5, 6, and 8. The first floor of Building 9 contains a system of concrete trenches (pipe chases) in the floor covered by steel plates. These pipe chases contained various service and process piping lines, including the MDL piping for the building. Most of the buildings are occupied and not all of the building areas were accessible to survey.

OBJECTIVE

The objective of the confirmatory survey is to provide independent document reviews and radiological data for use by the NRC in evaluating the adequacy and accuracy of the licensee's radiological status report relative to established guidelines.

DOCUMENT REVIEW

ESSAP reviewed the licensee's documentation associated with the decommissioning survey and analytical procedures and methods utilized by the licensee were reviewed for adequacy and appropriateness.[1] The post-remedial action data were reviewed for accuracy and completeness.

PROCEDURES

During the period from August 30 through September 2, 1993, ESSAP performed a confirmatory survey of Buildings 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, and 12 and the outdoor areas. The survey was conducted in accordance with a survey plan that was submitted to and approved by the NRC, Region I Office.[2] The hydrogen facility was not surveyed because it had been demolished and paved over prior to ESSAP's arrival. The survey of outdoor areas included the main storm drain catch basin (east parking lot), storm drain outfall to Peters Creek, and areas adjacent to the fenceline that surrounds the site.

INTERIOR

ESSAP used the following procedures for the interior portions of the survey.

Reference Grid

The existing 1 m^2 reference grid established by the licensee was used by ESSAP for survey reference. The licensee's reference system included (1) a section identifier that specifically located the survey area by building and floor, and (2) survey unit and subunit identifiers that specified a particular room or building area. The point of origin for floors and ceilings was the northwest corner of the surface and the upper left corner for walls. The survey point locations were measured from the point of origin and given X and Y dimensions (in meters) with the same signs as the standard Cartesian coordinate system (e.g., typical survey point locations were positive in the X direction and negative in the Y direction).

The measurement and sampling locations for the Monitored Drain Line system and pipe chases were consistently numbered by defining the zero point to be the north or east end of that section. Distances (in meters) were then measured from that point towards the south or west as appropriate.

Surface Scans

Floor and lower wall surfaces were scanned for alpha, beta, and gamma activity using large-area gas proportional and NaI scintillation detectors. A 100% floor scan was performed on the first floors of Buildings 5, 6, 6A, 7, 8A, and 9 and the tank pit in Building 9. Scans of the pipe chases and other areas not accessible with the large-area detectors were performed using smaller hand-held detectors. All detectors were coupled to ratemeter-scalers or ratemeters with audible indicators. Locations of elevated direct radiation identified by surface scans were marked for further investigation.

Surface Activity Measurements

Measurements to determine total alpha and beta surface activity levels were performed on randomly selected grid locations on the floor and lower walls in each of the areas surveyed. Approximately 500 direct measurements were performed in the surveyed areas. Direct measurements were performed using ZnS scintillation and thin-window GM detectors, coupled to ratemeter-scalers. A smear sample for determining removable activity was obtained at each direct measurement location. Measurement and sampling locations for total and removable activity are illustrated in Figures 3 through 22.

Exposure Rate Measurements

Background exposure rate measurements at 1 m above the surface, were obtained from locations within Building 4 and the Firehouse. These buildings exhibit similar construction as the surveyed buildings and their site history indicates no use of radiological materials. Exposure rate measurements were performed at one meter above surfaces at 23 interior locations using a pressurized ionization chamber (PIC). Measurement locations are shown in Figures 3 through 22.

Miscellaneous Sampling

Twenty soil samples were selected for confirmatory analysis from those collected and archived by the licensee from the monitored drain line system remediation (Figure 23).

A smear sample was collected by passing cloth media through a section of pipe running between Buildings 6 and 6A. This pipe was from a section of the MDL that was left in place. A section of this pipe, approximately one foot long, was cut in half by the licensee and provided to ESSAP for survey measurements (i.e., direct measurements and smears).

EXTERIOR

ESSAP used the following procedures for outdoor portions of the survey area.

Reference Grid

ESSAP measurement and sampling locations were referenced to prominent site features and recorded on appropriate drawings.

Surface Scans

Surface scans of outdoor locations were performed using NaI scintillation detectors, coupled to ratemeters with audible indicators. Areas of elevated direct radiation, suggesting the presence of surface or near surface contamination, were marked for further investigation.

Exposure Rate Measurements

Background exposure rate measurements were made at 6 off-site locations within 0.5 to 10 km of the site using a PIC. Measurement locations are indicated on Figure 24.

Exposure rate measurements were performed at 1 meter above the surface at each soil sampling location using a PIC. Measurement locations are indicated on Figure 25.

Soil Sampling

Background soil samples were collected from 6 off-site locations within 0.5 to 10 km of the site. Measurement locations are indicated on Figure 24.

Surface soil (0-15 cm) samples were collected from 6 randomly selected locations around the site (Figure 25). Additionally, an archived soil sample was selected from the east parking lot area where packaged radioactive waste was staged.

Miscellaneous Sampling

Sediment samples were collected from the main storm drain outfall to Peters Creek and from the storm drain catch basin in the east parking lot. Sampling locations are shown in Figure 25.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ESSAP Oak Ridge laboratory for analyses and interpretation. Smears were analyzed for gross alpha and gross beta activity. Direct measurement and smear data were converted to units of disintegrations per minute per 100 cm^2 (dpm/100 cm^2), and exposure rate measurements were reported in microroentgens per hour (μR/h). Soil and miscellaneous samples were analyzed by gamma spectrometry and/or alpha spectrometry. Spectra were reviewed for U-235, U-238, and any other identifiable photopeaks. Soil sample results were reported in units of picocuries per gram (pCi/g). Additional information concerning major instrumentation, sampling equipment, and analytical procedures is provided in Appendices A and B. Results were compared to NRC guidelines which are provided in Appendix C.

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP reviewed the licensee's radiological survey data and comments were provided to the NRC.[3,4,5] The licensee provided the NRC with a response to those comments made in references 3 and 4. The ESSAP comments expressed in Reference 5 were forwarded to NRC Headquarters for resolution. In ESSAP's opinion, the licensee's documents provide an adequate description of the radiological condition of the facility relative to the NRC guidelines for release to unrestricted use.

INTERIOR

Surface Scans

Surface scans identified two locations of elevated direct radiation at the following locations: the floor on the first floor of Building 6 (13,000 beta dpm/100 cm^2) and adjacent to the pipe chase in Room 10-3-1 of Building 9 (23,000 beta dpm/100 cm^2). The licensee remediated each location by scabbling. ESSAP then performed post-remedial action scans and direct measurements to confirm the decontamination.

Surface Activity Levels

Results of total and removable surface activity levels are summarized in Table 1. Total activity measurements ranged from <69 dpm/100 cm^2 to 3000 dpm/100 cm^2 for alpha and <1400 dpm/100 cm^2 to 4800 dpm/100 cm^2 for beta. Grid block averages were determined for the two direct measurements within the pipe chases that exceeded 5000 dpm/100 cm^2 beta activity. The grid block averages for alpha were 260 and 1000 dpm/100 cm^2, and for beta activity were 2700 and 2900 dpm/100 cm^2. Removable activity ranged from <12 to 300 dpm/100 cm^2 for alpha and from <16 to 67 dpm/100 cm^2 for beta.

Exposure Rate Measurements

The background exposure rates averaged 9 μR/h.

Exposure rate measurements are summarized in Table 2. The measurements ranged from 7 μR/h to 13 μR/h.

Uranium Concentrations in Archived MDL Soil Samples

Concentrations of U-235, U-238, and total uranium measured by ESSAP in MDL soil samples (collected by the licensee and provided to ESSAP for confirmatory analysis) ranged from 0.1 to 2.3 pCi/g, 0.1 to 3.2 pCi/g, and 3.0 to 69.0 pCi/g, respectively (Table 3). Based on a paired comparison *t*-test, there are no statistically significant differences ($p = 0.6$) between the licensee's and the ESSAP gamma spectrometry data for U-235 (licensee U-238 concentrations were not available for all soil samples).

Four MDL soil samples were analyzed by alpha spectrometry to evaluate the appropriateness of the total-uranium-to-U-235 ratio established by the licensee (Table 4). The uranium activity in these samples was not sufficient to establish such a ratio. The ratio of total uranium to U-235 (30) established by the licensee appears to be a reasonable value in calculating total uranium concentrations based on knowledge of the material used and the ESSAP limited soil results.

Miscellaneous Samples

Results of gross alpha and gross beta activity on the smear taken from inside the section of pipe between Buildings 6 and 6A was <12 dpm/100 cm^2 for alpha and <16 dpm/100 cm^2 for beta.

Review of the gamma spectrometry data resulted in no identifiable photopeaks other than those from naturally occurring radionuclides.

Direct measurements on fragments removed from the pipe were <78 and <1400 cpm/100 cm^2, for alpha and beta activity, respectively. Removable activity on the pipe fragments was <12 dpm/100 cm^2 for alpha and <16 dpm/100 cm^2 for beta.

EXTERIOR

Surface Scans

Surface scans for gamma activity were within the range of ambient background levels.

Exposure Rate Measurements

Background exposure rates for outdoor areas ranged from 8 to 9 μR/h and averaged 9 μR/h (Table 5).

Exposure rate measurements for on-site outdoor areas are presented in Table 6. On-site exposure rates ranged from 9 to 11 μR/h.

Uranium Concentrations in Soil Samples

Total uranium concentration in background soil samples ranged from 2.4 to 4.8 pCi/g (Table 5).

Uranium concentrations in soil samples collected from around the site are presented in Table 7. Concentrations of U-235, U-238, and total uranium in samples collected from the site area ranged from 0.1 to 0.3 pCi/g, 1.1 to 2.9 pCi/g, and 3.0 to 9.0 pCi/g, respectively.

Miscellaneous Samples

The uranium concentrations in the two sediment samples were 1.2 pCi/g for U-238 for both samples, 0.2 to 0.4 pCi/g for U-235, and 6.0 and 12.0 pCi/g for total uranium. Since only two samples were collected, the results do not appear in a separate table.

COMPARISON OF RESULTS WITH GUIDELINES

The NRC guidelines for surface contamination and residual concentrations of radionuclides in soil, established for license termination or release of a facility for unrestricted use are presented in Appendix C. The primary contaminant of concern at this site is enriched uranium. The surface contamination guidelines for natural uranium, U-235, U-238 and associated decay products are:[6]

Total Activity

5,000 α dpm/100 cm^2, averaged over a 1 m^2 area

15,000 α dpm/100 cm^2, maximum in a 100 cm^2 area

Removable Activity

1,000 α dpm/100 cm^2

Surface activity measurements for total and removable activity in all interior areas surveyed were within these guidelines.

The soil concentration guideline for enriched uranium is 30 pCi/g above natural background.[7] With one exception (MDL pit behind Building 5, NW corner; 69.0 pCi/g), the uranium concentrations in soil samples collected were within this limit. This same soil sample was also analyzed by alpha spectrometry and determined to have a total uranium concentration of 21.3 pCi/g (Table 4). The reason for this difference is unknown; however, it is believed to be the result of incomplete sample homogenization prior to alpha spectroscopy analysis.

The NRC guideline for exposure rate at 1 m above the surface is 5 μR/h above background.[8] All interior and exterior exposure rates were within this limit.

SUMMARY

During the period August 30 through September 2, 1993, at the request of the NRC Region I Office, the Environmental Survey and Site Assessment Program of ORISE performed a confirmatory survey of Buildings 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, and 12 and outdoor areas at the Westinghouse Electric Corporation in Large, Pennsylvania. The interior survey activities consisted of surface scans of the floor and lower wall surfaces for alpha, beta, and gamma activity, measurements of total and removable activity, exposure rate measurements, soil and miscellaneous sampling. Exterior survey activities included gamma surface scans, exposure rate measurements, and soil and sediment sampling.

Total and removable surface activity measurements were all below the guideline values. Interior and exterior exposure rate measurements were all within the 5 μR/h above background criterion.

The total uranium concentration in soil and sediment samples, with one exception, was below the guideline value of 30 pCi/g. The total uranium concentration in the soil sample collected below the northwest corner of the MDL pit was determined to be 69.0 pCi/g by gamma spectrometry.

