ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

January 2, 2003

Mr. Thomas G. McLaughlin
Mail Stop: T-7F27
Division of Waste Management
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 38, THE HEAT EXCHANGER FOOTERS AND THE FOUNDATIONS FOR BUILDINGS 13, 14, 19, 21, 23, 25, 33, 35, 36 AND 42, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-014)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility during the period of September 23 through 26, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely,

Wade C. Adams
Project Leader/Health Physicist
Environmental Survey and
Site Assessment Program

WCA:ar

Enclosure

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LETTER REPORT
CONFIRMATORY SURVEY OF BUILDING 38, THE HEAT EXCHANGER FOOTERS AND THE FOUNDATIONS FOR BUILDINGS 13, 14, 19, 21, 23, 25, 33, 35, 36 AND 42, MOLYCORP, INC., WASHINGTON FACILITY WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-014)

INTRODUCTION AND SITE HISTORY

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) has operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained licensable concentrations (1 to 1.5%) of natural thorium which was retained onsite in the form of a process slag.

In the late 1960s, new federal requirements necessitated Molycorp to obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained thorium above the 0.05% limit. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations that used thorium-containing ores were discontinued around 1970—however, some of the thorium bearing slag was used as fill material over portions of the site (RSI 2001).

In 1972, some of the thorium-bearing slag and contaminated soil was disposed of at the West Valley, New York, burial site. The disposal was terminated when New York officials decided that the contamination level was too insignificant to use up valuable burial area. Molycorp then commenced to segregate and stabilize the remaining thoriated material in a capped pile containing about 27,700 cubic yards of slag on the south property. A 1975 Applied Health Physics (AHP) report indicated the average Th-232 concentration in the slag pile was 1,250 pCi/g, with exposure rates less than the 0.2 mR/h maximum level allowed at the time by the U.S. Nuclear Regulatory Commission (NRC). This pile was eventually removed and shipped offsite for disposal (MACTEC 2002a).

In June 1981, an AEC compliance inspection revealed that thorium-bearing slag had been inadvertently buried onsite in violation of the terms and conditions of the Molycorp license and AEC regulations. A Notice of Violation, issued by the AEC, requested that Molycorp take remedial action to excavate these materials and dispose of them in accordance with AEC regulations and guidance documents.

In 1985, Oak Ridge Associated Universities (ORAU), now known as the Oak Ridge Institute for Science and Education (ORISE), conducted a radiological survey of the site. The survey identified elevated (twice background or greater) levels of thorium in surface impoundment dikes and indicated the potential of subsurface thoriated slags in the western portion of the site (ORAU 1985).

In 1990, RSA, Inc. conducted a subsurface survey to characterize the thorium contamination across the western portion of the site (i.e., the surface impoundment area) and the areas immediately to the north, west, and northwest. RSA also conducted radiation exposure rate surveys within the study area. The findings indicated that subsurface concentrations of thorium were above those in surface soils in almost every drilled hole—however, the pattern indicated that underground radiation levels decreased to background at a depth of about ten feet. While a majority of the sampled holes exhibited concentrations of greater than 0.01 % thorium, the thorium content exceeded an average of 0.05% at some point below the surface of the ground in only a few holes (MACTEC 2002a).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a Site Characterization Plan (SCP) to the NRC for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Through historical site assessments and characterization surveys, the licensee or their contractor classified each site building/foundation as either radiologically affected or unaffected. All areas surveyed for this report were classified by Molycorp's decontamination and decommissioning (D&D) contractor, MACTEC, as affected.

There were 21 buildings on the site—all have had final status surveys (FSS) performed and all but two buildings have been dismantled. For Building 38, MACTEC identified elevated radiation that was fixed into concrete and required removal of those portions of the concrete; however, contaminated purlins and rafters were to remain in place until building dismantlement (MACTEC 2002a).

The current phase of the decommissioning involves the dismantlement of the building foundations. After dismantlement of the Building 13, 14, 19, 21, 23, 25, 33, 35, 36 and 42 shells, MACTEC performed FSS activities on the foundations by breaking up the concrete slab with backhoes, flipping over the concrete slab pieces to expose the undersides for survey, and placing the pieces back into the building footprint. Some portions of the undersides had the potential to be exposed to surface soil contamination due to the practice of using slag from past operations as backfill throughout the site (MACTEC 2002b). Although most of the top surfaces of these building foundations are expected to be clean and are classified as unaffected, the undersides of the concrete slabs that are in contact with the soil required surveys prior to release (RSI 2001).

All remediation activities have been performed under the Decommissioning Plan for the Washington, PA facility which implemented final status survey guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a).

The NRC's Division of Waste Management requested that the Environmental Survey and Site Assessment Program (ESSAP) of ORISE perform confirmatory survey activities on buildings, building foundations and other miscellaneous building components that were deemed by MACTEC to meet the radiological release guidelines, at the Molycorp, Inc. Washington facility and for which the licensee and MACTEC have prepared FSS reports.

SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers [km (35 miles)] southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania. The site is bounded by two dedicated streets in Canton Township—Caldwell Avenue and Weirich Avenue. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002a).

Building 38 is located along the southeastern portion of the site. The building is 11 m long by 10 m wide with a 2 m high cinderblock wall basement with a poured reinforced concrete floor. There is a large roll top door and a personnel door located on the west wall. The building foundations and the heat exchanger footers are located throughout the site (Figure 1). The building foundations consist of reinforced poured concrete.

DOCUMENT/DATA REVIEW

ESSAP reviewed the available RSI and MACTEC historical site information and previous survey documentation to determine the adequacy and appropriateness of the radiological instrumentation and procedures (RSI 1999 and 2001 and MACTEC 2002b and c). ESSAP reviewed survey data for Building 38 and for the foundations for Buildings 13, 14, 19, 21, 23, 25, 33 and 42 prior to the site survey and reviewed the survey data for the other building foundations during the site survey activities (MACTEC 2002d, e, f, g, and h).

SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Building 38, the heat exchanger footers and for the foundations of Buildings 13, 14, 19, 21, 23, 25, 33, 35, 36 and 42 at the Molycorp, Washington facility during the period of September 23 through 25, 2002. ESSAP's confirmatory survey coverage was determined by MACTEC's radiological classification of the buildings/foundations—all of which were classified as affected. Survey activities consisted of alpha plus beta surface scans, alpha and beta surface activity measurements, and exposure rate measurements. Prior results from the site determined that smear samples, for determining removable activity levels, were not required. These activities were conducted in accordance with site-specific survey plans, submitted to and approved by the NRC and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a and b, 2000 and 2002c).

REFERENCE SYSTEM

Measurement and sampling locations were referenced on floor plan/building footprint maps prepared by either ESSAP personnel during previous survey activities or MACTEC personnel during FSS.

SURFACE SCANS

Building 38

Surface scans for alpha plus beta radiation were performed on up to 100% of the floor surfaces and up to 50% of the lower wall surfaces. Gamma surface scans were performed on up to 100% of all accessible floor surfaces. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators; gamma surface scans were performed with NaI scintillation detectors coupled to ratemeters with audible indicators. Locations of elevated direct radiation detected by surface scans were marked for further investigation.

Building 31 Exterior West Wall

Previous ESSAP and PADEP survey activities had indicated significant residual alpha and beta activity on the lower wall portion of the exterior west wall (ORISE 2002d and PADEP 2002). After dismantlement, MACTEC personnel removed the lower two feet of the wall and disposed of that portion as low-level radioactive waste (LLRW).

Surface scans for alpha plus beta radiation were performed on up to 50% of the lower wall surface. Surface scans were performed using gas proportional detectors coupled to ratemeter scalers with audible indicators.

Building Foundations/Footers

Surface scans for beta radiation were performed on up to 25% of the exposed undersides of the building foundation surfaces; gamma surface scans were performed on up to 75% of the building footprints. Beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators; gamma surface scans were performed with NaI scintillation detectors coupled to ratemeters with audible indicators. Locations of elevated direct radiation detected by surface scans were marked for further investigation.

SURFACE ACTIVITY MEASUREMENTS

Building 38

Alpha and beta surface activity measurements were performed at twenty locations on the lower walls and ten locations on the floor. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Measurement locations are shown on Figure 2.

Heat Exchanger Footers

Alpha and beta surface activity measurements were performed at twenty randomly selected locations on three separate concrete footer rubble piles. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Measurement locations are shown on Figure 3.

Building 31 Exterior West Wall

Alpha and beta surface activity measurements were performed at twelve locations on the remaining portion of the Building 31 Exterior West Wall. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Measurement locations are shown on Figure 4.

Building Foundations

Alpha and beta surface activity measurements were performed at 15 locations on the Building 13 foundation rubble pile, 21 locations on the Building 14 foundation, at 13 locations on the Building 19 foundation, 20 locations on the Building 21 foundation/rubble pile, 20 locations on the Building 23 foundation, 19 locations on the Building 25 foundation, 29 locations on the Building 33 foundation, five locations on the Building 35 foundation, 20 locations on the Building 36 foundation rubble piles, and 20 locations on the Building 42 foundation. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Measurement locations are shown on Figures 5 through 14.

EXPOSURE RATE MEASUREMENTS

Exterior background exposure rate measurements were performed at six locations within a 0.5 to 10 km radius of the site (Figure 15). Site exposure rates were performed at a total of 16 locations on the building foundations including Building 38 (Figures 2, 5, and 7 through 13).

SOIL SAMPLING

Background soil samples were collected from each external background exposure rate measurement location (Figure 15). Surface (0 to 15 cm) soil samples were collected from four locations in three building foundations; two from Building 35 foundation and one each from Building 25 and 33 foundations.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002e). Soil samples were analyzed by gamma spectroscopy and results reported in picocuries per gram (pCi/g). The radionuclides of interest are uranium and thorium; however, spectra were reviewed for other identifiable photopeaks. Direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm^2). Exposure rates were reported in microroentgens per hour (μR/h). The survey results were interpreted and compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

Natural Thorium

1,000 dpm/100 cm^2, averaged over a 1 m^2 area

3,000 dpm/100 cm^2, total, maximum in a 100 cm^2 area

200 dpm/100 cm^2, removable

Natural Uranium

5,000 α dpm/100 cm^2, averaged over a 1 m^2 area

15,000 α dpm/100 cm^2, total, maximum in a 100 cm^2 area

1,000 α dpm/100 cm^2, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and

beta radiations, therefore, either alpha or beta activity may be measured for determining residual thorium surface activity. As interpreted by the NRC, the average 1,000 dpm/100 cm^2 and maximum 3,000 dpm/100 cm^2 should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the beta activity level corresponding to 1,000 alpha dpm/100 cm^2 is 670 beta dpm/100 cm^2. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm^2 or 2,000 dpm/100 cm^2 would exceed the alpha average or maximum activity guideline for thorium, respectively.