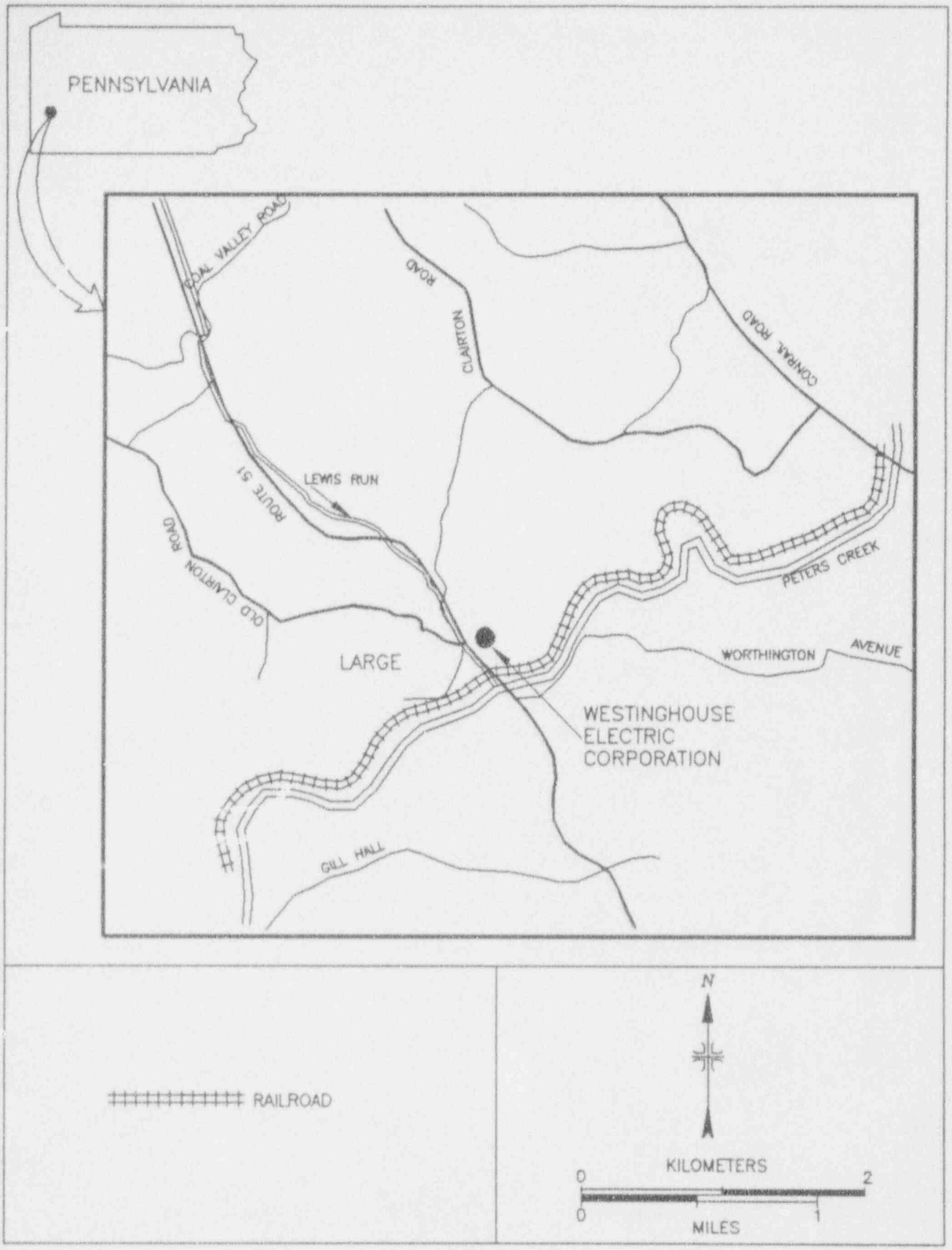


FIGURE 1: Location of the Westinghouse Electric Corporation, Large, Pennsylvania

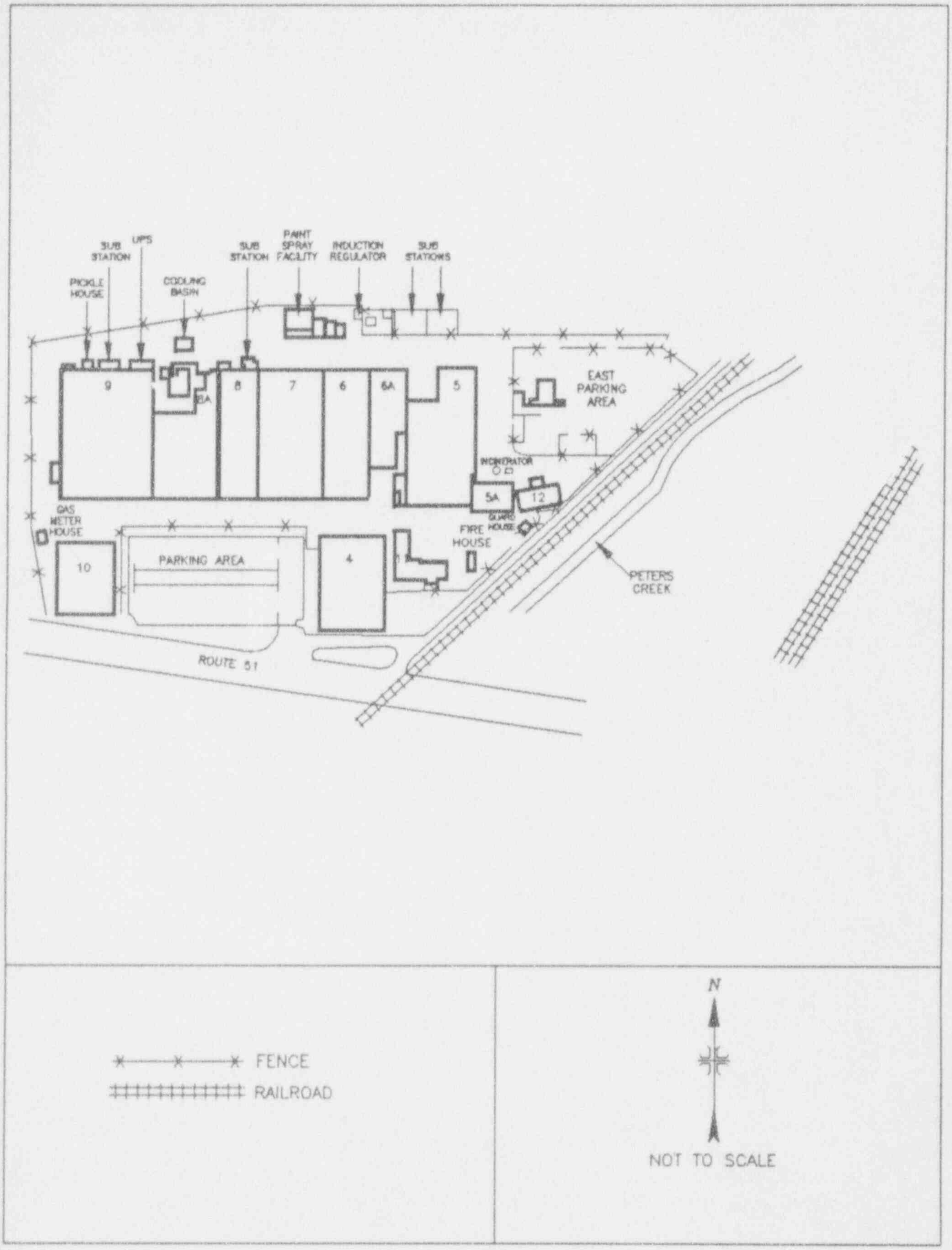


FIGURE 2: Site Plot Plan

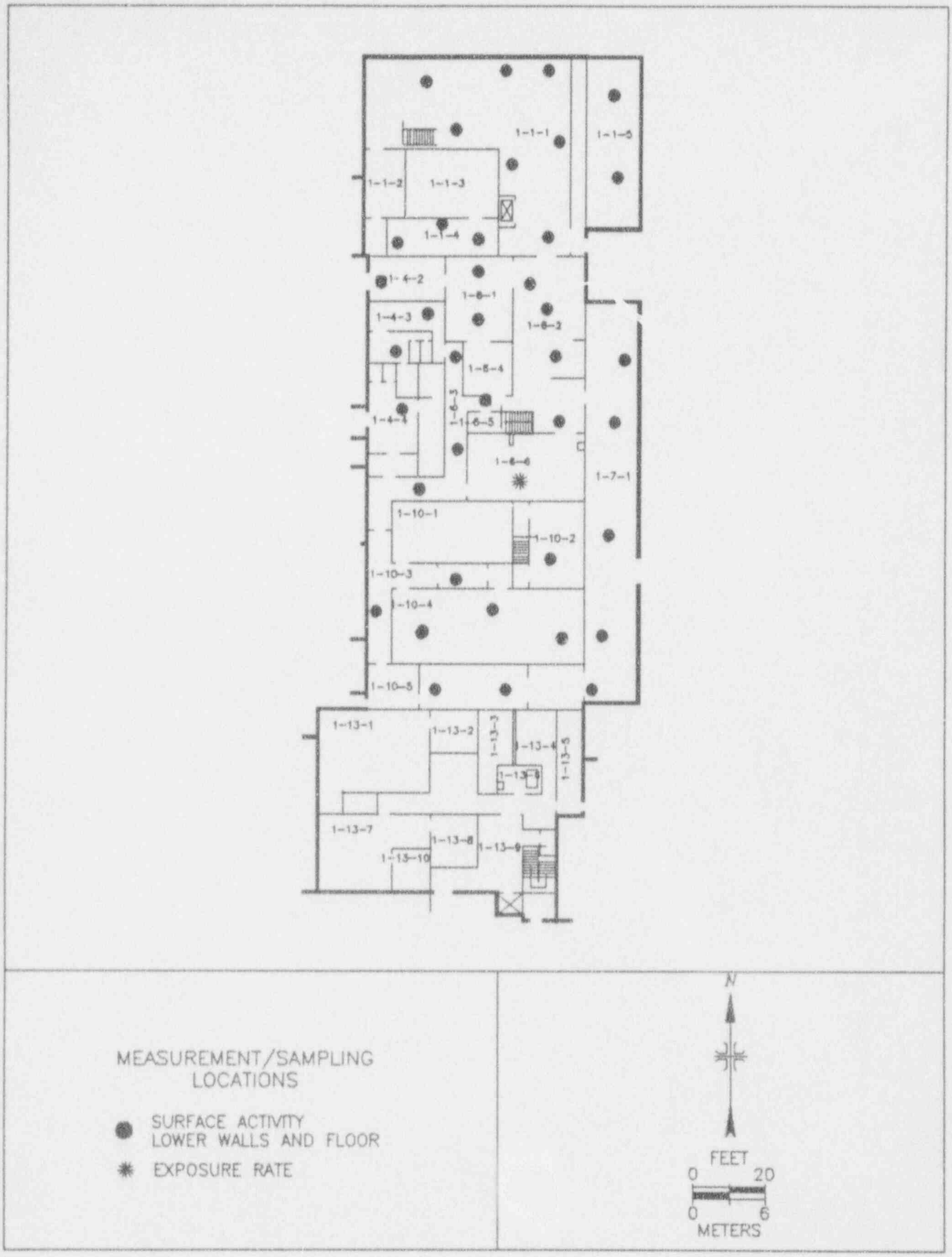


FIGURE 3: Building 5, First Floor, Eastern Portion – Measurement and Sampling Locations

WLP1

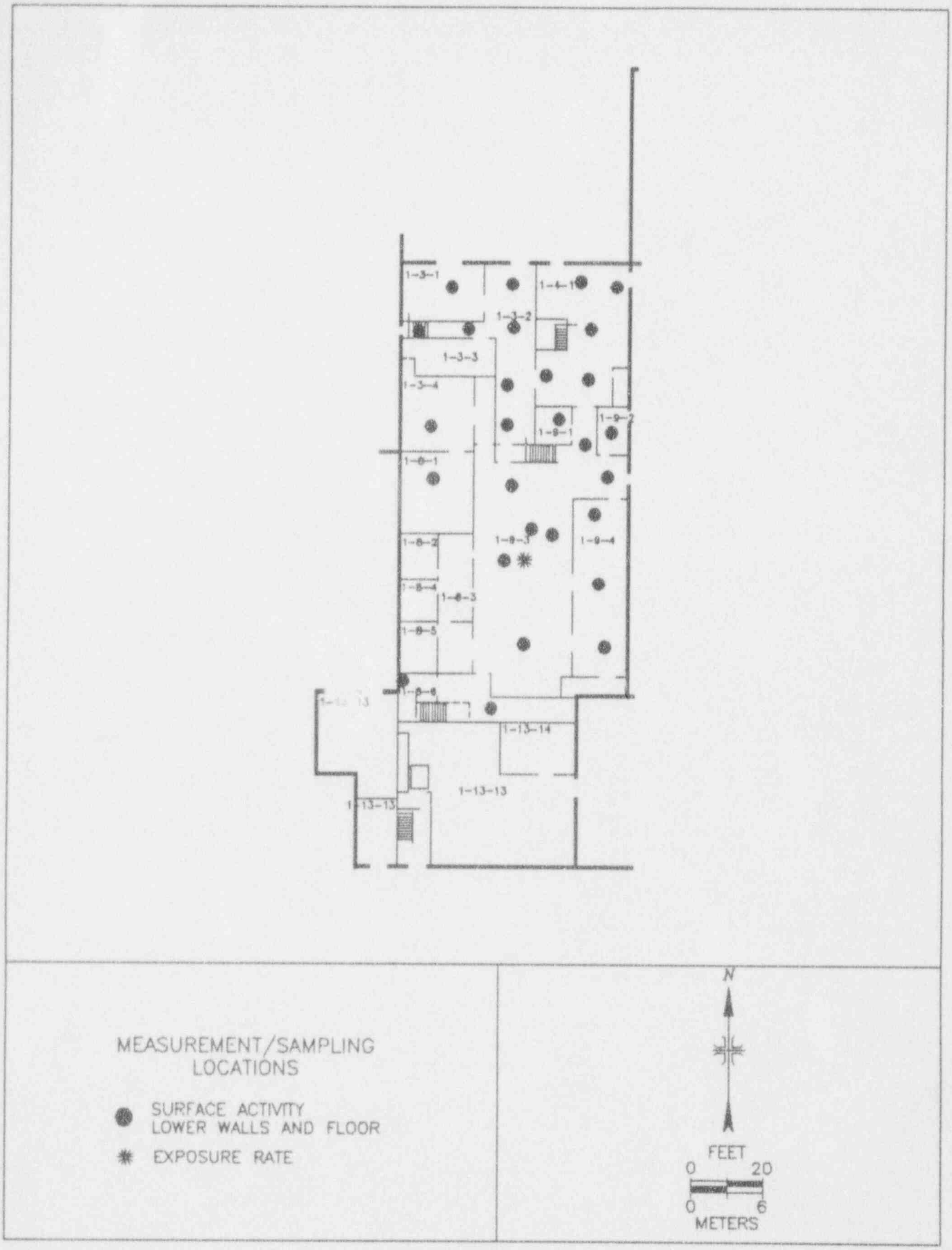


FIGURE 4: Building 5, First Floor, Western Portion – Measurement and Sampling Locations

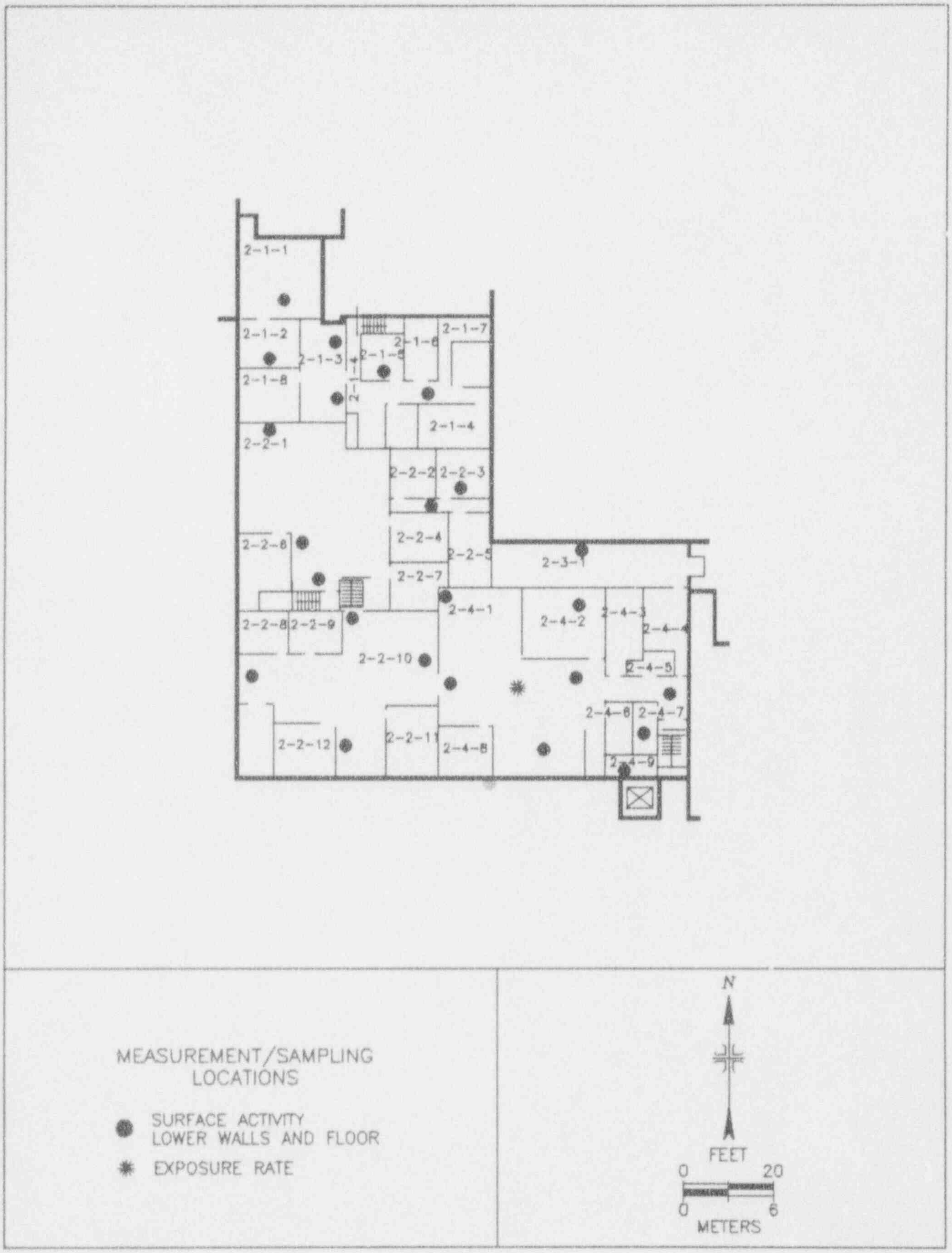


FIGURE 5: Building 5, Second Floor — Measurement and Sampling Locations

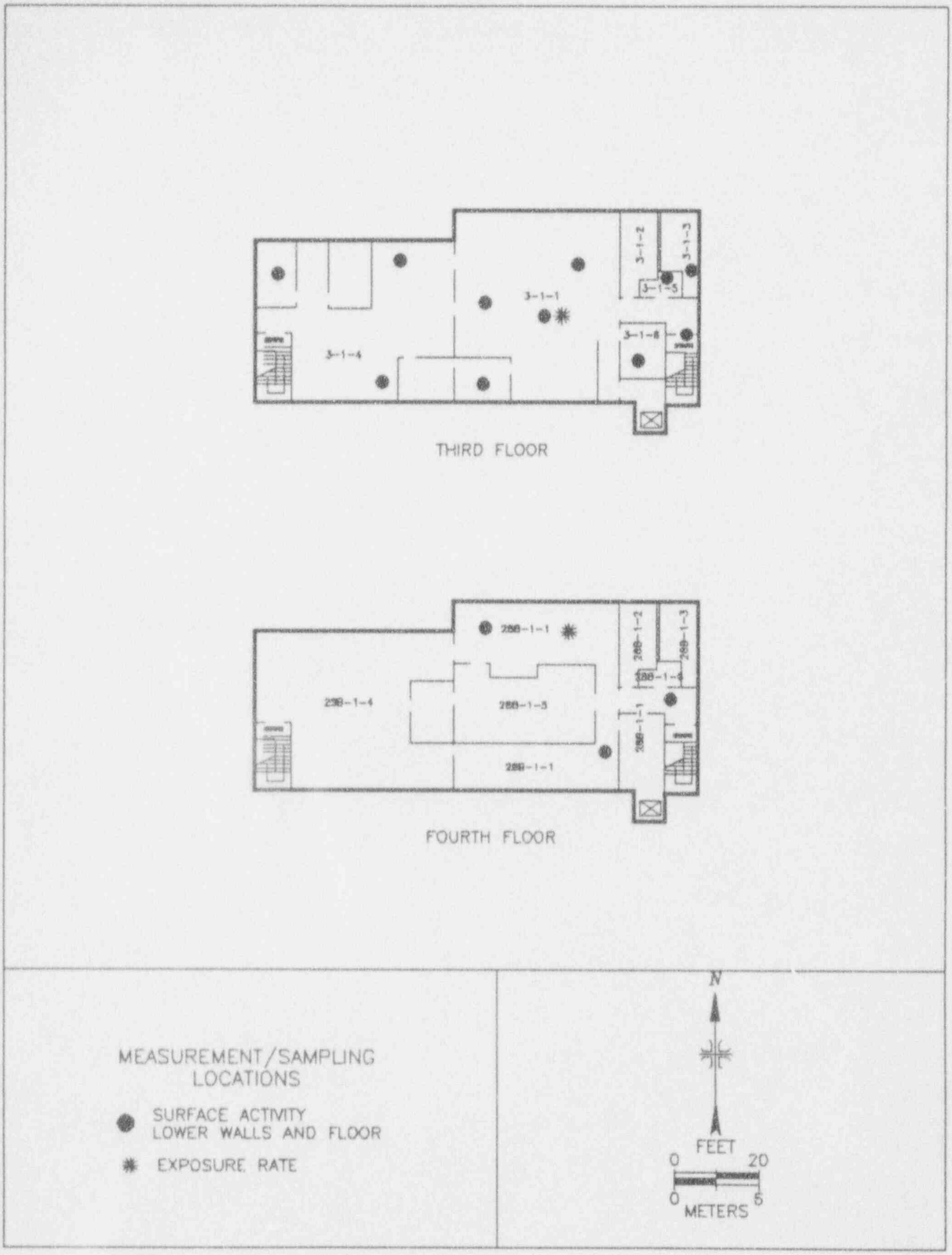


FIGURE 6: Building 5, Third and Fourth Floors – Measurement and Sampling Locations

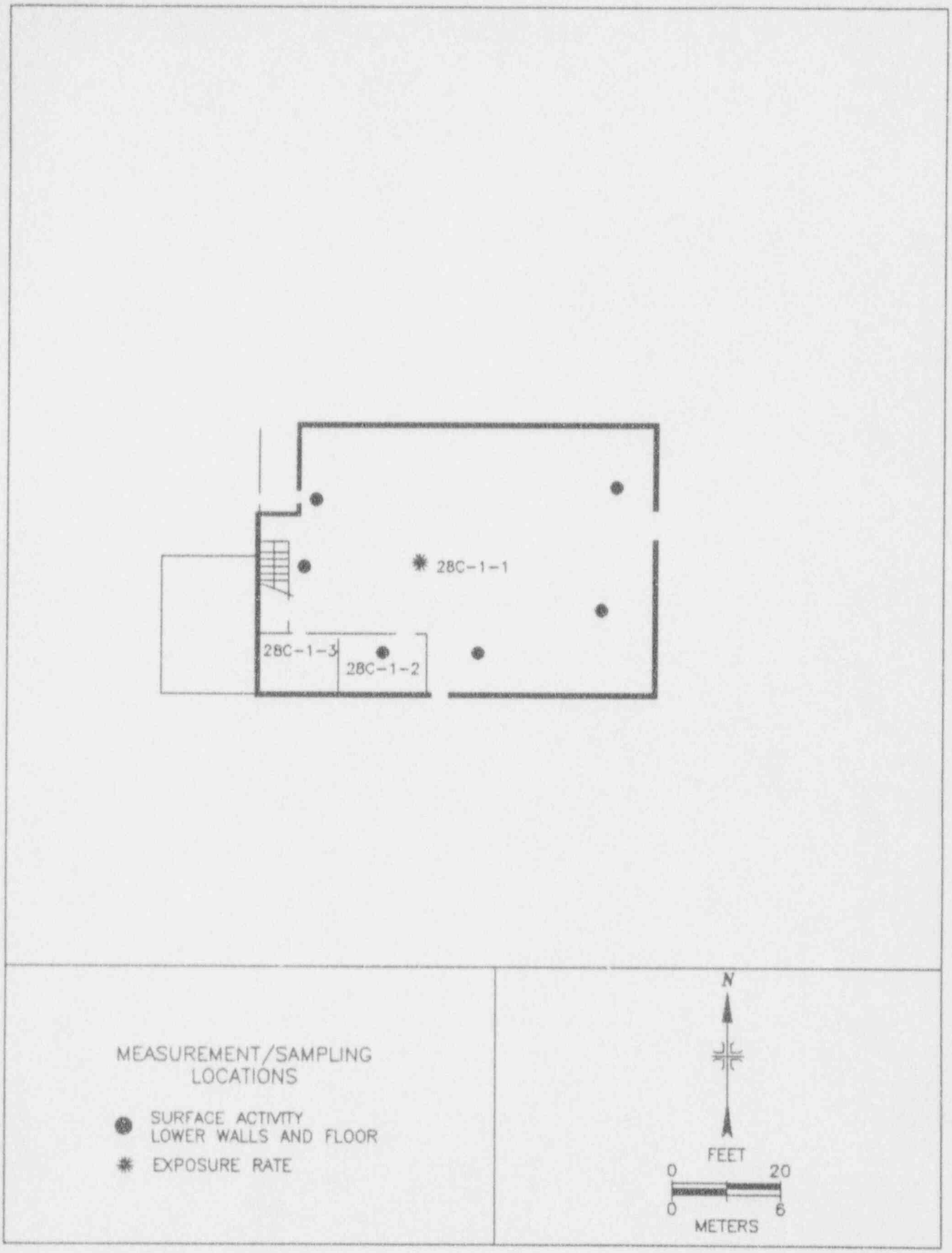


FIGURE 7: Building 5A, First Floor – Measurement and Sampling Locations

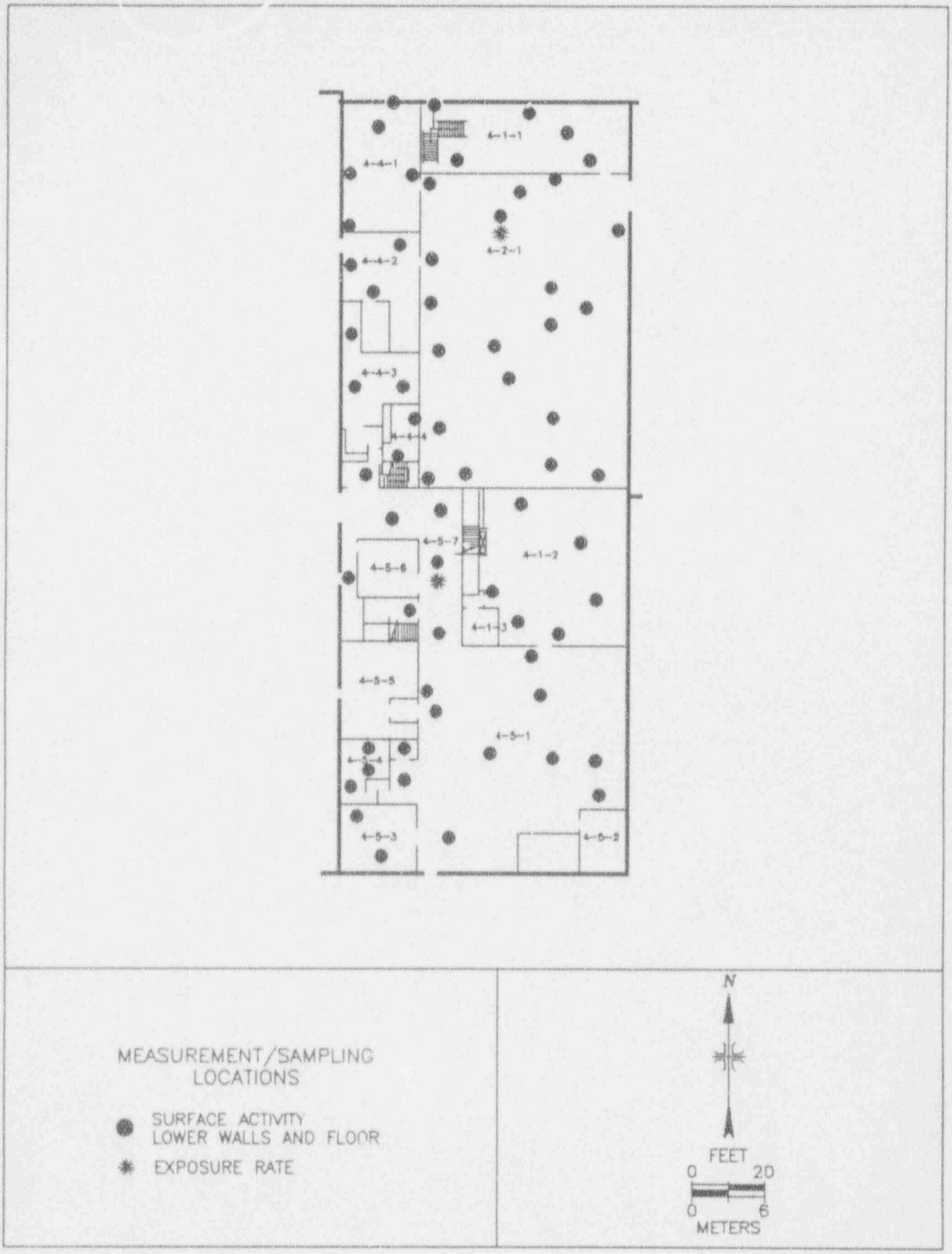


FIGURE 8: Building 6, First Floor — Measurement and Sampling Locations

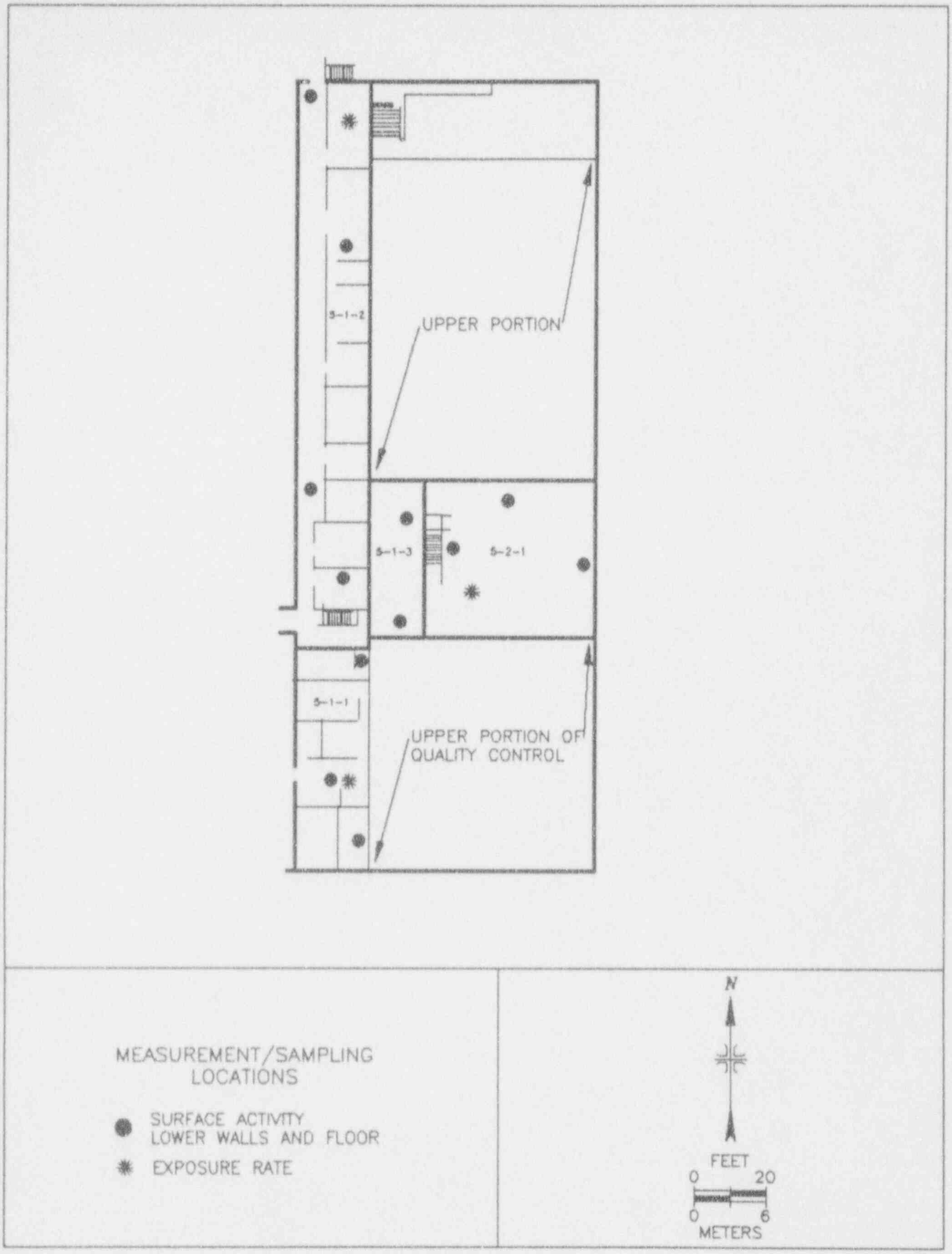


FIGURE 9: Building 6, Second Floor – Measurement and Sampling Locations

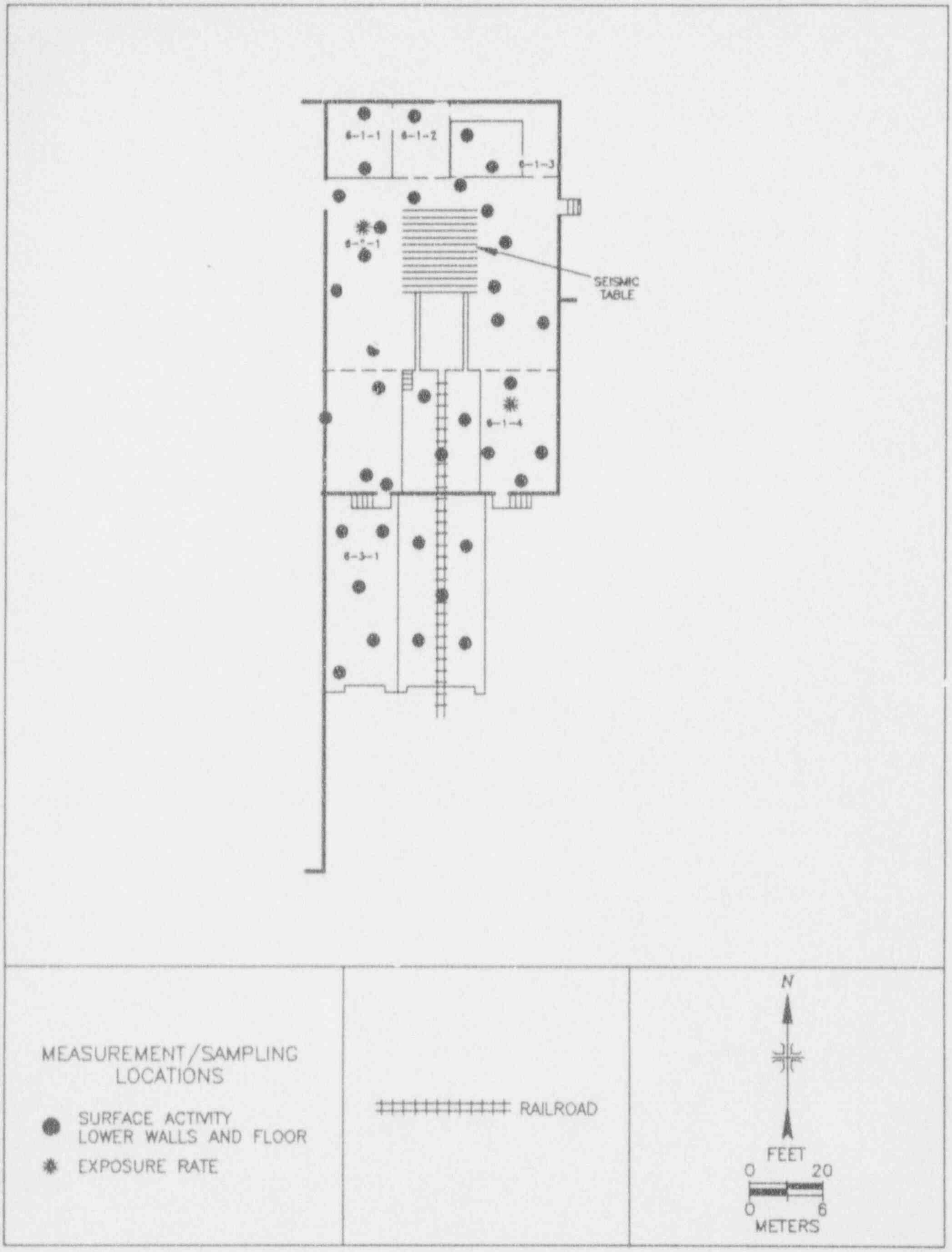


FIGURE 10: Building 6A, First Floor – Measurement and Sampling Locations