The NRC guideline for exposure rates at one meter above building surfaces is 5 μR/h above background and at one meter above soil/exterior surfaces is 10 μR/h above background (NRC 1991). ESSAP compared on-site soil samples with the off-site background soil samples to determine if uranium and thorium concentrations were elevated and to determine if contamination existed in the surface soil (0-15 cm) underneath the building foundations.

FINDINGS AND RESULTS

DOCUMENT REVIEW

ESSAP's review of the FSS documentation and subsequent confirmatory surveys indicated that there were basic issues concerning MACTEC'S radiological survey procedures (MACTEC 2002a, d, e, f, g and h). These concerns included:

- surface scanning procedures/techniques
- the need for better internal quality assurance document reviews
- FSS data should be provided prior to confirmatory survey activities
- radiological protection/cross-contamination during dismantlement/demolition activities

SURFACE SCANS AND SURFACE ACTIVITY LEVELS

Building 38

Alpha plus beta and gamma surface scans of the building structural components did not identify any areas of elevated radiation on the floor or lower walls. Total surface activity levels for Building 38 are presented in Table 1. Alpha surface activity levels ranged from 0 to 180 dpm/100 cm^2 and beta surface activity levels ranged from -160 to 660 dpm/100 cm^2.

Heat Exchanger Footers

Alpha plus beta and gamma surface scans indicated one location of residual contamination above the average guideline remained on a portion of a concrete footer; the area of contamination was less than 200 cm^2. Total surface activity levels for the heat exchanger footers are presented in Table 2. With the exception of location 8, which had a beta activity level of 1,300 dpm/100 cm^2, alpha and beta surface activity levels ranged from 24 to 140 dpm/100 cm^2 and from -140 to 390 dpm/100 cm^2, respectively.

Building 31 Exterior West Wall

Alpha plus beta surface scans of the remaining portion of the wall did not identify any areas of elevated alpha or beta radiation. Total surface activity levels for the Building 31 Exterior West Wall are presented in Table 3. Only one alpha surface activity measurement, at 16 dpm/100 cm^2, was performed. Total beta surface activity levels ranged from 210 to 480 dpm/100 cm^2.

Building Foundations

Gamma and beta surface scans of the building foundations and underlying soils for the areas surveyed identified several locations of elevated gamma and/or beta radiation within the Building 14, 19, 23 and 25 foundations; these areas were marked for further investigation. Total surface activity levels for the Building 13, 14, 19, 21, 23, 25, 33, 36, and 42 foundations are presented in

Table 4; Building 35 total surface activity levels are presented in Table 5. Total surface activity levels for the building foundations are summarized below.

Survey Area	Alpha Activity Range (dpm/100 cm^2)	Beta Activity Range (dpm/100 cm^2)
Building 13 Foundation	32	-280 to 370
Building 14 Foundation	40 to 290	-110 to 2,500
Building 19 Foundation	16 to 95	-180 to 4,400
Building 21 Foundation	16 to 32	-290 to 300
Building 23 Foundation	24	-170 to 670
Building 25 Foundation	-16 to 130	38 to 820
Building 33 Foundation	8 to 120	-120 to 700
Building 35 Foundation	0 to 40	60 to 370
Building 36 Foundation	56	-400 to 210
Building 42 Foundation	—	-330 to 0

Exposure Rates

Site exposure rates for the building foundations are presented in Table 6 and ranged from 8 to 10 μR/h. Background exposure rates, presented in Table 7, averaged 8 μR/h.

Soil Samples

Radionuclide concentrations in background and site soil samples are summarized in Table 7. The radionuclide concentration for the background soil samples ranged as follows: -0.5 to 2.2 pCi/g for Th-230; 0.46 to 1.32 pCi/g for Th-228; 0.57 to 1.25 pCi/g for Th-232, 1.03 to 2.53 pCi/g for total thorium; -0.01 to 0.19 pCi/g for U-235; 0.81 to 1.67 pCi/g for U-238; and, 1.64 to 3.53 pCi/g for total uranium.

The radionuclide concentration for the individual site soil samples ranged as follows: 14 to 48 pCi/g for Th-230; 9.35 to 35.0 pCi/g for Th-228; 9.47 to 35.3 pCi/g for Th-232, 18.82 to 70.3 pCi/g for

total thorium; -0.04 to 0.53 pCi/g for U-235; 4.6 to 7.2 pCi/g for U-238; and, 9.2 to 14.9 pCi/g for total uranium.

COMPARISON OF RESULTS WITH GUIDELINES

ESSAP's confirmatory survey activities did not identify any areas of elevated beta surface activity within the interior of Building 38, the remaining portion of the Building 31 Exterior West Wall, or on the Building 13, 21, 35, 36 and 42 foundations. The confirmatory survey activities identified one unmarked area of elevated beta surface activity on the heat exchanger footers; six locations on the Building 14 foundation; four locations on the Building 19 foundation; one location on the Building 23 foundation; one location on the Building 25 foundation; and one location on the Building 33 foundation. Of these locations, one location on the Building 14 foundation and two on the Building 19 foundation exceeded the maximum guideline; two locations on the Building 14 foundation (locations 20 and 21) exceeded the average guideline value for a 1 m^2 area. The remaining measurement locations that exceeded the average guideline were isolated areas (less than 400 cm^2) with activity levels between the average and maximum guideline. Cursory surveys of the adjacent 1 m^2 areas did not indicate any additional elevated areas, therefore the activity levels in these areas would satisfy the 1 m^2 average guideline.

All site exposure rate measurements were within the NRC guidelines. The site surface soil samples contained residual thorium and uranium at concentrations that ranged up to 48 times background levels.

SUMMARY

During the period of September 23 through 25, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 38, the heat exchanger footers, the exterior lower west wall of Building 31, and the foundations of Buildings 13, 14, 19, 21, 23, 25, 33, 35, 36 and 42 at the Molycorp, Inc. Washington facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta

surface scans, alpha and beta surface activity measurements, exposure rate measurements and soil sampling.

Based on the confirmatory survey results, it is ESSAP's opinion that alpha and/or beta activity, in excess of the guidelines, remains on various pieces of concrete within the Building 14 and 19 foundations. ESSAP's survey findings for the Building 14 and 19 foundations do not support the licensee's conclusion that the radiological conditions of these structures satisfy the NRC guidelines for release for unrestricted use. ESSAP's findings for Building 38 and the remaining building foundations are consistent with the licensee's measurements and support the licensee's conclusion that the radiological conditions of those surveyed areas satisfy the NRC guidelines for release for unrestricted use. The soil sample data also indicate that soil contamination is present on the surface of the soil just underneath the building foundations in the Building 25, 33 and 35 footprints.

Previously, there was elevated activity in excess of the guideline levels on the west wall of Building 31. It was ESSAP's understanding the MACTEC personnel were to determine if the activity resulted from the adjacent foundation dismantlement process (ORISE 2002d). MACTEC personnel dismantled the west wall of Building 31 and removed the bottom two feet of the wall to dispose of as LLRW. ESSAP's survey findings on the remaining portion of the wall indicated that residual contamination was no longer present.