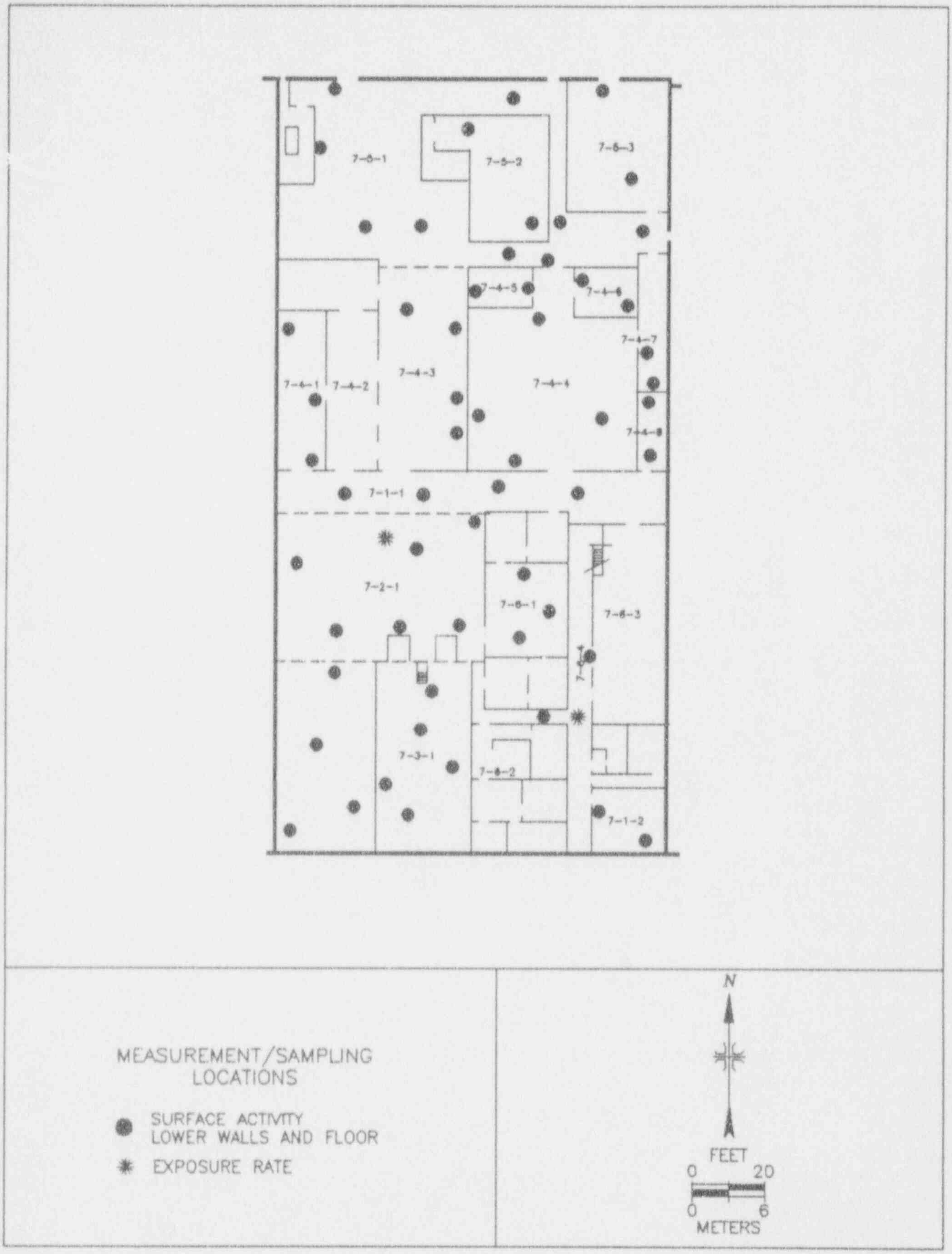


FIGURE 11: Building 7, First Floor — Measurement and Sampling Locations

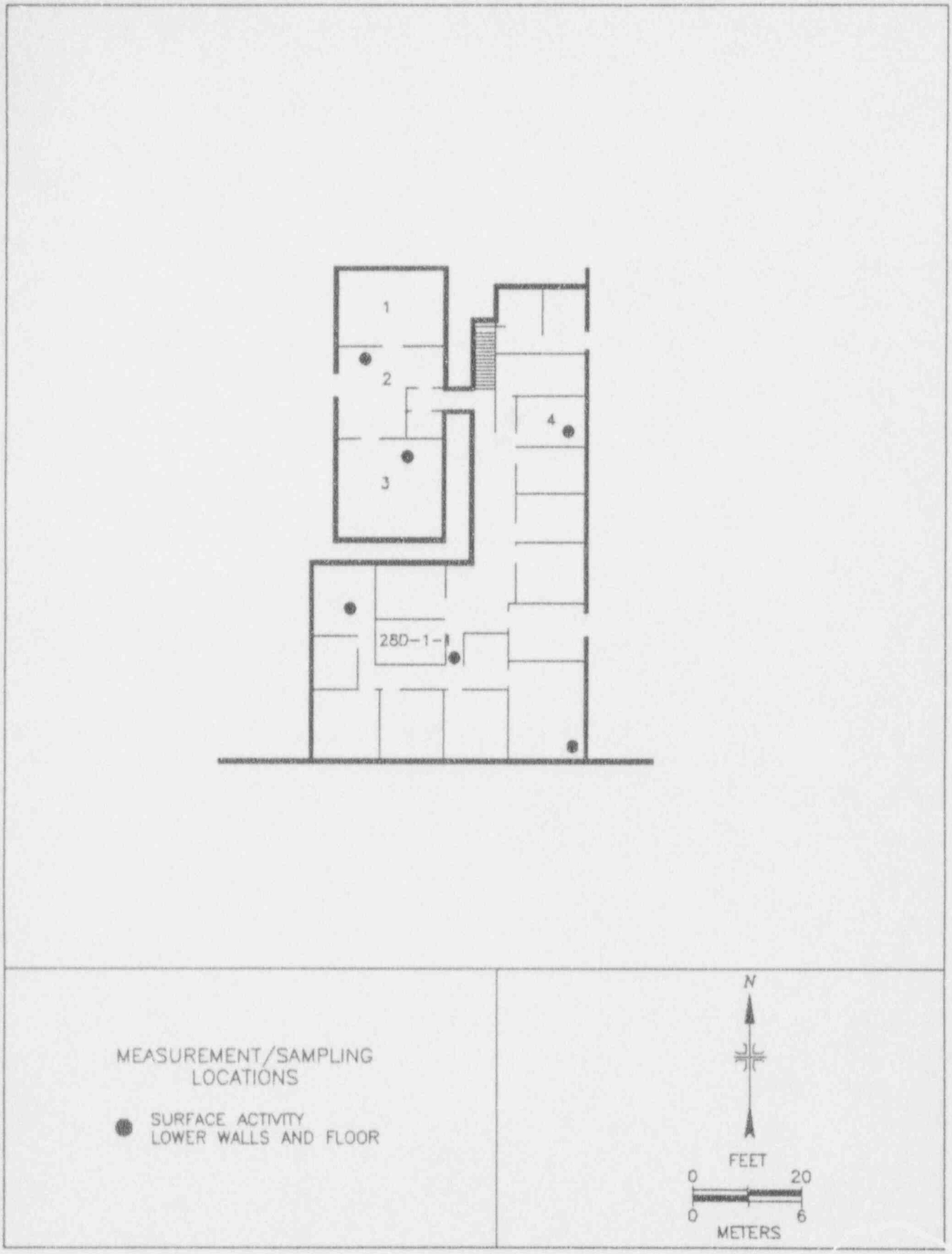


FIGURE 12: Building 7, Second Floor - Measurement and Sampling Locations

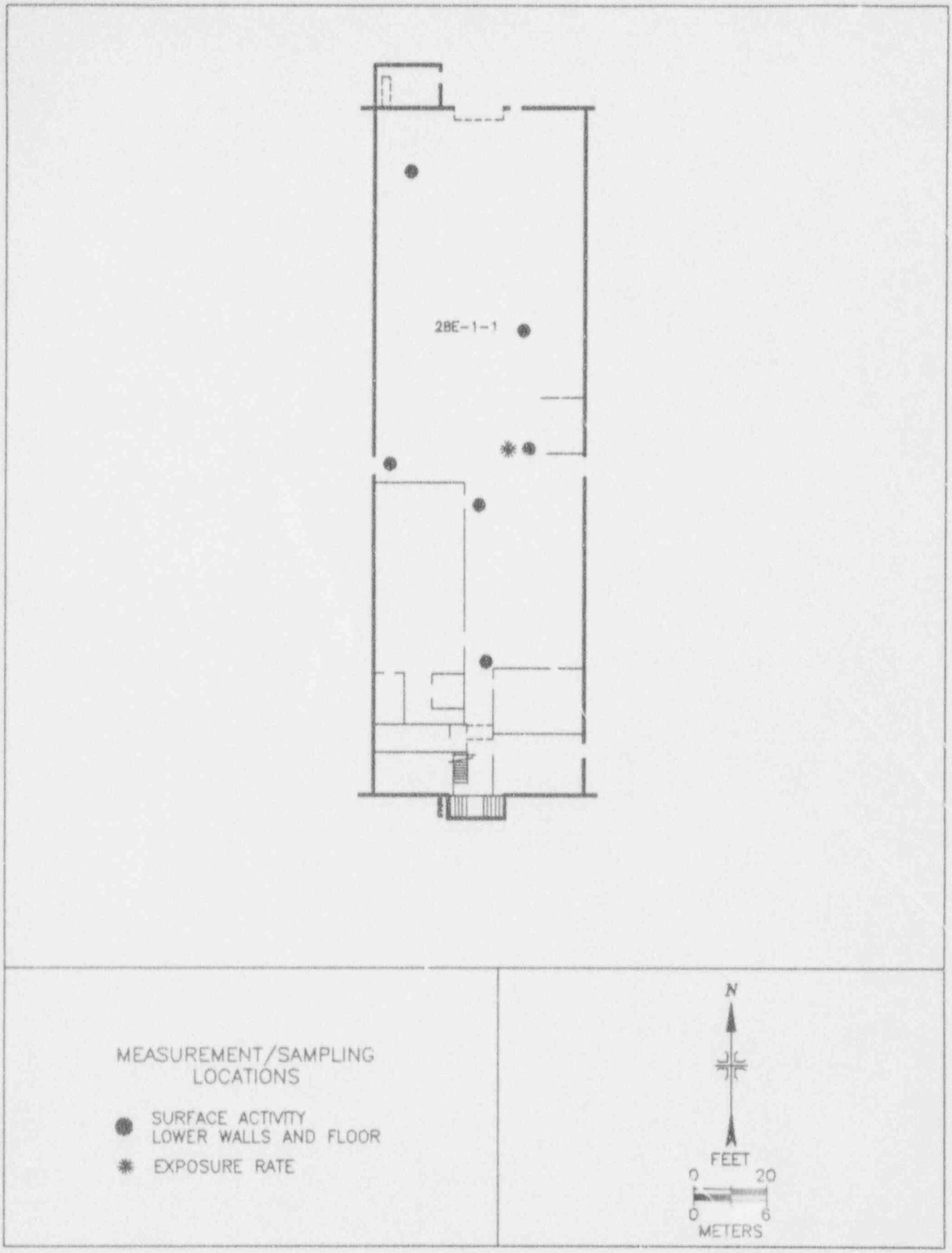


FIGURE 13: Building 8, First Floor – Measurement and Sampling Locations

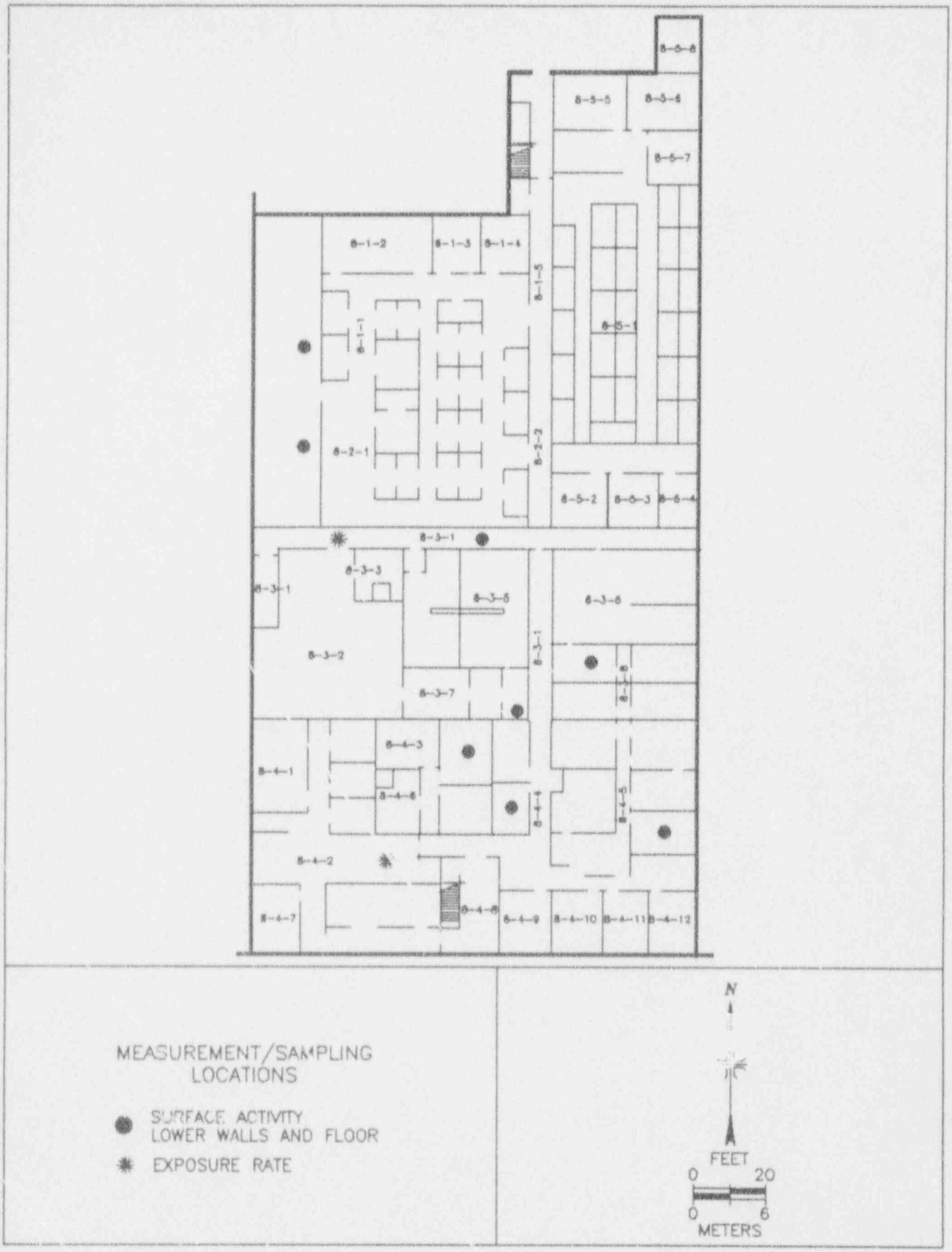


FIGURE 14: Building 8A, First Floor – Measurement and Sampling Locations