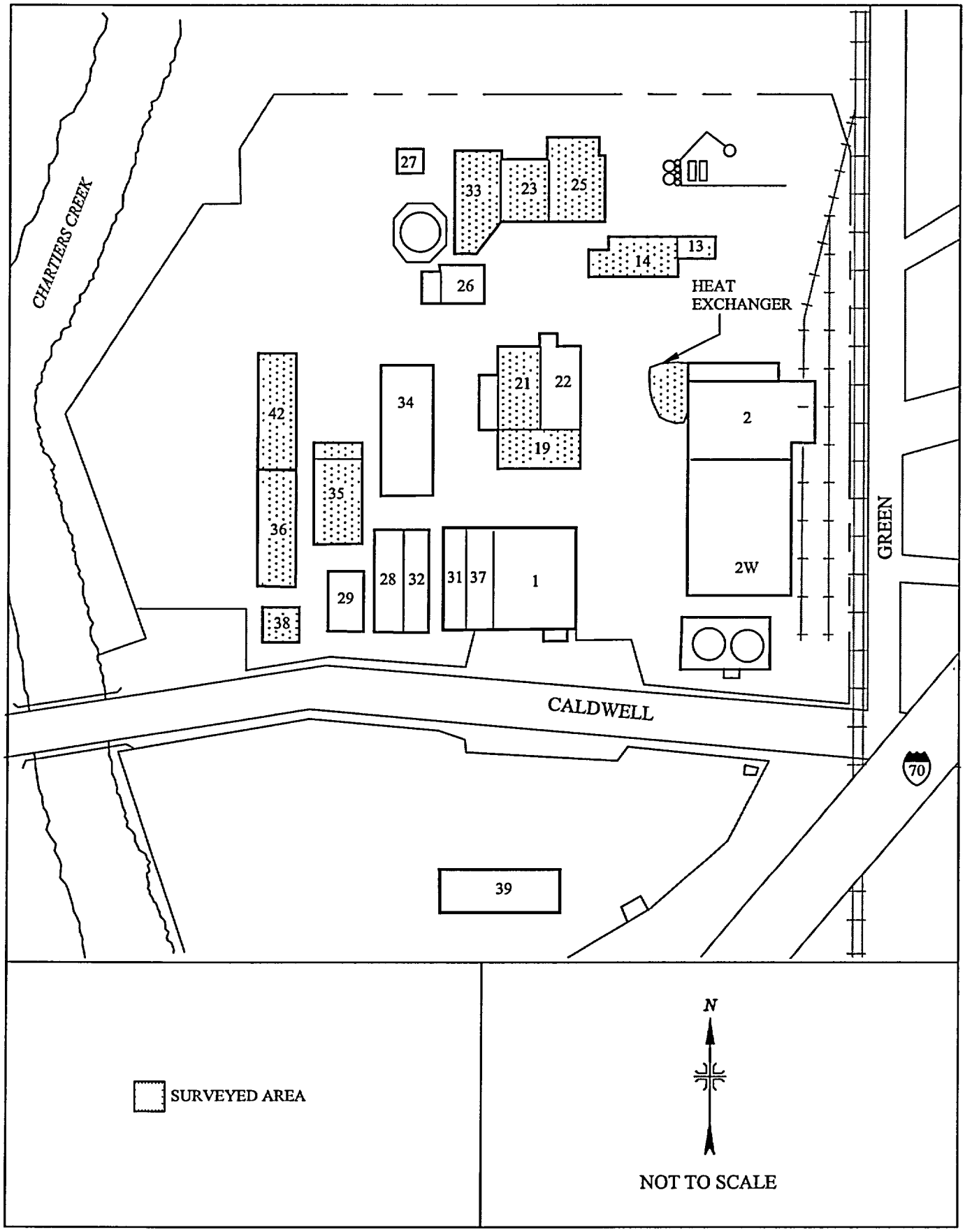

FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania

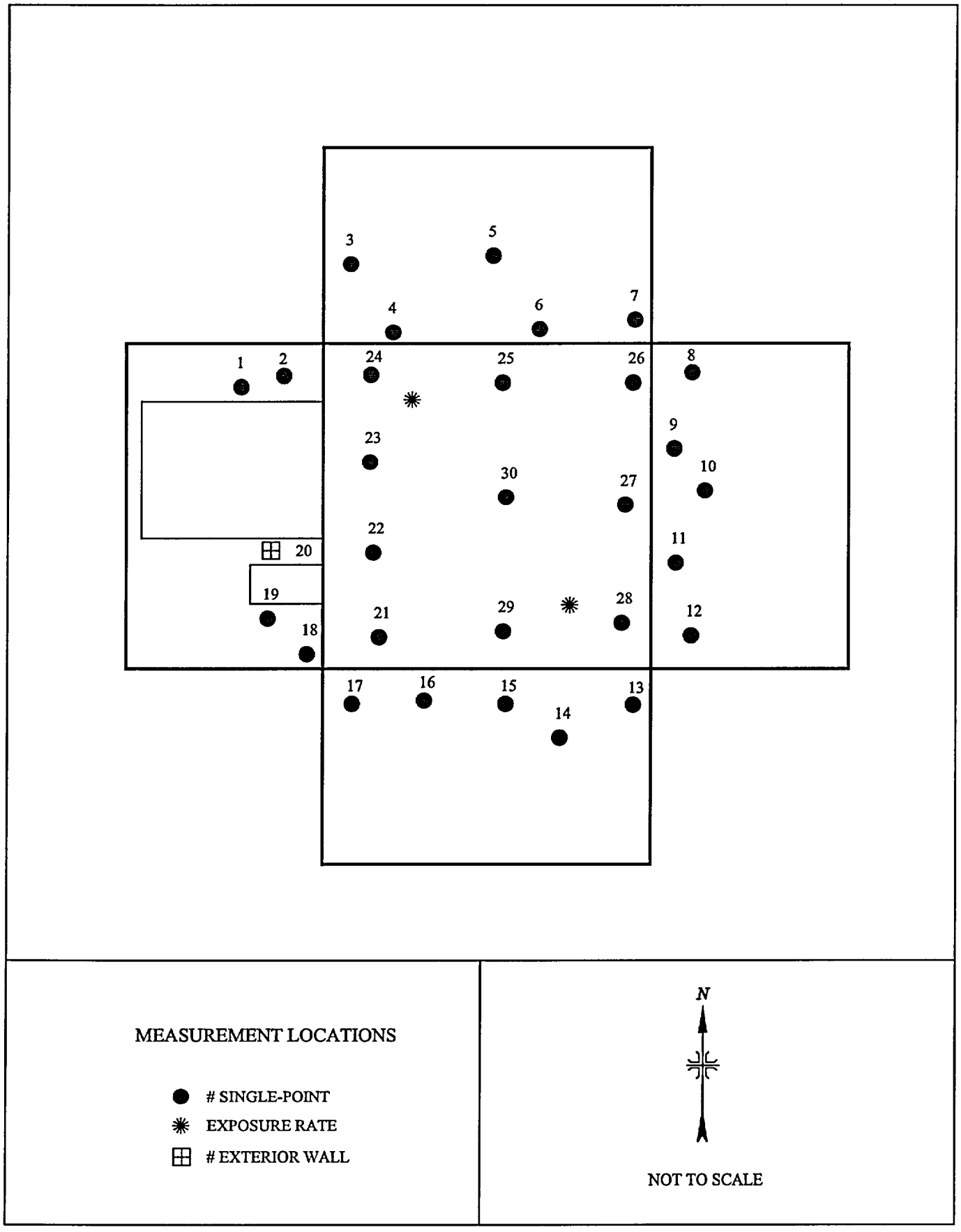

FIGURE 2: Building 38 - Measurement Locations

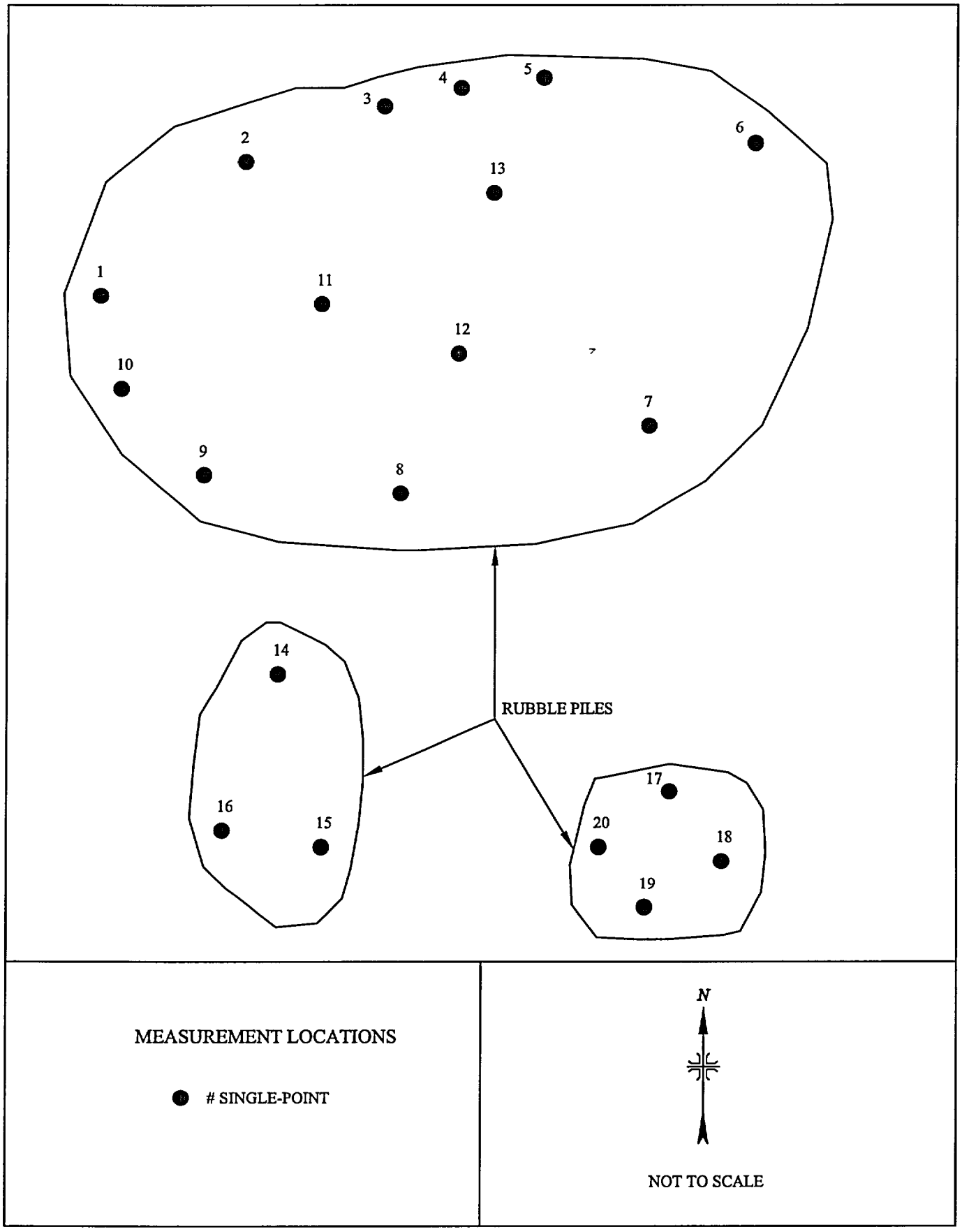

FIGURE 3: Heat Exchanger Footers - Measurement Locations

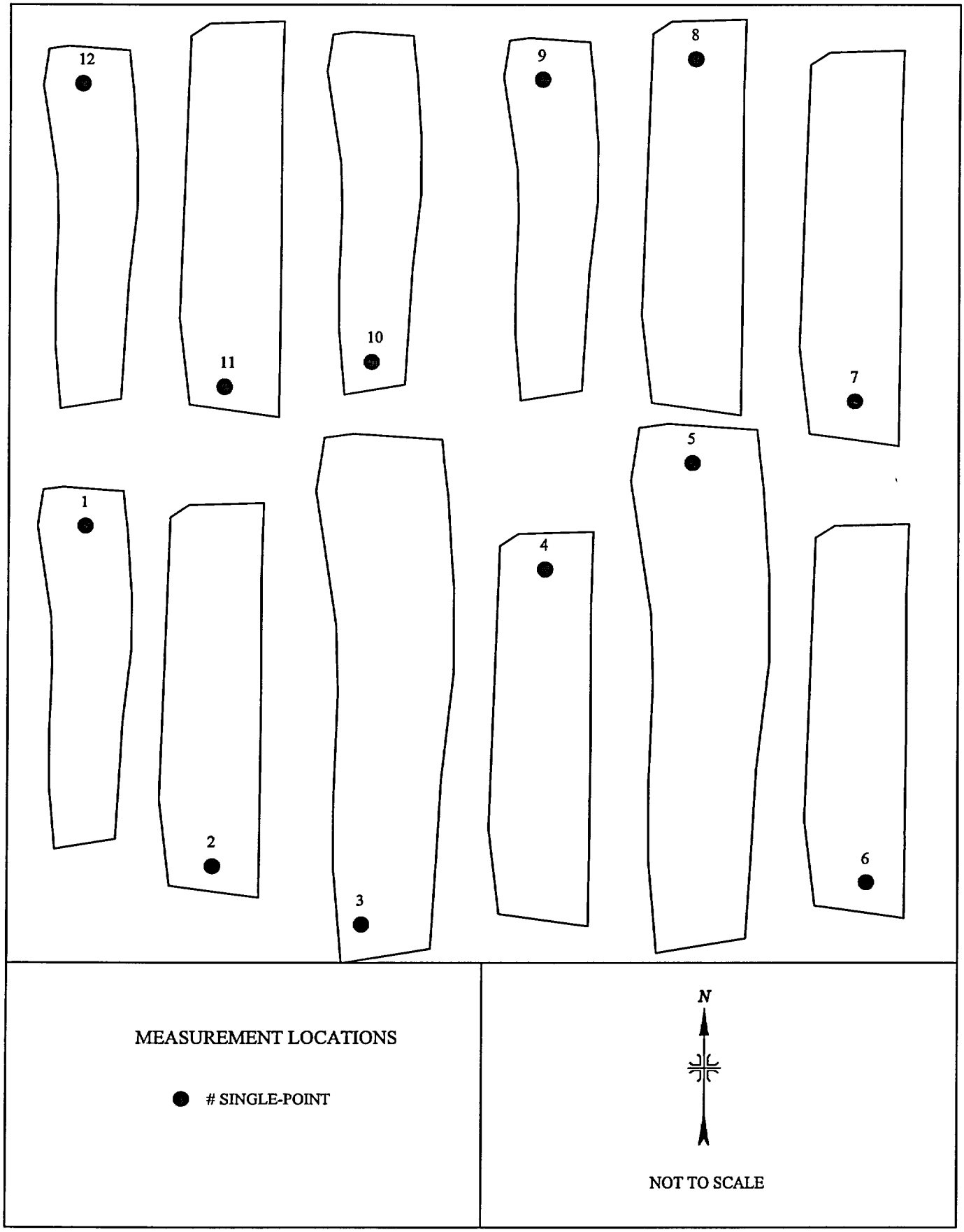

FIGURE 4: Building 31, Exterior West Wall - Measurement Locations

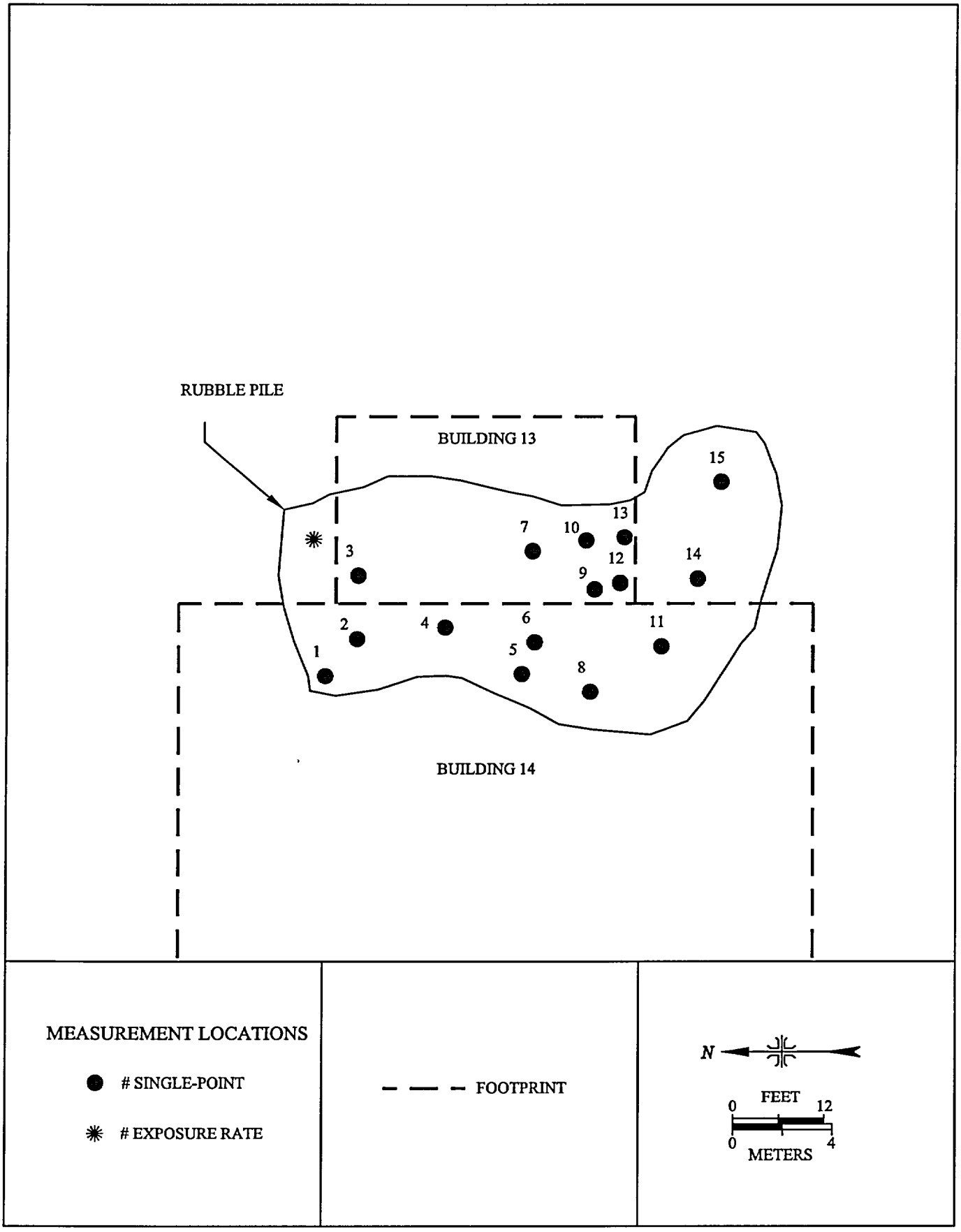

FIGURE 5: Building 13 Foundation - Measurement Locations

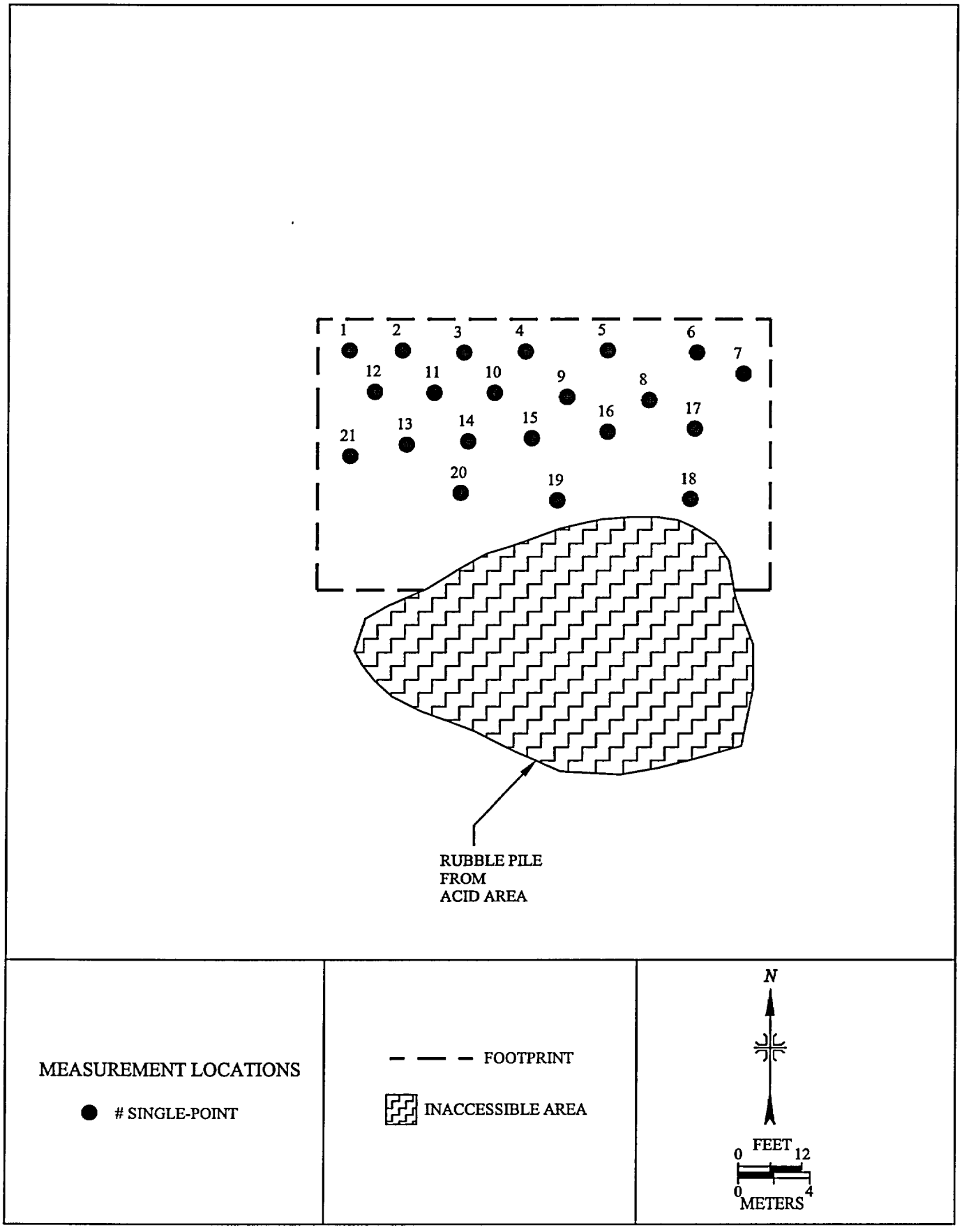

FIGURE 6: Building 14 Foundation - Measurement Locations

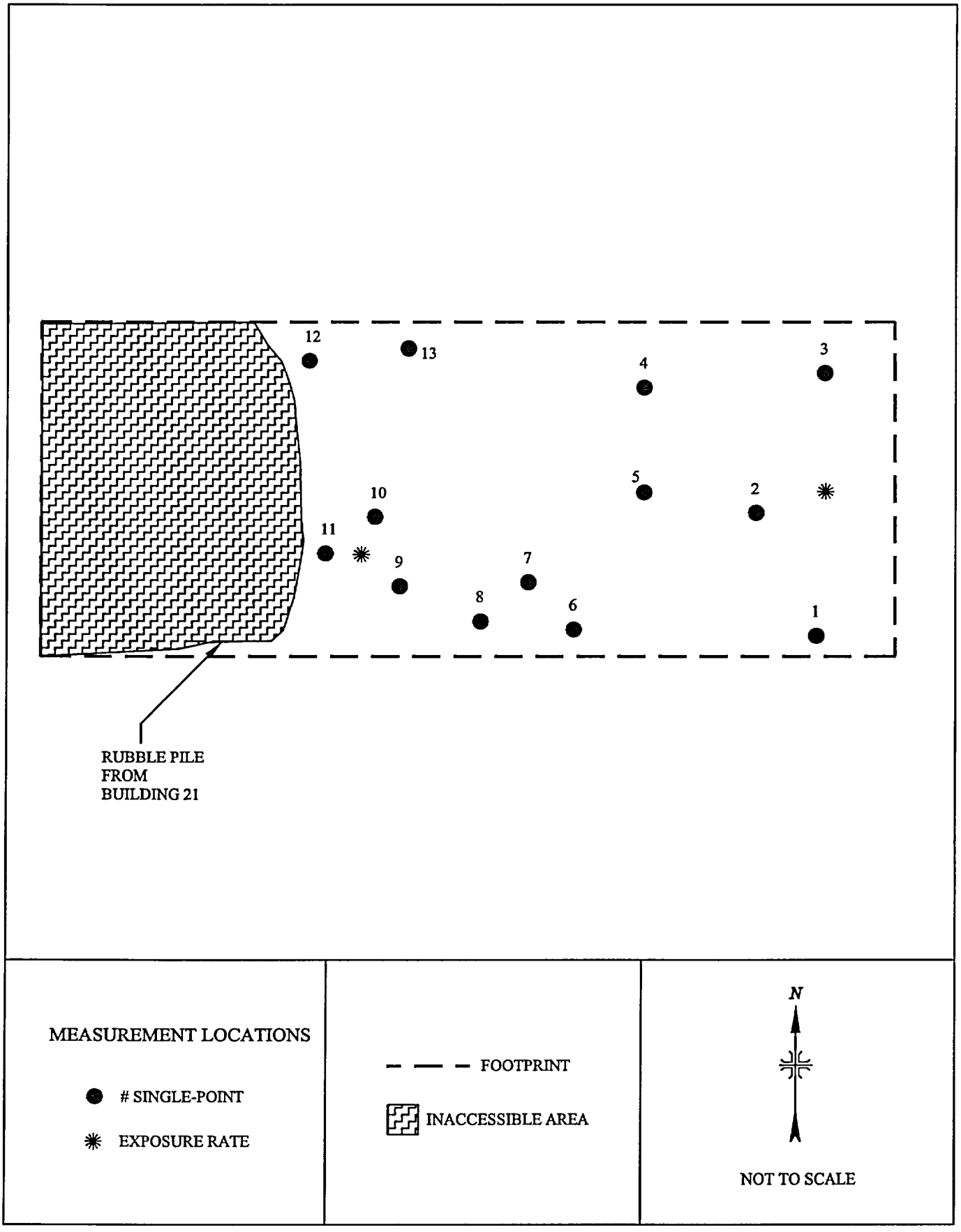

FIGURE 7: Building 19 Foundation - Measurement Locations

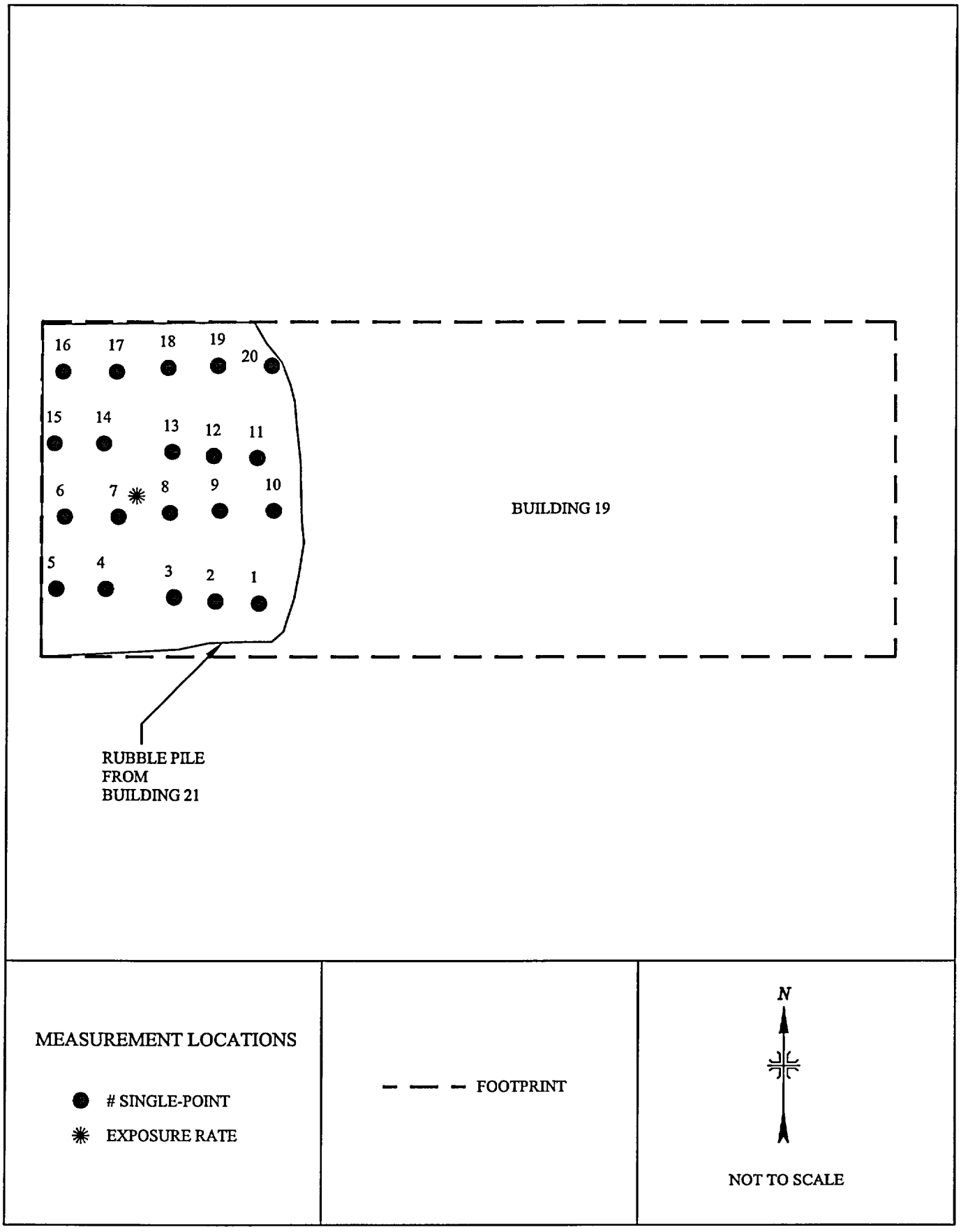

FIGURE 8: Building 21 Foundation - Measurement Locations

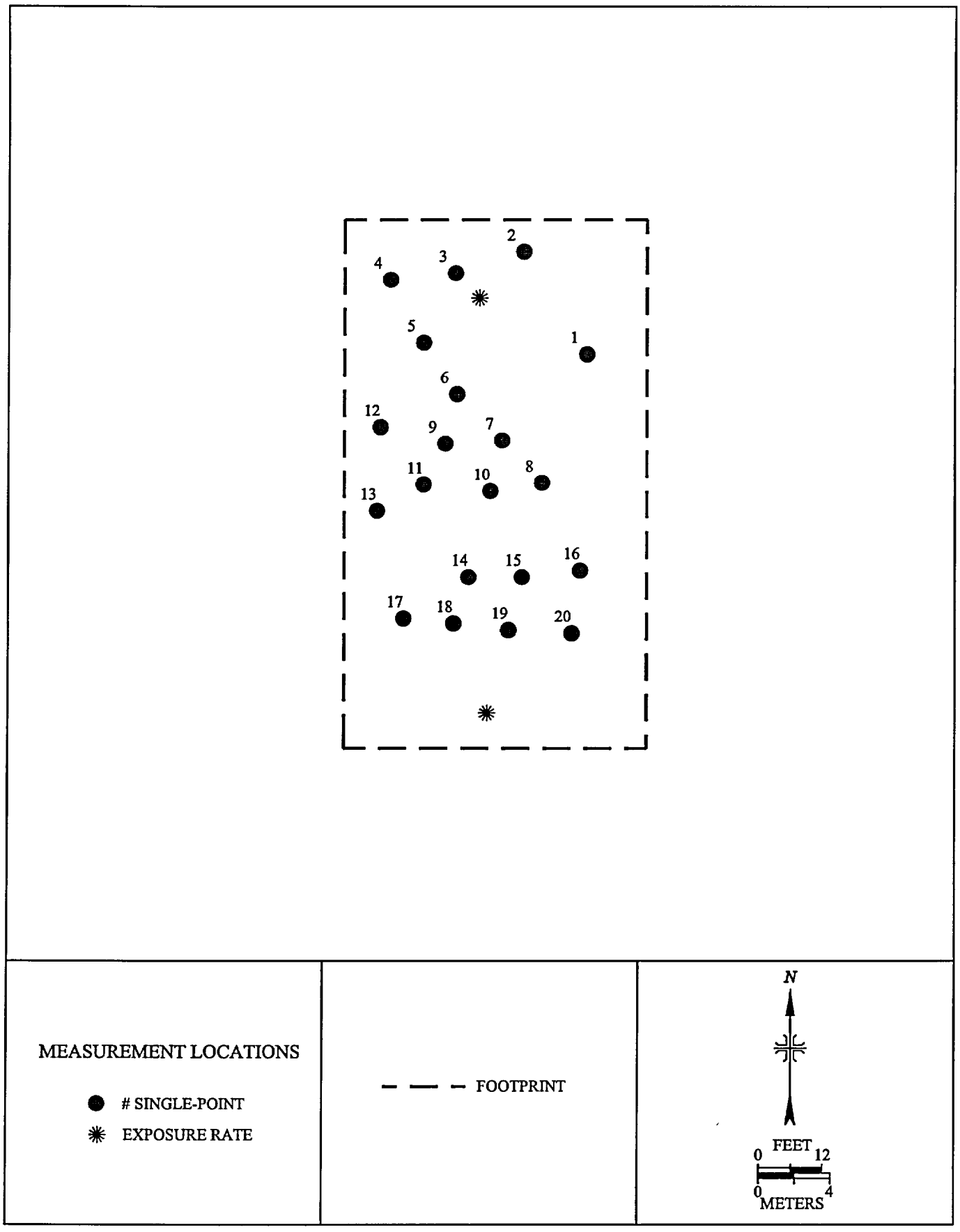

FIGURE 9: Building 23 Foundation - Measurement Locations

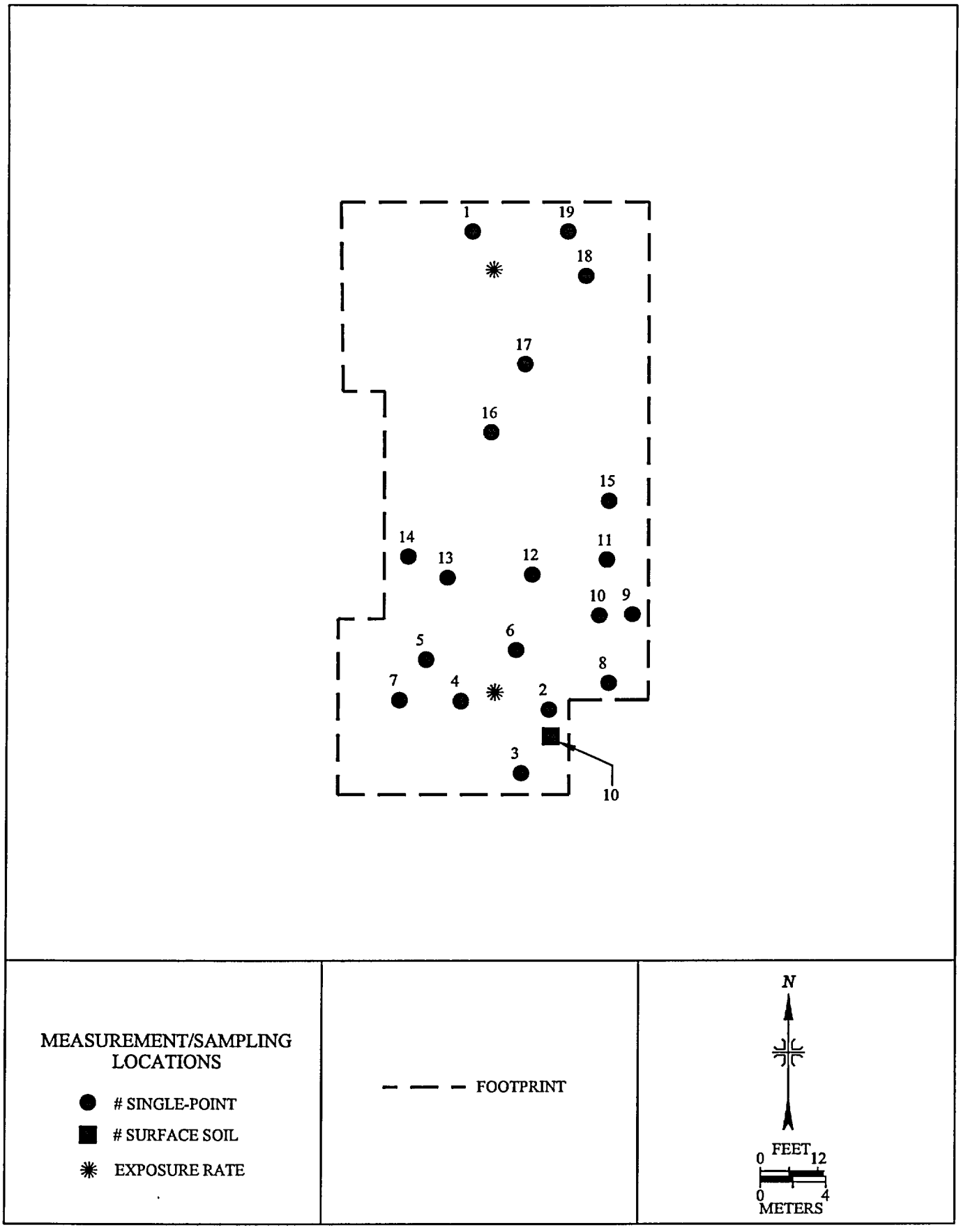

FIGURE 10: Building 25 Foundation - Measurement and Sampling Locations

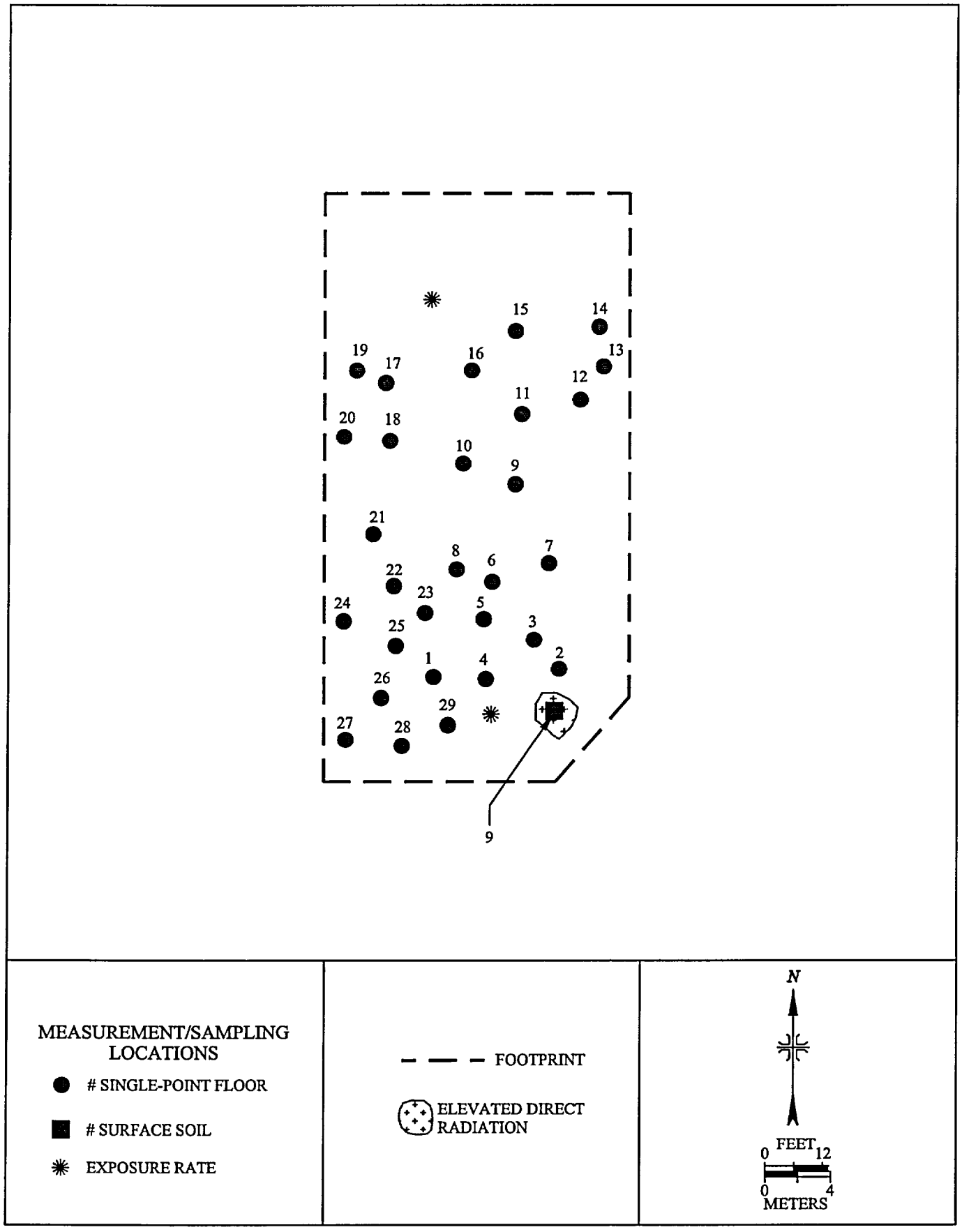

FIGURE 11: Building 33 Foundation - Measurement and Sampling Locations

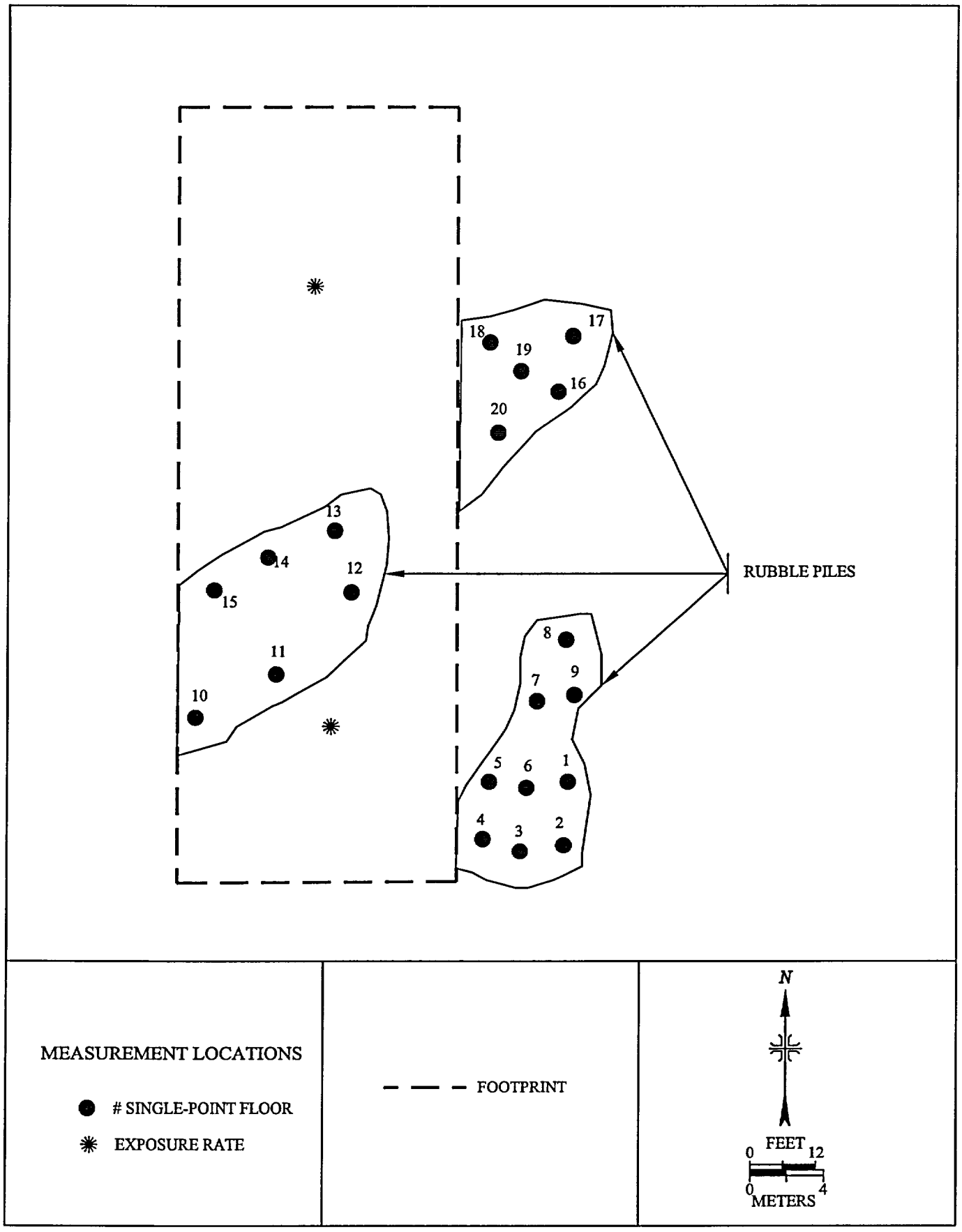

FIGURE 12: Building 36 Foundation - Measurement Locations

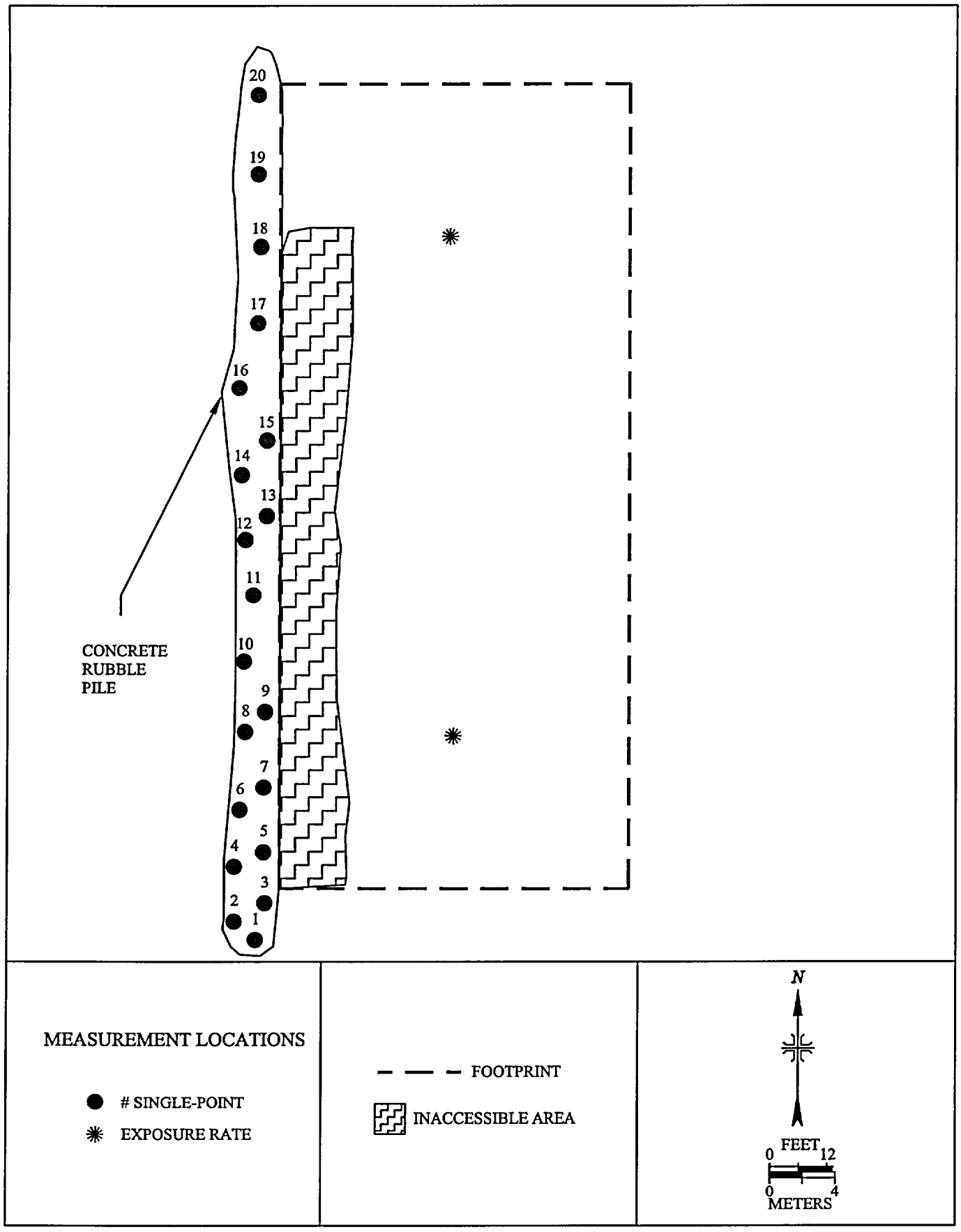

FIGURE 13: Building 42 Foundation - Measurement Locations

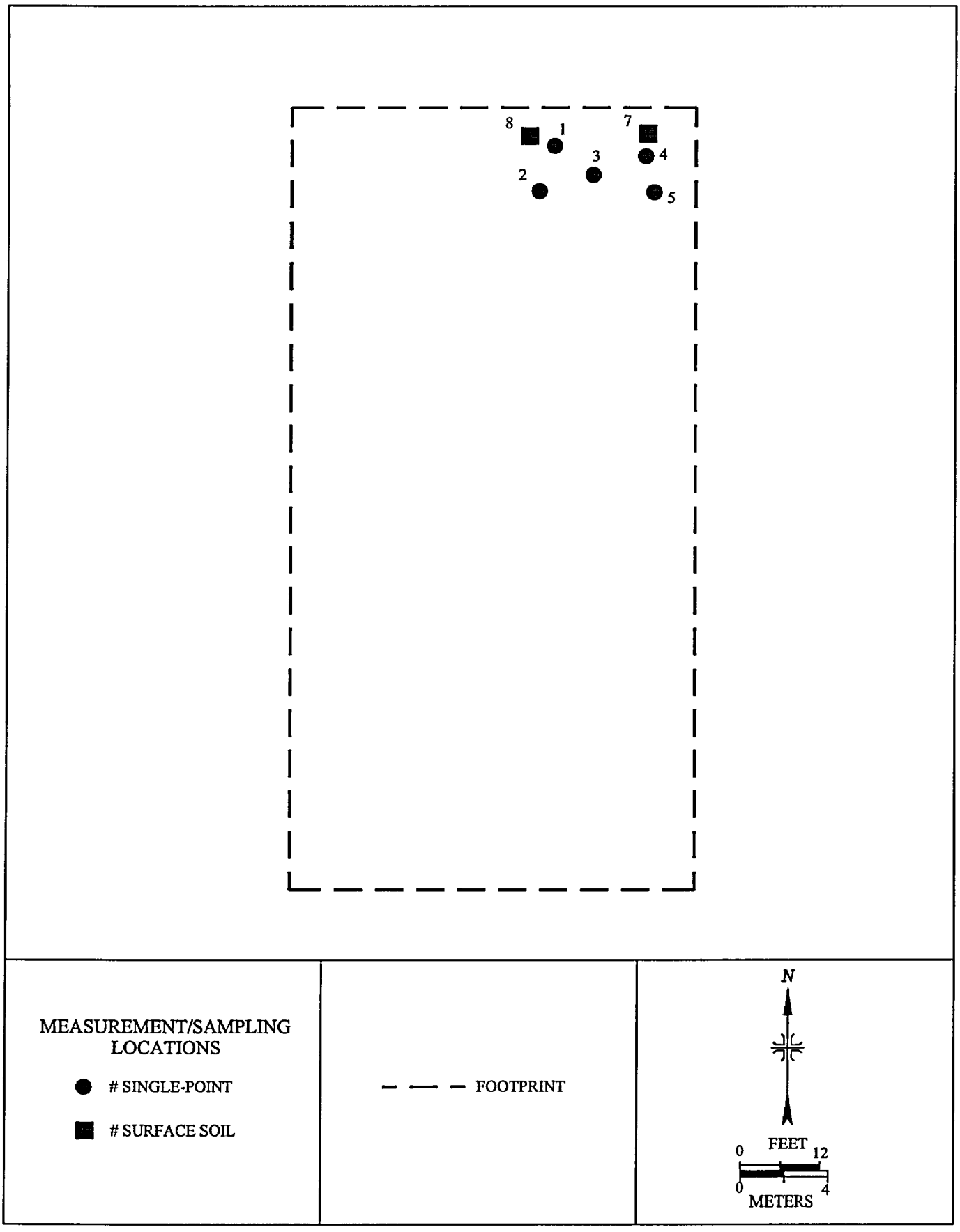