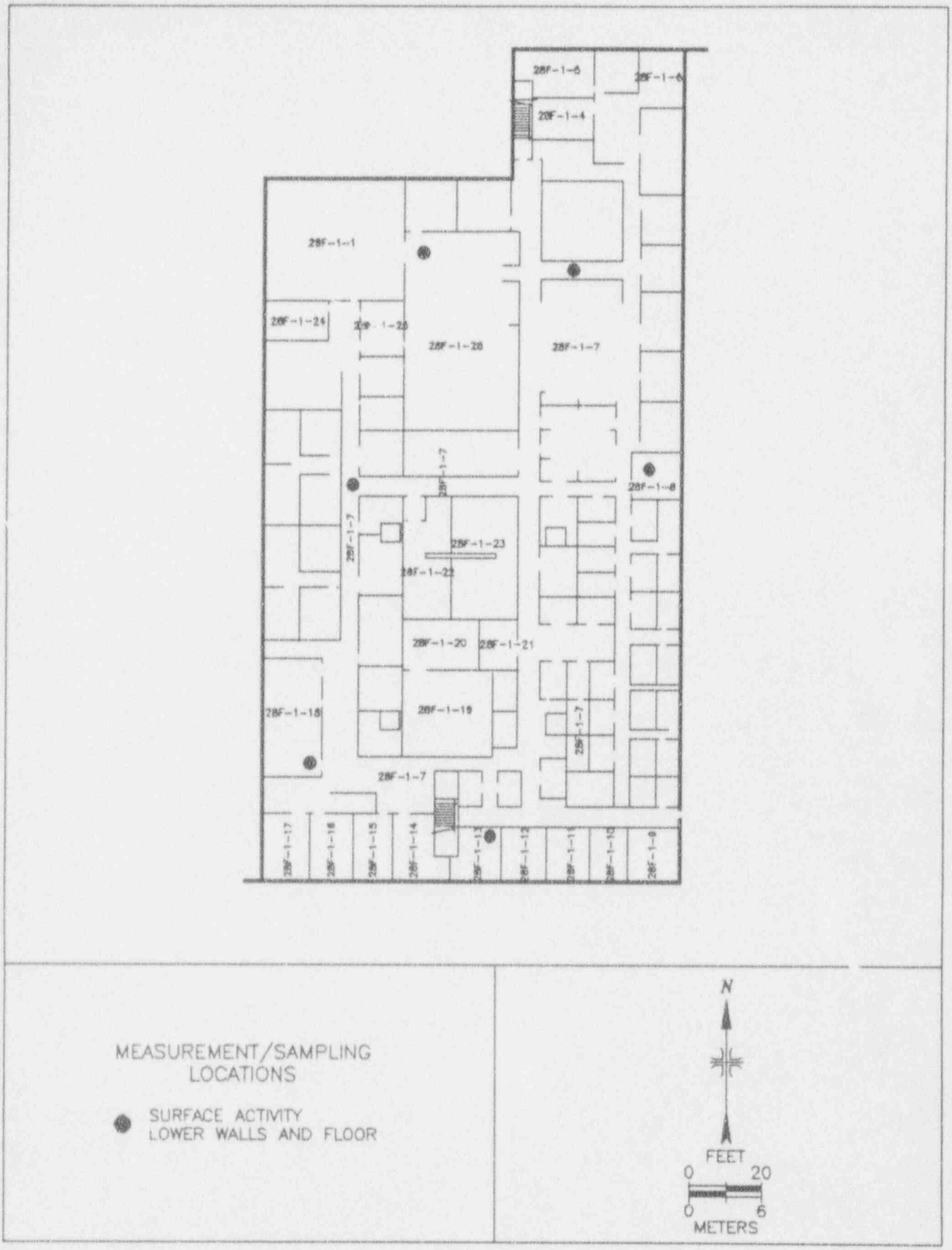


FIGURE 15: Building 8A, Second Floor – Measurement and Sampling Locations

WLP9

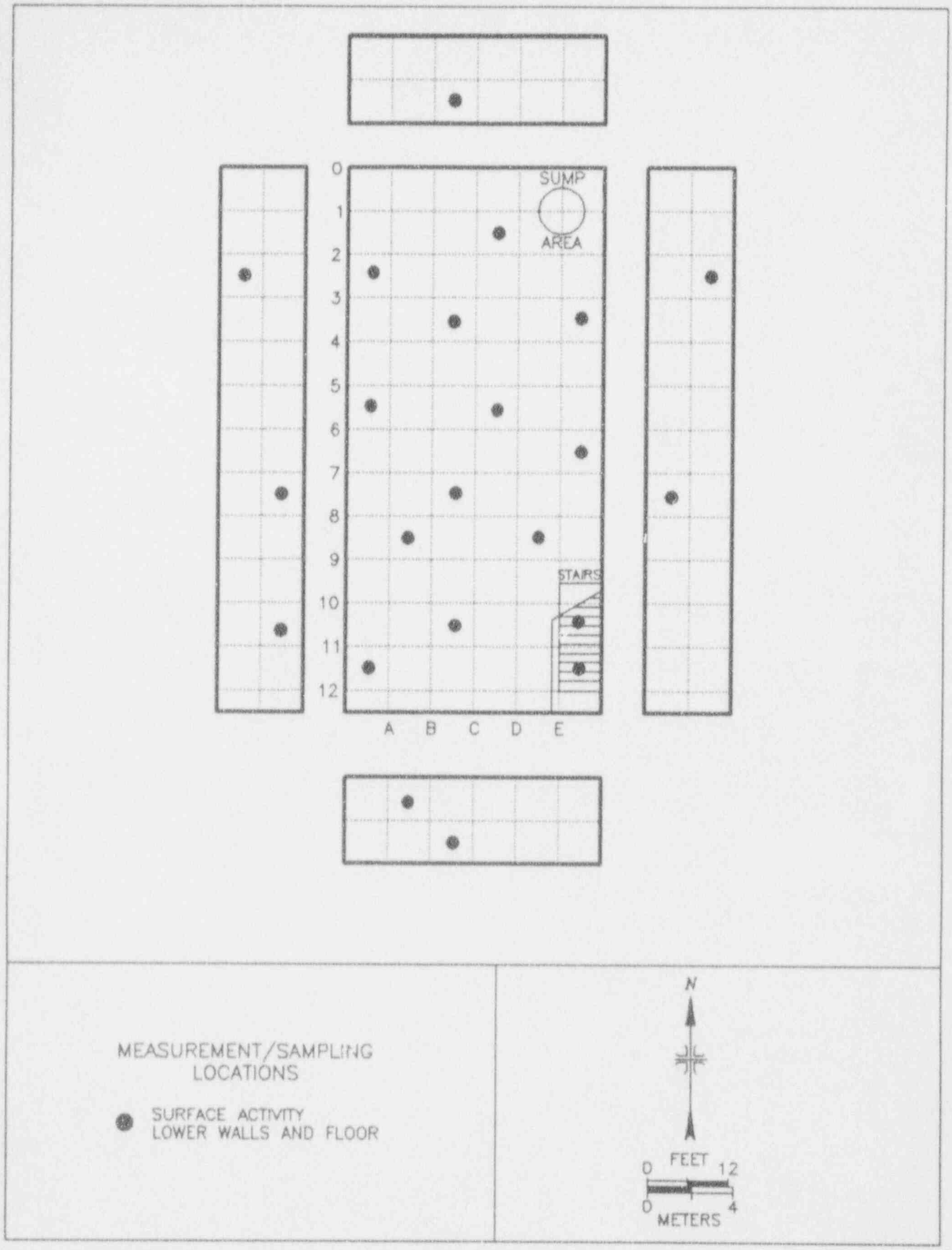


FIGURE 16: Building 9, Tank Pit – Measurement and Sampling Locations

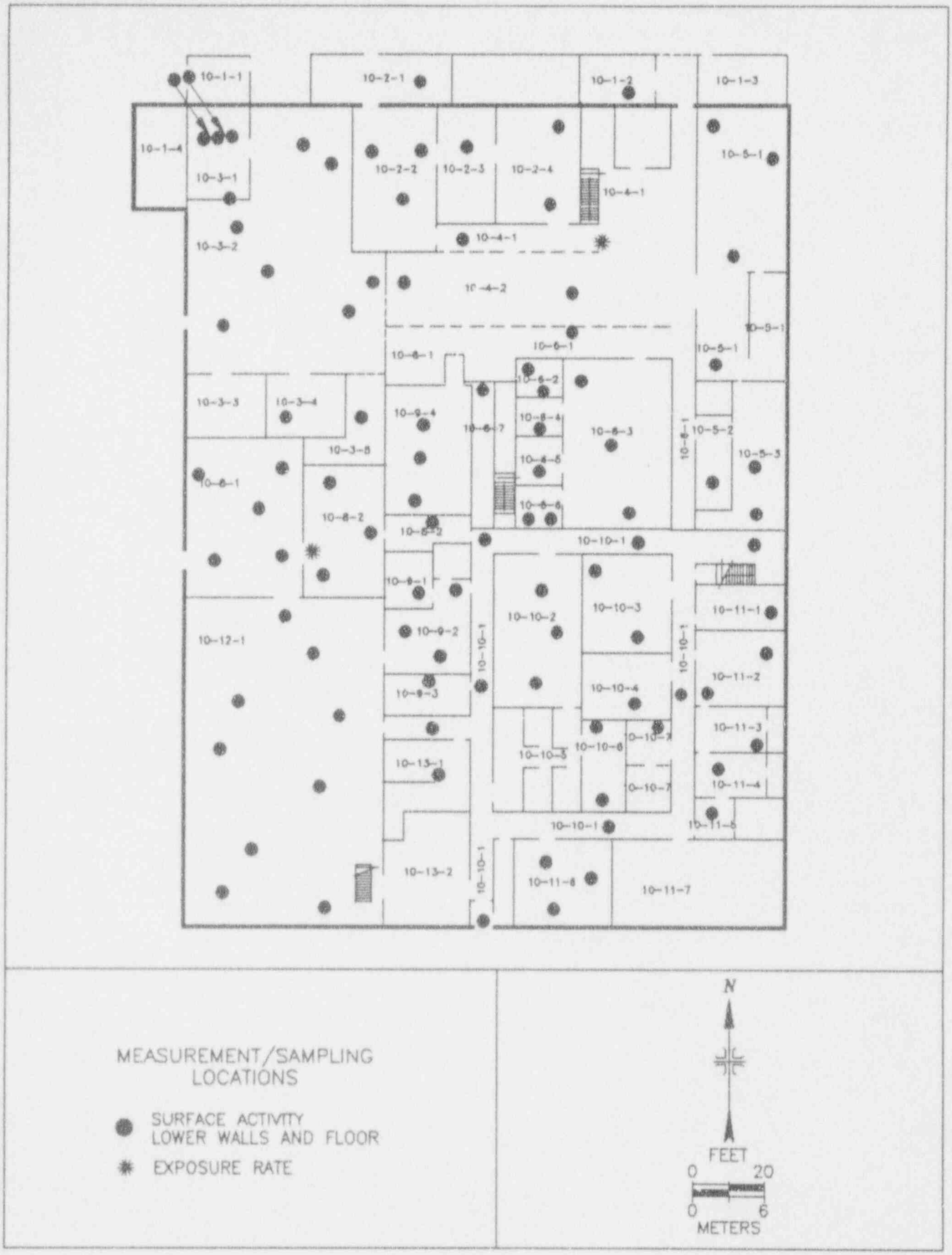


FIGURE 17: Building 9, First Floor — Measurement and Sampling Locations

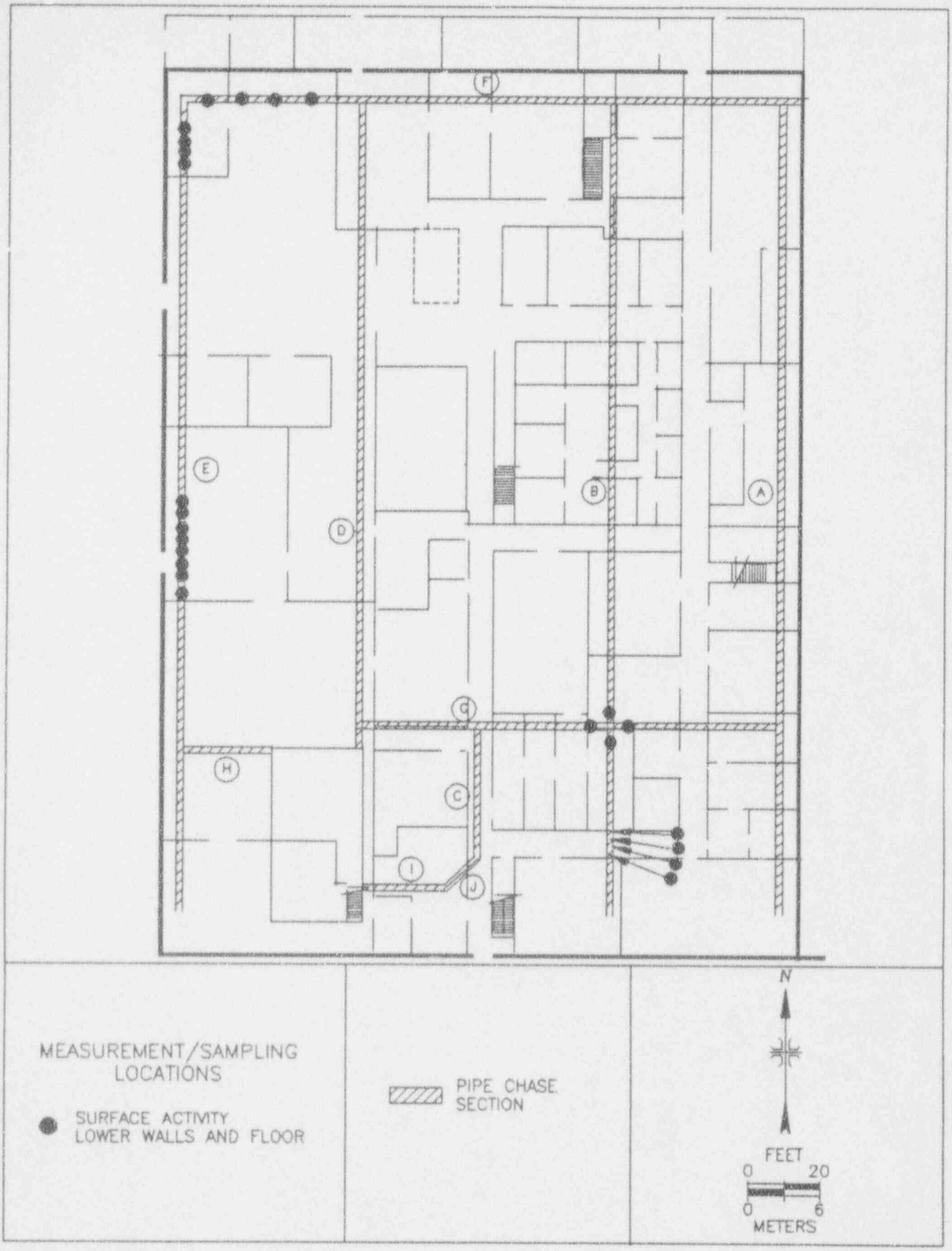


FIGURE 18 Building 9, First Floor Pipe Chases – Measurement and Sampling Locations