FIGURE 14: Building 35 Foundation - Measurement and Sampling Locations

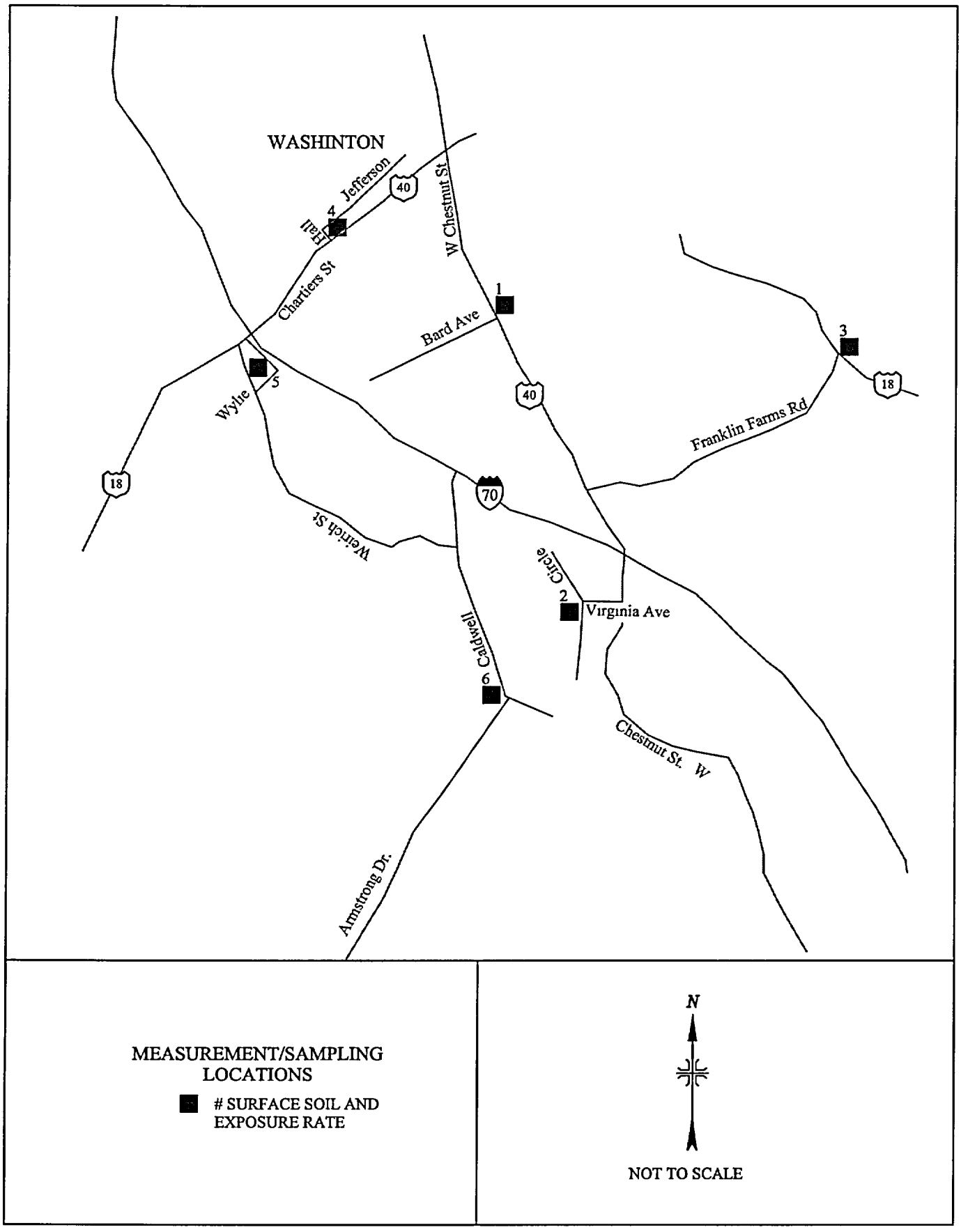

FIGURE 15: Background Measurement and Sampling Locations - Washington, PA

TABLE 1

SURFACE ACTIVITY LEVELS
BUILDING 38
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Total Alpha Activity (dpm/100 cm^2)	Total Beta Activity (dpm/100 cm^2)
Lower Walls		
1	48	120
2	16	200
3	48	310
4	24	350
5	32	340
6	0	370
7	0	410
8	8	350
9	0	620
10	40	-160
11	48	620
12	24	660
13	56	470
14	8	210
15	0	120
16	40	30
17	24	98
18	24	11
19	32	91
20	8	34

TABLE 1 (continued)

SURFACE ACTIVITY LEVELS
BUILDING 38
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Total Alpha Activity (dpm/100 cm^2)	Total Beta Activity (dpm/100 cm^2)
Floor		
21	71	440
22	170	220
23	180	280
24	140	220
25	95	360
26	71	300
27	150	330
28	87	280
29	170	400
30	180	300

[a]Refer to Figure 2

TABLE 2

SURFACE ACTIVITY LEVELS
HEAT EXCHANGER FOOTERS
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Total Alpha Activity (dpm/100 cm^2)	Total Beta Activity (dpm/100 cm^2)
Pile #1		
1	24	170
2	--[b]	240
3	--	340
4	--	-15
5	--	4
6	--	34
7	--	45
8	140	1,300
9	--	64
10	32	-140
11	--	390
12	--	57
13	--	53
Pile #2		
14	--	64
15	--	150
16	--	-19

TABLE 2 (continued)

SURFACE ACTIVITY LEVELS
HEAT EXCHANGER FOOTERS
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Total Alpha Activity (dpm/100 cm^2)	Total Beta Activity (dpm/100 cm^2)