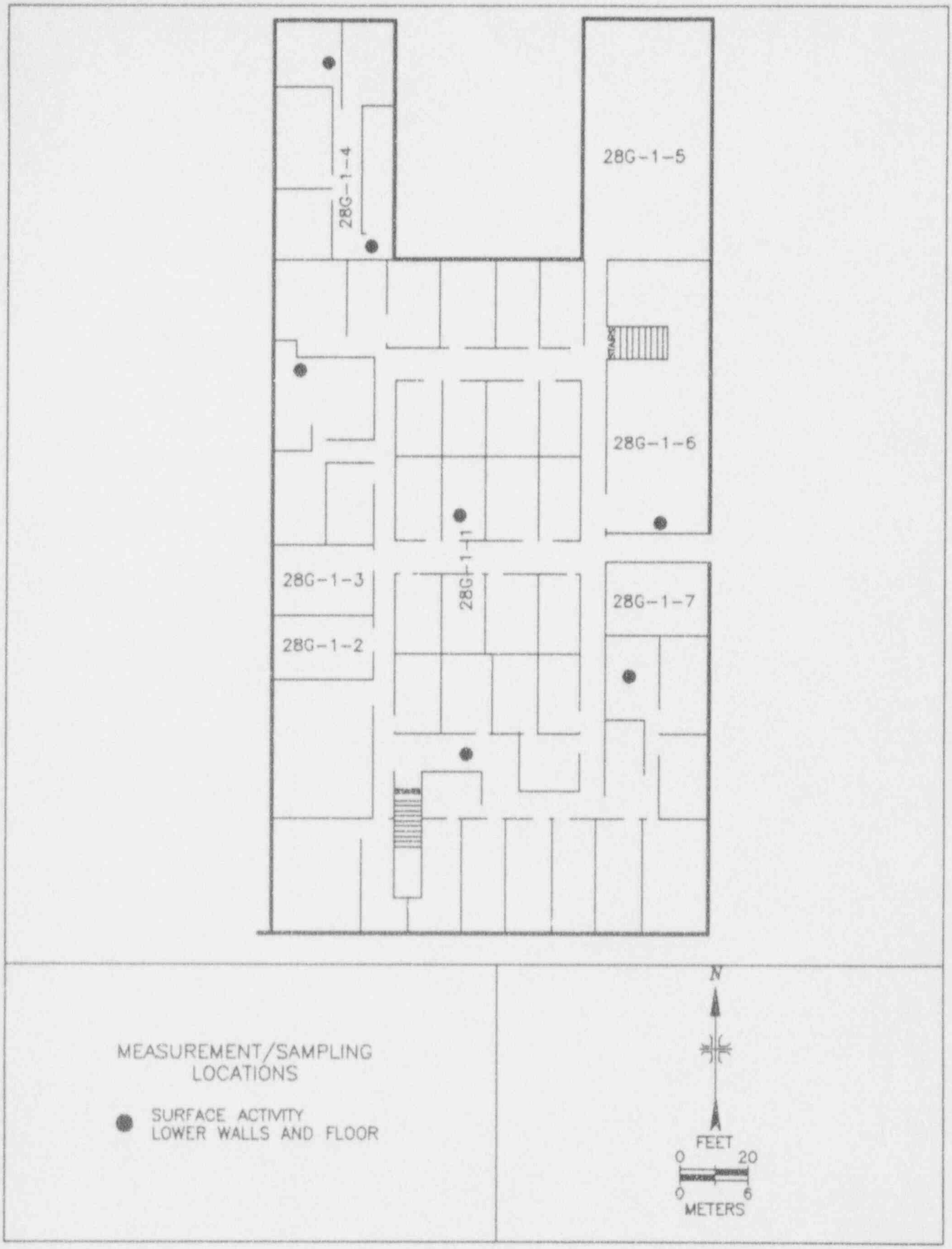


FIGURE 19: Building 9, Second Floor – Measurement and Sampling Locations

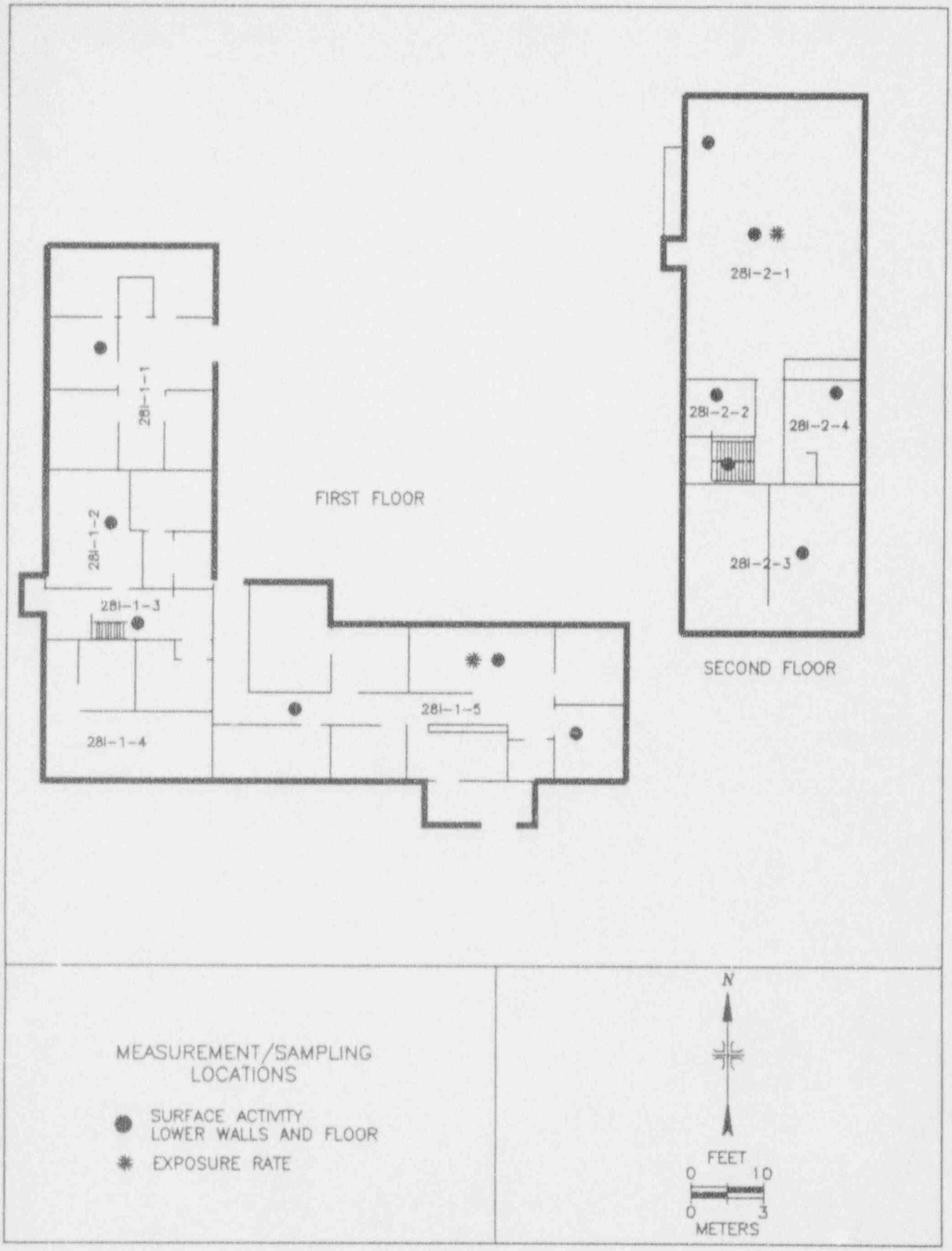


FIGURE 20: Building 11, First and Second Floors – Measurement and Sampling Locations