Pile #3		
17	--[b]	94
18	--	-23
19	--	-15
20	95	-4

[a]Refer to Figure 3
[b]Measurement not performed

TABLE 3

SURFACE ACTIVITY LEVELS
BUILDING 31 EXTERIOR LOWER WEST WALL
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Total Alpha Activity (dpm/100 cm^2)	Total Beta Activity (dpm/100 cm^2)
1	16	210
2	--[b]	460
3	--	470
4	--	320
5	--	460
6	--	430
7	--	480
8	--	300
9	--	330
10	--	340
11	--	410
12	--	430

[a]Refer to Figure 4
[b]Measurement not performed

TABLE 4

SURFACE ACTIVITY LEVELS
BUILDING FOUNDATIONS
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface Activity Levels (dpm/100cm^2)					
	Building 13 Foundation		Building 14 Foundation		Building 19 Foundation	
	Alpha	Beta	Alpha	Beta	Alpha	Beta
1	32	-150	56	-11	24	-110
2	--[b]	4	--	64	16	-98
3	--	-280	--	230	--	-180
4	--	19	--	400	--	-64
5	--	-170	--	1,300	--	-11
6	--	-49	--	510	--	540
7	--	-230	--	-110	48	930
8	--	-57	--	700	24	2,200
9	--	110	--	110	--	-110
10	--	-45	40	34	95	4,400
11	--	370	--	640	--	-60
12	--	-140	--	160	56	1,100
13	--	220	--	420	--	30
14	--	42	--	330	--	--
15	--	-60	--	140	--	--
16	--	--	--	150	--	--
17	--	--	290	2,500	--	--
18	--	--	--	230	--	--
19	--	--	87	920	--	--
20	--	--	100	1,400	--	--
21	--	--	63	1,400	--	--

TABLE 4 (continued)

SURFACE ACTIVITY LEVELS
BUILDING FOUNDATIONS
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface Activity Levels (dpm/100cm^2)					
	Building 21 Foundation		Building 23 Foundation		Building 25 Foundation	
	Alpha	Beta	Alpha	Beta	Alpha	Beta
1	32	-26	--	-64	16	150
2	--	-290	--	72	79	360
3	--	-72	--	-68	56	320
4	--	-26	--	8	24	190
5	--	120	--	160	63	330
6	--	-68	--	110	40	94
7	--	-150	--	-11	40	400
8	--	83	--	220	8	190
9	--	-38	--	670	-16	510
10	16	-30	24	91	130	530
11	--	-57	--	470	--	390
12	--	160	--	170	--	820
13	--	230	--	72	--	250
14	--	-49	--	-42	--	440
15	--	53	--	250	--	530
16	--	26	--	-170	--	530
17	--	220	--	120	--	300
18	--	-120	--	60	--	170
19	--	300	--	-38	--	38
20	--	45	24	-76	--	--

TABLE 4 (continued)

SURFACE ACTIVITY LEVELS
BUILDING FOUNDATIONS
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface Activity Levels (dpm/100cm^2)					
	Building 33 Foundation		Building 36 Foundation		Building 42 Foundation	
	Alpha	Beta	Alpha	Beta	Alpha	Beta
1	120	350	56	-230	--	-110
2	8	390	--	-90	--	-160
3	40	380	--	-160	--	-160
4	56	250	--	-94	--	-180
5	32	140	--	210	--	-38
6	8	110	--	-83	--	-53
7	56	120	--	-110	--	-76
8	48	94	--	-400	--	-160
9	87	-120	--	0	--	-200
10	48	83	--	-42	--	0
11	16	200	--	-300	--	-200
12	40	150	--	-200	--	-57
13	16	-23	--	-160	--	-180
14	16	-19	--	-280	--	-190
15	56	30	--	-150	--	-76
16	48	120	--	-310	--	-60
17	63	-15	--	-220	--	-220
18	24	110	--	-72	--	-170
19	40	-110	--	-180	--	-330