WLP14

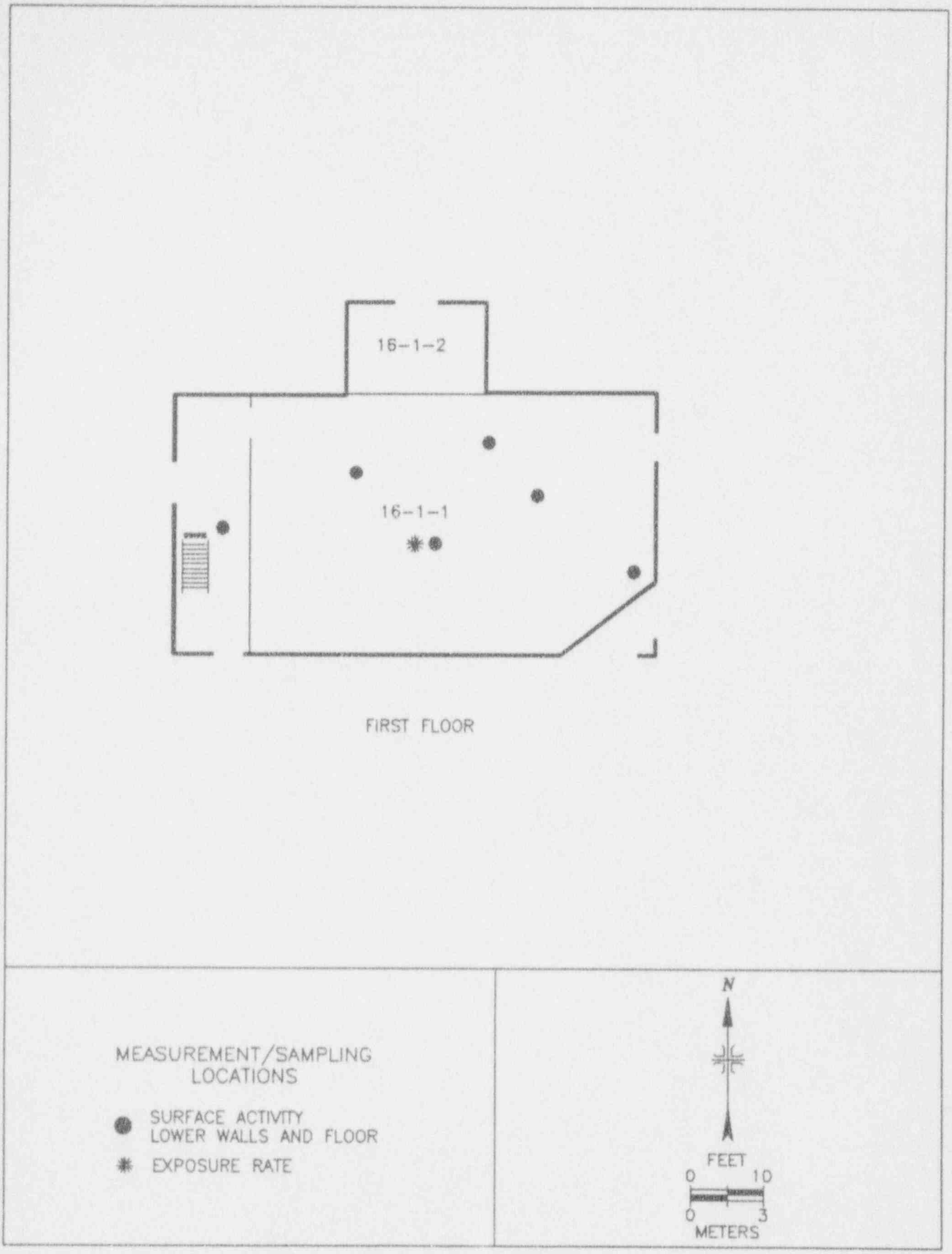


FIGURE 21: Building 12, First Floor – Measurement and Sampling Locations

WLP16

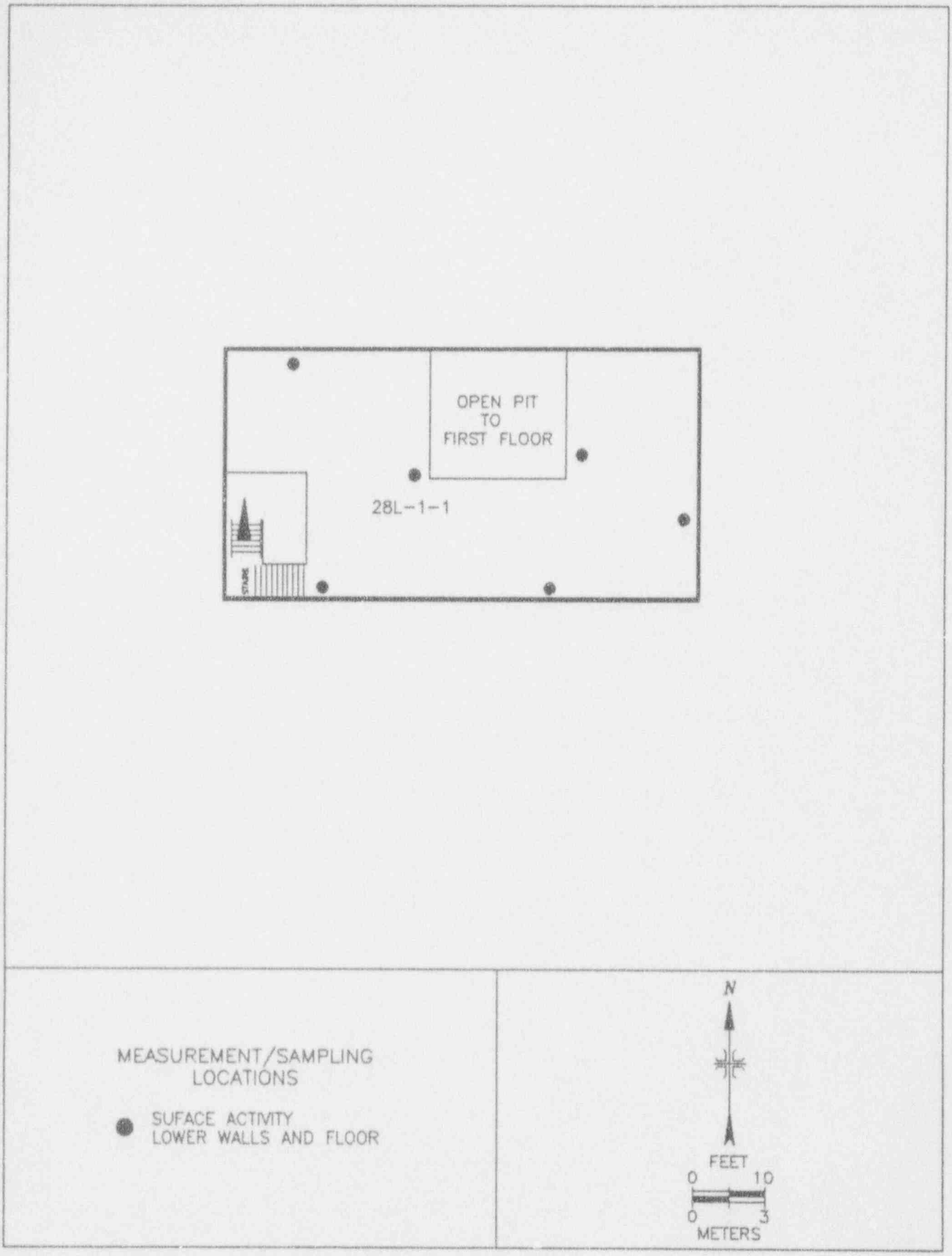


FIGURE 22: Building 12, Second Floor — Measurement and Sampling Locations

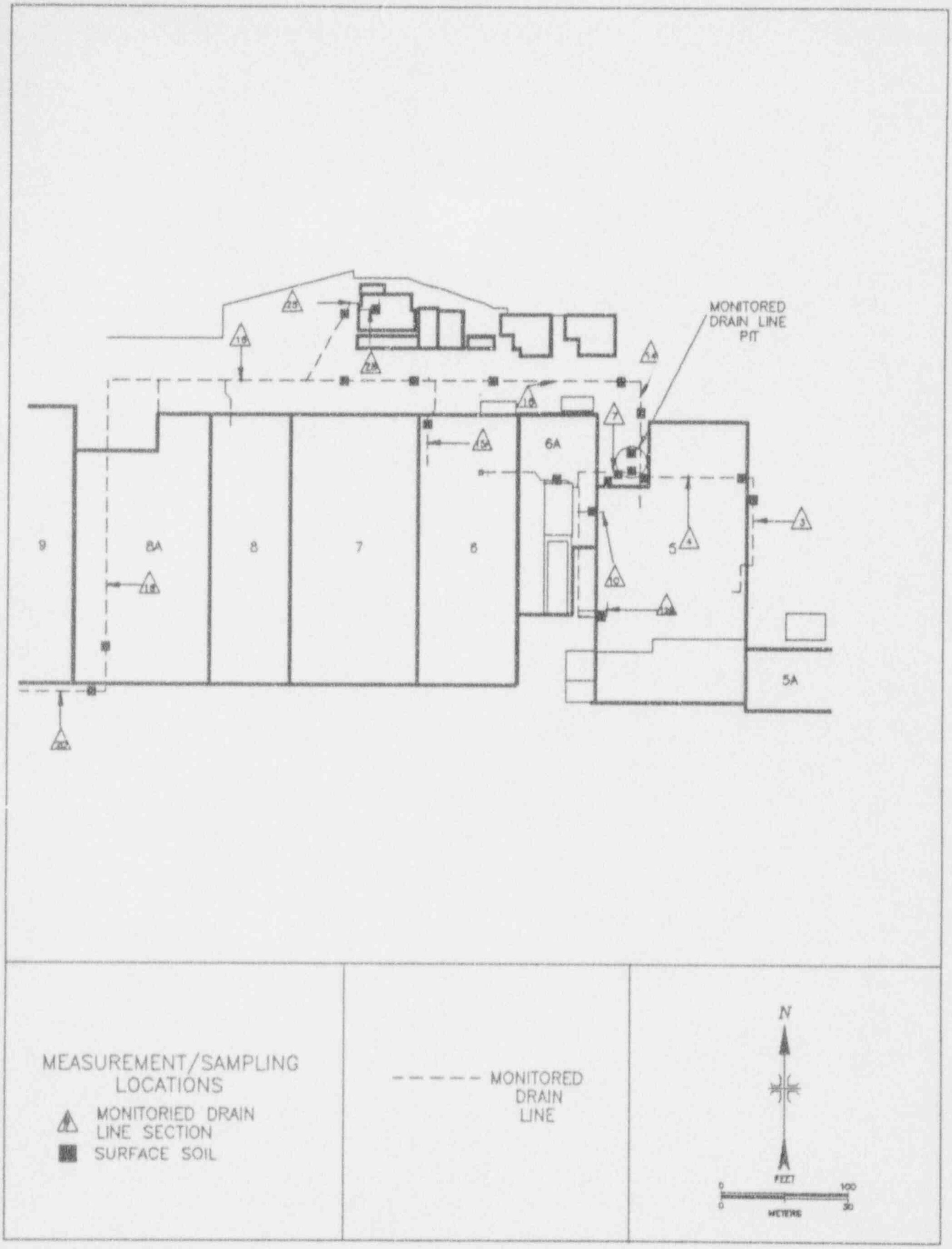


FIGURE 23: Monitored Drain Line - Sampling Locations

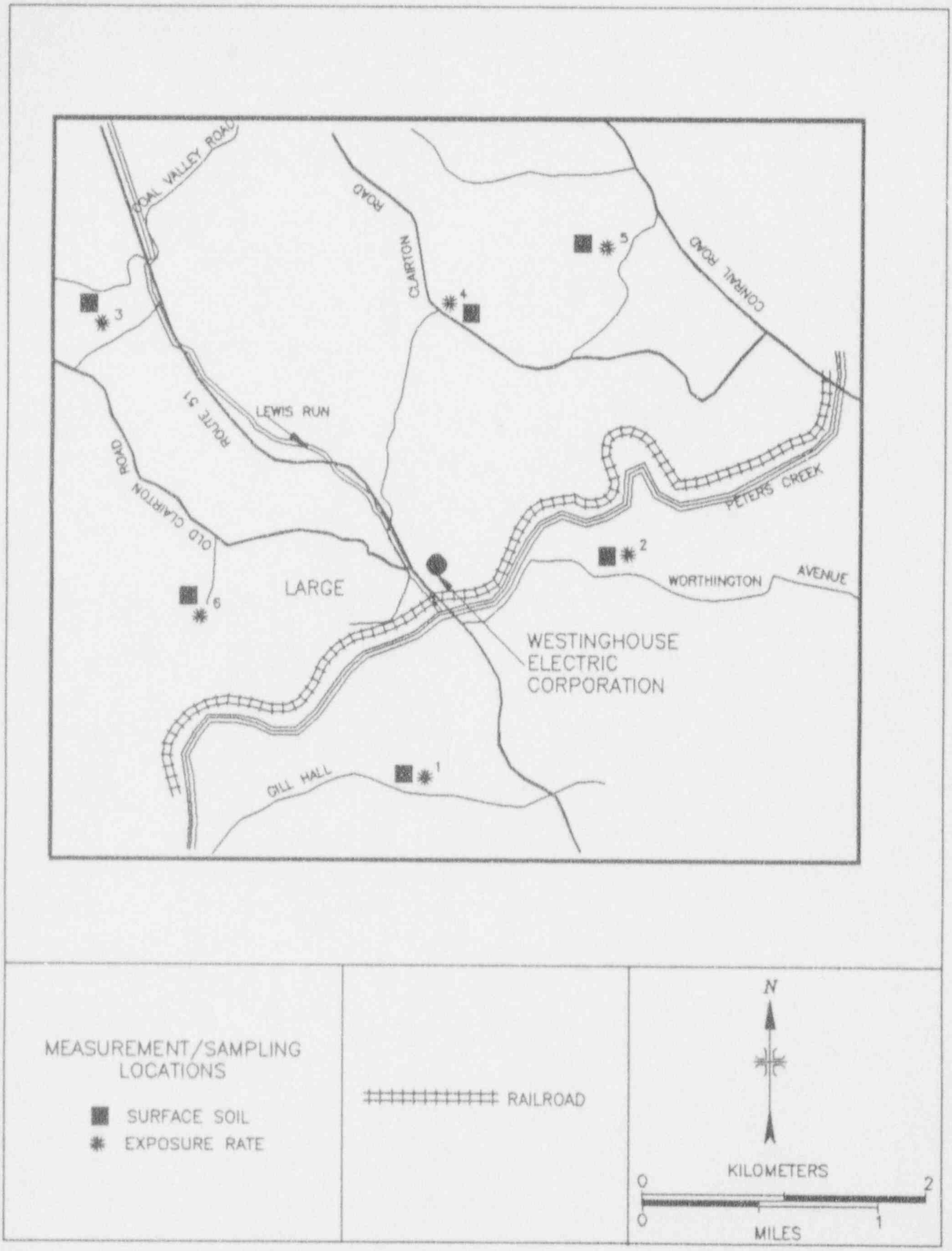


FIGURE 24: Backgroud Exposure Rate Measurement and Soil Sampling Locations

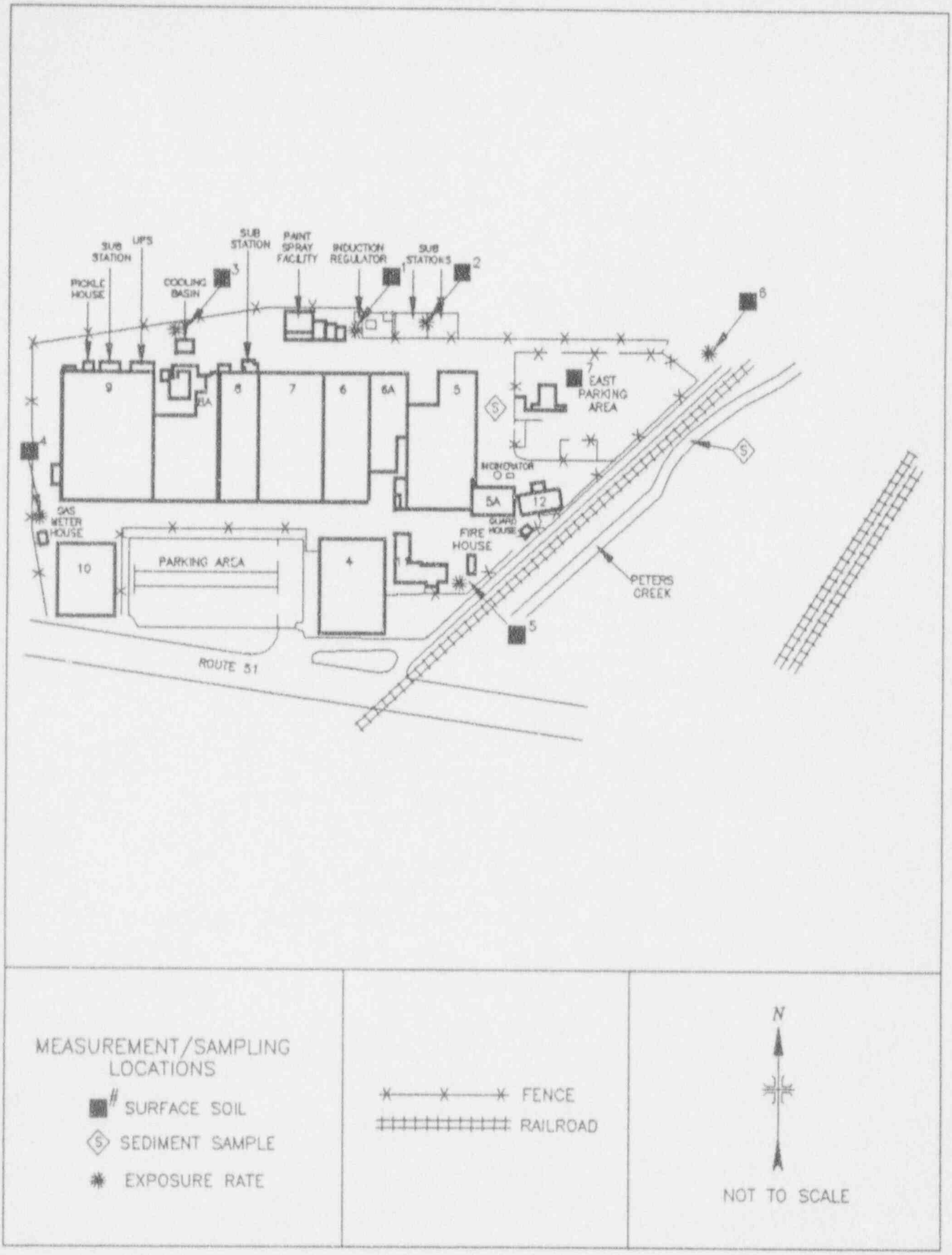


FIGURE 25: Exterior Exposure Rate Measurements and Soil and Sediment Sampling Locations

TABLE 1

SUMMARY OF SURFACE ACTIVITY MEASUREMENTS WESTINGHOUSE ELECTRIC CORPORATION LARGE, PENNSYLVANIA

Location	Figure(s)	Number of Individual Measurements	Range of Total Activity (dpm/100 cm^2)		Range of Removable Activity (dpm/100 cm^2)	
			Alpha	Beta	Alpha	Beta
Building 5 1st Floor	3,4	67	73	<1500-1900	<12	<16
Building 5 2nd Floor	5	24	<78-1400	<1400	<12-160	<16-38
Building 5 3rd Floor	6	11	<78	<1400	<12	<16
Building 5 4th Floor	6	3	<78	<1400	<12	<16
Building 5A 1st Floor	7	6	<78	<1400	<12	<16
Building 6 1st Floor	8	66	<73	<1400-4800	<12	<16
Building 6 2nd Floor	9	12	<78	<1400	<12	<16
Building 6A 1st Floor	10	38	<73	<1500	<12	<16
Building 7 1st Floor	11	58	<73	<1500	<12	<16
Building 7 2nd Floor	12	6	<78	<1400	<12	<16
Building 8 1st Floor	13	6	<78	<1400	<12	<16
Building 8A 1st Floor	14	8	<69	<1400	<12	<16

TABLE 1 (Continued)

SUMMARY OF SURFACE ACTIVITY MEASUREMENTS
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

Location	Figure(s)	Number of Individual Measurements	Range of Total Activity (dpm/100 cm^2)		Range of Removable Activity (dpm/100 cm^2)	
			Alpha	Beta	Alpha	Beta
Building 8A 2nd Floor	15	6	<78	<1400	<12	<16
Building 9 Tank Pit	16	22	<73-780	<1500	<12	<16
Building 9 1st Floor	17	97	<69-2200	<1400-2300	<12	<16
Building 9 Pipe Chases	18	24	<69-3000	<1400-5300[a]	<12-300	<16-67
Building 9 2nd Floor	19	7	<78	<1400	<12-29	<16
Building 11 1st Floor	20	6	<78	<1400	<12	<16
Building 11 2nd Floor	20	6	<78	<1400	<12	<16
Building 12 1st Floor	21	6	<78	<1400	<12	<16
Building 12 2nd Floor	22	6	<78	<1400	<12	<16

[a] Averages over 1 m^2 were calculated for two locations within the pipe chases that exceeded 5000 dpm/100 cm^2 beta activity. Resulting grid block averages were 2700 and 2900 dpm/100 cm^2 for total beta activity.

TABLE 2

INTERIOR EXPOSURE RATE MEASUREMENTS
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

Location	Figure	Exposure Rate (μR/h) at 1 m Above Surface
Bldg 9, 1st Floor, 10-8-2	17	9
Bldg 9, 1st Floor, 10-4-1	17	8
Bldg 8A, 1st Floor, 8-3-1	14	8
Bldg 8A, 1st Floor, 8-4-2	14	8
Bldg 7, 1st Floor, 7-2-1	11	9
Bldg 7, 1st Floor, 7-6-4	11	11
Bldg 6A, 1st Floor, 6-2-1	10	7
Bldg 6A, 1st Floor, 6-1-4	10	9
Bldg 6, 1st Floor, 4-5-7	8	9
Bldg 6, 1st Floor, 4-2-1	8	9
Bldg 5, 1st Floor, 1-9-3	4	8
Bldg 5, 1st Floor, 1-6-6	3	10
Bldg 8, 1st Floor, 28E-1-1	13	8
Bldg 5A, 1st Floor, 28C-1-1	7	9
Bldg 12, 1st Floor, 16-1-1	21	10
Bldg 11, 1st Floor, 28I-1-5	20	10
Bldg 11, 2nd Floor, 28I-2-1	20	9
Bldg 5, 2nd Floor, 2-4-1	5	9
Bldg 5, 3rd Floor, 3-1-1	6	9
Bldg 5, 4th Floor, 28B-1-1	6	10
Bldg 6, 2nd Floor, 5-2-1	9	9
Bldg 6, 2nd Floor, 5-1-1	9	10
Bldg 6, 2nd Floor, 5-1-2	9	13

TABLE 3

URANIUM CONCENTRATIONS IN ARCHIVED MDL SOIL SAMPLES
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

Location[a]	Uranium Concentration (pCi/g)			
	U-235	U-238	Total Uranium[b]	Licensee [illegible]235[c]
MDL Pit, NW Corner	2.3 ± 0.2	1.7 ± 1.4	69.0	[illegible]8 [illegible].24
MDL Pit, SW Corner	0.3 ± 0.1	1.6 ± 0.9	9.0	[illegible]6 ± 0.18
Beneath Clay Pipe From MDL Pit	0.1 ± 0.1	0.9 ± 0.5	3.0	<0.19
MDL Section 3, 16.5	0.2 ± 0.1	1.7 ± 1.6	6.0	0.127 ± 0.067
MDL Section 4, 62.0	0.4 ± 0.1	1.4 ± 1.2	12.0	<0.25
MDL Section 7, 23.0	0.2 ± 0.1	1.7 ± 1.6	6.0	<0.40
MDL Section 10, 8.0	0.2 ± 0.1	1.3 ± 1.1	6.0	0.381 ± 0.22
MDL Section 12B, 3.0	0.2 ± 0.1	2.1 ± 0.8	6.0	0.190 ± 0.084
MDL Section 14, 20.0	0.2 ± 0.1	3.2 ± 1.8	6.0	<0.16
MDL Section 14, 51.0	0.1 ± 0.1	2.5 ± 2.0	3.0	<0.40
MDL Section 15, 66.0	0.3 ± 0.1	1.7 ± 1.1	9.0	0.237 ± 0.22
MDL Section 15, 149.0	0.2 ± 0.1	1.2 ± 0.7	6.0	<0.26
MDL Section 15A, 44.0	0.2 ± 0.1	1.7 ± 1.2	6.0	<0.40
MDL Section 16, 175.0	0.2 ± 0.1	2.5 ± 1.3	6.0	<0.27
MDL Section 16, 248.0	0.3 ± 0.1	1.4 ± 1.2	9.0	0.311 ± 0.23
MDL Section 18, 128.0	0.2 ± 0.1	1.6 ± 0.9	6.0	0.204 ± 0.17
MDL Section 20, 124.0	0.1 ± 0.1	0.7 ± 0.5	3.0	0.281 ± 0.13
MDL Section 25, 4.0	0.2 ± 1.0	1.3 ± 1.1	6.0	<0.15
MDL Section 28, 12.0	0.3 ± 0.1	0.7 ± 0.6	9.0	<0.34
MDL Piping Remaining Beneath Bldg 6A	<0.3	0.1 ± 1.9	<9.0	<0.44

[a] Refer to Figure 23.

[b] Total uranium concentrations are calculated based on a total uranium to U-235 ratio of 30, as established by the licensee.

[c] U-235 concentration reported by the licensee.

TABLE 4

URANIUM CONCENTRATIONS IN ARCHIVED MDL SOIL SAMPLES
(DETERMINED BY ALPHA SPECTROMETRY)
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

Location[a]	Uranium Concentration (pCi/g)			
	U-234	U-235	U-238	Total Uranium[b]
MDL Pit, NW Corner	19.5 ± 0.6	1.2 ± 0.2	0.7 ± 0.1	21.3
MDL Pit, SW Corner	3.3 ± 0.2	0.2 ± 0.1	0.8 ± 0.1	4.3
Beneath Clay Pipe From MDL Pit	1.4 ± 0.2	0.1 ± 0.1	1.0 ± 0.1	2.4
MDL Section 4, 62.0	4.4 ± 0.3	0.3 ± 0.1	1.1 ± 0.2	5.8

[a] Refer to Figure 23.

[b] Total uranium concentrations are calculated based on the sum of the U-234, U-235 and U-238 concentrations, as determined by alpha spectrometry.

TABLE 5

BACKGROUND EXPOSURE RATES AND URANIUM CONCENTRATIONS IN SOIL WESTINGHOUSE ELECTRIC CORPORATION LARGE, PENNSYLVANIA

Measurement Location[a]	Exposure Rate (μR/h) at 1 m Above Surface	Total Uranium Concentration (pCi/g)[b]
1 Scotia Pump Station,Ridge Rd.	9	3.4
2 St. Clares Cemetery	8	4.8
3 Elliot Rd Across from Drive-In	9	3.6
4 Hwy 885 and Clairton Rd.	9	2.5
5 Wall Rd and Wall Ave.	9	2.4
6 End of Red Cliff Dr.	8	2.5

[a] Refer to Figure 24.

[b] Total uranium concentrations are calculated based on natural isotopic abundances of U-234 and U-238.

TABLE 6

EXTERIOR EXPOSURE RATE MEASUREMENTS
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

Location[a]	Exposure Rate at 1 m Above Surface (μR/h)
1 15 m N. of Building 6A	9
2 33 m N. of Building 5	11
3 Fenceline N. of Building 8A	11
4 Fenceline N. of Gas Meter House	10
5 Fenceline S. of Firehouse	11
6 N. E. Perimeter of East Parking Lot	10

[a] Refer to Figure 25.