20	32	220	--	-130	--	-34

TABLE 4 (continued)

SURFACE ACTIVITY LEVELS
BUILDING FOUNDATIONS
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Surface Activity Levels (dpm/100cm^2)					
	Building 33 Foundation (continued)		Building 36 Foundation (continued)		Building 42 Foundation (continued)	
	Alpha	Beta	Alpha	Beta	Alpha	Beta
21	16	-57	--	--	--	--
22	8	42	--	--	--	--
23	48	110	--	--	--	--
24	79	250	--	--	--	--
25	63	220	--	--	--	--
26	16	200	--	--	--	--
27	48	140	--	--	--	--
28	56	700	--	--	--	--
29	63	0	--	--	--	--
30	--	--	--	--	--	--

[a]Refer to Figures 5 through 13.
[b]Measurement not performed.

TABLE 5

SURFACE ACTIVITY LEVELS
BUILDING 35 FOUNDATION
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Total Alpha Activity (dpm/100 cm^2)	Total Beta Activity (dpm/100 cm^2)
1	0	200
2	32	60
3	16	320
4	40	320
5	40	370

[a]Refer to Figure 14

TABLE 6

EXPOSURE RATES
BUILDING 38 AND BUILDINGS FOUNDATIONS
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Exposure Rate @ 1 m (µR/h)
Building 13, Rubble Pile	8
Building 19, East End	8
Building 19, West End	8
Building 21, Rubble Pile	8
Building 23, North End	8
Building 23, South End	8
Building 25, North End	8
Building 25, South End	8
Building 33, North End	9
Building 33, South End	9
Building 36, North End	8
Building 36, South End	8
Building 38, North West Corner	9
Building 38, South East Corner	10