TABLE 7

URANIUM CONCENTRATIONS IN SOIL SAMPLES, EXTERIOR LOCATIONS
WESTINGHOUSE ELECTRIC CORPORATION
LARGE, PENNSYLVANIA

<table>
<tr><th rowspan="2">Location[b]</th><th colspan="4">Uranium Concentration (pCi/g)[a]</th></tr>
<tr><th>U-235</th><th>U-238</th><th colspan="2">Total Uranium[c]</th></tr>
<tr><td colspan="5">Gamma Spectrometry</td></tr>
<tr><td>1 15 m N. or Building 6A</td><td>0.3 ± 0.1</td><td>2.7 ± 1.3</td><td colspan="2">9.0</td></tr>
<tr><td>2 33 m N. of Building 5</td><td>0.1 ± 0.1</td><td>1.1 ± 0.9</td><td colspan="2">3.0</td></tr>
<tr><td>3 Fenceline N. of Building 8A</td><td>0.2 ± 0.1</td><td>2.2 ± 1.3</td><td colspan="2">6.0</td></tr>
<tr><td>4 Fenceline N. of Gas Meter House</td><td>0.2 ± 0.1</td><td>1.1 ± 0.7</td><td colspan="2">6.0</td></tr>
<tr><td>5 Fenceline S. of Firehouse</td><td>0.2 ± 0.1</td><td>2.3 ± 1.2</td><td colspan="2">6.0</td></tr>
<tr><td>6 N. E. Perimeter of East Parking Lot</td><td>0.3 ± 0.1</td><td>2.9 ± 1.6</td><td colspan="2">9.0</td></tr>
<tr><td>7 East Parking Lot[e]</td><td>0.3 ± 0.1</td><td>1.7 ± 1.3</td><td colspan="2">9.0</td></tr>
<tr><td>Alpha Spectrometry</td><td>U-234</td><td>U-235</td><td>U-238</td><td>Total U[d]</td></tr>
<tr><td>7 East Parking Lot[e]</td><td>2.3 ± 0.3</td><td>0.1 ± 0.1</td><td>2.0 ± 0.3</td><td>4.4</td></tr>
</table>

[a] Uncertainties represent the 95% confidence level, based only on counting statistics.

[b] Refer to Figure 25.

[c] Total uranium concentrations are calculated based on a total uranium to U-235 ratio of 30, as established by the licensee.

[d] Total uranium concentrations are calculated based on the sum of the U-234, U-235 and U-238 concentrations.

[e] Archived sample, originally collected by the licensee.

REFERENCES

1. Westinghouse Electrical Corporation, License Termination Reports # 001 - #042, dated from November 2, 1992 to July 9, 1993.

2. Oak Ridge Institute for Science and Education, "Proposed Confirmatory Survey Plan for Buildings 5, 5A, 6, 6A, 7, 8, 8A, 9, 11, 12 and the Hydrogen Facility, Westinghouse Electric Corporation, Large, PA," August 19, 1993.

3. Oak Ridge Institute for Science and Education, letter from M. R. Landis to J. D. Kinneman, Region I, U.S. NRC, "License Termination Reports #002, #004, #007, and #009 for Westinghouse Electric Corporation, Large, PA." July 23, 1993.

4. Oak Ridge Institute for Science and Education, letter from A. J. Ansari to J. D. Kinneman, Region I, U.S. NRC, "Additional Comment—License Termination Reports for Westinghouse Electric Corporation, Large, PA," August 3, 1993.

5. Oak Ridge Institute for Science and Education, letter from E. W. Abelquist to J. D. Kinneman, Region I, U.S. NRC, "Additional Comment—License Termination Reports for Westinghouse Electrical Corporation, Large, PA," August 24, 1993.

6. U.S. Nuclear Regulatory Commission, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Materials," August, 1987.

7. U.S. Nuclear Regulatory Commission, "Disposal of Onsite Storage of Thorium and Uranium Wastes from Past Operations," 46 FR 52061, Washington, D.C., October 23, 1981.

8. U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, "Review Plan: Evaluating Decommissioning Plans for Licenses Under 10 CFR Parts 30, 40, and 70," Washington, D.C., 1991.

APPENDIX A

MAJOR INSTRUMENTATION

APPENDIX A

MAJOR INSTRUMENTATION

The display of a specific product is not to be construed as an endorsement of the product or its manufacturer by the authors or their employers.

DIRECT RADIATION MEASUREMENT

Instruments

Eberline Pulse Ratemeter
Model PRM-6
(Eberline, Santa Fe, NM)

Eberline "Rascal" Ratemeter-Scaler
Model PRS-1
(Eberline, Santa Fe, NM)

Ludlum Floor Monitor
Model 239-1
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Ludlum Ratemeter-Scaler
Model 2221
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Detectors

Eberline GM Detector
Model HP-260
Effective Area, 15.5 cm^2
(Eberline, Santa Fe, NM)

Eberline ZnS Scintillation Detector
Model AC-3-7
Effective Area, 59 cm^2
(Eberline, Santa Fe, NM)

APPENDIX A

MAJOR INSTRUMENTATION

The display of a specific product is not to be construed as an endorsement of the product or its manufacturer by the authors or their employers.

DIRECT RADIATION MEASUREMENT

Instruments

Eberline Pulse Ratemeter
Model PRM-6
(Eberline, Santa Fe, NM)

Eberline "Rascal" Ratemeter-Scaler
Model PRS-1
(Eberline, Santa Fe, NM)

Ludlum Floor Monitor
Model 239-1
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Ludlum Ratemeter-Scaler
Model 2221
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Detectors

Eberline GM Detector
Model HP-260
Effective Area, 15.5 cm^2
(Eberline, Santa Fe, NM)

Eberline ZnS Scintillation Detector
Model AC-3-7
Effective Area, 59 cm^2
(Eberline, Santa Fe, NM)

Ludlum Gas Proportional Detector
Model 43-37
Effective Area, 550 cm^2
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Reuter-Stokes Pressurized Ion Chamber
Model RSS-111
(Reuter-Stokes, Cleveland, OH)

Victoreen NaI Scintillation Detector
Model 489-55
3.2 cm x 3.8 cm Crystal
(Victoreen, Cleveland, OH)

LABORATORY ANALYTICAL INSTRUMENTATION

Alpha Spectrometry System
Tennelec Electronics Model
(Tennelec, Oak Ridge, TN)
Used in conjunction with:
Surface Barrier and Ion Implanted Detectors
(Canberra, Meriden, CT and
Tennelec, Oak Ridge, TN) and
Multichannel Analyzer
3100 Vax Workstation
(Canberra, Meriden,CT)

High Purity Extended Range Intrinsic Detectors
Model No: ERVDS30-25195
(Tennelec, Oak Ridge, TN)
Used in conjunction with:
Lead Shield Model G-11
(Nuclear Lead, Oak Ridge, TN) and
Multichannel Analyzer
3100 Vax Workstation
(Canberra, Meriden, CT)

High-Purity Germanium Detector
Model GMX-23195-S, 23% Eff.
(EG&G ORTEC, Oak Ridge, TN)
Used in conjunction with:
Lead Shield Model G-16
(Gamma Products, Palos Hills, IL) and
Multichannel Analyzer
3100 Vax Workstation
(Canberra, Meriden, CT)

LABORATORY ANALYTICAL INSTRUMENTATION (Continued)

Low Background Gas Proportional Counter
Model LB-5100-W
(Oxford, Oak Ridge, TN)

APPENDIX B

SURVEY AND ANALYTICAL PROCEDURES

APPENDIX B

SURVEY AND ANALYTICAL PROCEDURES

SURVEY PROCEDURES

Surface Scans

Surface scans were performed by passing the probes slowly over the surface; the distance between the probe and the surface was maintained at a minimum - nominally about 1 cm. A large surface area, gas proportional floor monitor was used to scan the floors of the surveyed areas. Other surfaces were scanned using small area (15.5 cm^2 or 59 cm^2) hand-held detectors. Identification of elevated levels was based on increases in the audible signal from the recording and/or indicating instrument. Combinations of detectors and instruments used for the scans were:

Alpha	—	ZnS scintillation detector with ratemeter-scaler
	—	gas proportional detector with ratemeter-scaler
Beta	—	thin-window GM detector with ratemeter-scaler
	—	gas proportional detector with ratemeter-scaler
Gamma	---	NaI scintillation detector with ratemeter

Surface Activity Measurements

Measurements of total alpha and total beta activity levels were performed using ZnS scintillation and thin-window GM detectors with ratemeter-scalers.

Count rates (cpm), which were integrated over 1 minute in a static position, were converted to activity levels (dpm/100 cm^2) by dividing the net rate by the 4π efficiency and correcting for the active area of the detector. The alpha activity background count rates for the ZnS scintillation detectors averaged 1 cpm for each detector. Alpha efficiency factors averaged 0.17 for the ZnS scintillation detectors. The beta activity background count rates for the GM detectors averaged 50 cpm. Beta efficiency factors ranged from 0.15 - 0.17 for the GM detectors. The effective windows for the ZnS scintillation and GM detectors were 59 cm^2 and 15.5 cm^2, respectively.

Removable Activity Measurements

Removable activity levels were determined using numbered filter paper disks, 47 mm in diameter. Moderate pressure was applied to the smear and approximately 100 cm^2 of the surface was wiped. Smears were placed in labeled envelopes with the location and other pertinent information recorded.

Exposure Rate Measurements

Measurements of gamma exposure rates were performed at 1 m above the surface, using a pressurized ionization chamber (PIC).

Miscellaneous Samples

Soil Samples

Approximately 1 kg of soil was collected at each sample location. Collected samples were placed in a plastic bag, sealed, and labeled in accordance with ESSAP survey procedures.

Sediment Samples

Approximately 1 kg of sediment was collected at each sample location. Collected samples were placed in a plastic container sealed and labeled in accordance with ESSAP survey procedures.

ANALYTICAL PROCEDURES

Removable Activity

Gross Alpha/Beta

Smears were counted on a low background gas proportional system for gross alpha and gross beta activity.

Miscellaneous Samples

Gamma Spectrometry

Samples of soil and sediment were dried, mixed, crushed, and/or homogenized as necessary, and a portion sealed in 0.5-liter Marinelli beaker or other appropriate container. The quantity placed in the beaker was chosen to reproduce the calibrated counting geometry. Net material weights were determined and the samples counted using intrinsic germanium detectors coupled to a pulse height analyzer system. Background and Compton stripping, peak search, peak identification, and concentration calculations were performed using the computer capabilities inherent in the analyzer system. Energy peaks used for determination of radionuclides of concern were:

U - 235	0.186 MeV
U - 238	0.063 MeV or 0.093 MeV from Th-234*

*Secular equilibrium assumed.

Spectra were also reviewed for other identifiable photopeaks.

Alpha Spectrometry

Soil samples were crushed, homogenized and analyzed for isotopic uranium. Samples were dissolved by potassium fluoride and pyrosulfate fusion and the elements of interest were precipitated with barium sulfate. Barium sulfate precipitate was redissolved and the specific elements of interest were individually separated by liquid-liquid extraction and re-precipitated with a cerium fluoride carrier. The precipitate was then counted using surface barrier and ion implanted detectors (Tennelec and Canberra), alpha spectrometers (Tennelec and Canberra), and a multichannel analyzer (Canberra).

UNCERTAINTIES AND DETECTION LIMITS

The uncertainties associated with the analytical data presented in the tables of this report represent the 95% confidence level for that data based only on counting statistics. Additional uncertainties associated with sampling and measurement procedures, have not been propagated into the data presented in this report.

Detection limits, referred to as minimum detectable activity (MDA), were based on 2.71 plus 4.66 times the standard deviation of the background count. When the activity was determined to be less than the MDA of the measurement procedure, the result was reported as less than MDA. Because of variations in background levels, measurement efficiencies, and contributions from other radionuclide in samples, the detection limits differ from sample to sample and instrument to instrument.

CALIBRATION AND QUALITY ASSURANCE

Analytical and field survey activities were conducted in accordance with procedures from the following ESSAP documents:

- Survey Procedures Manual, Revision 7 (May 1992)
- Laboratory Procedures Manual, Revision 8 (July 1993)
- Quality Assurance Manual, Revision 6 (July 1993)

The procedures contained in these manuals were developed to meet the requirements of DOE Order 5700.6C and ASME NQA-1 for Quality Assurance and contain measures to assess processes during their performance.

Calibration of all field and laboratory instrumentation was based on standards/sources, traceable to NIST, when such standards/sources were available. In cases where they were not available, standards of an industry recognized organization was used. Calibration of pressurized ionization chambers was performed by the manufacturer.

Quality control procedures include:

- Daily instrument background and check-source measurements to confirm that equipment operation is within acceptable statistical fluctuations.
- Participation in EPA and EML laboratory Quality Assurance Programs.
- Training and certification of all individuals performing procedures.
- Periodic internal and external audits.

APPENDIX C

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE OR SPECIAL NUCLEAR MATERIALS

AND

GUIDELINES FOR RESIDUAL CONCENTRATIONS OF THORIUM AND URANIUM WASTES IN SOIL

GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE OR TERMINATION OF LICENSES FOR BYPRODUCT, SOURCE, OR SPECIAL NUCLEAR MATERIALS

U.S. Nuclear Regulatory Commission
Division of Fuel Cycle & Material Safety
Washington, D.C. 20555

August 1987

The instructions in this guide, in conjunction with Table 1, specify the radionuclides and radiation exposure rate limits which should be used in decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use. The limits in Table 1 do not apply to premises, equipment, or scrap containing induced radioactivity for which the radiological considerations pertinent to their use may be different. The release of such facilities or items from regulatory control is considered on a case by-case basis.

1. The licensee shall make a reasonable effort to eliminate residual contamination.

2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table 1 prior to the application of the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.

3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces or premises, equipment, or scrap which are likely to be contaminated, but are such size, construction, or location as to make the surface inaccessible for purposes of measurement, shall be presumed to be contaminated in excess of the limits.

4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to special circumstances such as razing of buildings, transfer from premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:

    a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature, extent, and degree of residual surface contamination.

    b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment, or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table 1. A copy of the survey report shall be filed with the Division of Fuel Cycle, Medical, Academic, and Commercial Use Safety, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, and also the Administrator of the NRC Regional Office having jurisdiction. The report should be filed at least 30 days prior to the planned date of abandonment. The survey report shall:

a. Identify the premises.

b. Show that reasonable effort has been made to eliminate residual contamination.

c. Describe the scope of the survey and general procedures followed.

d. State the findings of the survey in units specified in the instruction.

Following review of the report, the NRC will consider visiting the facilities to confirm the survey.

TABLE 1
ACCEPTABLE SURFACE CONTAMINATION LEVELS

Nuclides[a]	Average[b,c,f]	Maximum[b,d,f]	Removable[b,e,f]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm^2	3,000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm $\beta\gamma$/100 cm^2	15,000 dpm $\beta\gamma$/100 cm^2	1,000 dpm $\beta\gamma$/100 cm^2

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

[b] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c] Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d] The maximum contamination level applies to an area of not more than 100 cm^2.

[e] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

[f] The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h at 1 cm and 1.0 mrad/h at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

Guidelines for Residual Concentrations of Thorium and Uranium Wastes in Soil

On October 23, 1981, the Nuclear Regulatory Commission published in the Federal register a notice of Branch Technical Position on "Disposal or Onsite Storage of Thorium and Uranium Wastes from Past Operations." This document established guidelines for concentrations of uranium and thorium in soil, that will limit maximum radiation received by the public under various conditions of future land usage. These concentrations are as follows:

Material	Maximum Concentrations (pCi/g) for various options			
	1[a]	2[b]	3[c]	4[d]
Natural Thorium (Th-232 + Th-228) with daughters present and in equilibrium	10	50	--	500
Natural Uranium (U-238 + U-234) with daughters present and in equilibrium	10	--	40	200
Depleted Uranium:				
Soluble	35	100	--	1,000
Insoluble	35	300	--	3,000
Enriched Uranium:				
Soluble	30	100	--	1,000
Insoluble	30	250	--	2,500

[a] Based on EPA cleanup standards which limit radiation to 1 mrad/yr to lung and 3 mrad/yr to bone from ingestion and inhalation and 10 μR/h above background from direct external exposure.

[b] Based on limiting individual dose to 170 mrem/yr.

[c] Based on limiting equivalent exposure to 0.02 working level or less.

[d] Based on limiting individual dose to 500 mrem/yr and in case of natural uranium, limiting exposure to 0.02 working level or less.