Building 42, North End	8
Building 42, South End	8

[a]Refer to Figures 2, 5, 7 through 13

TABLE 7

EXPOSURE RATES AND SOIL SAMPLES
MOLYCORP INCORPORATED
WASHINGTON, PENNSYLVANIA

Location[a]	Exposure Rate (µR/h)	Radionuclide Concentration (pCi/g)						
		Th-230	Th-228	Th-232	Total Thorium[b]	U-235	U-238	Total Uranium[c]
Background Measurements and Samples								
1	8	1.5 ± 4.6	1.28 ± 0.11	1.25 ± 0.23	2.53	0.10 ± 0.11	1.34 ± 0.87	2.78
2	9	2.2 ± 2.6	0.46 ± 0.04	0.57 ± 0.10	1.03	0.02 ± 0.06	0.81 ± 0.39	1.64
3	10	1.5 ± 3.6	1.14 ± 0.09	1.20 ± 0.17	2.34	-0.01 ± 0.09	0.94 ± 0.51	1.87
4	8	-0.5 ± 4.6	1.32 ± 0.11	1.17 ± 0.20	2.49	0.19 ± 0.11	1.67 ± 0.77	3.53
5	8	1.0 ± 3.6	0.74 ± 0.07	0.97 ± 0.20	1.71	0.02 ± 0.09	1.07 ± 0.60	2.16
6	8	0.2 ± 4.0	1.17 ± 0.09	1.21 ± 0.19	2.38	0.10 ± 0.09	1.54 ± 0.56	3.18
Site Soil Samples from Selected Foundations								
7	--[d]	14 ± 13	35.0 ± 2.3	35.3 ± 2.9	70.3	-0.04 ± 0.36	4.8 ± 2.0	9.6
8	--	14.3 ± 9.5	21.2 ± 1.4	21.1 ± 1.7	42.3	0.02 ± 0.21	4.6 ± 1.2	9.2
9	--	20 ± 11	9.35 ± 0.63	9.47 ± 0.87	18.82	0.36 ± 0.31	5.4 ± 1.4	11.2
10	--	48 ± 18	21.7 ± 1.4	21.9 ± 1.8	43.6	0.53 ± 0.36	7.2 ± 1.7	14.9

[a]Refer to Figures 10, 11, 14 and 15.
[b]Total thorium calculated by adding Th-228 and Th-232 concentrations
[c]Total uranium concentrations calculated by doubling U-238 concentration and adding the U-235 concentration
[d]Measurement not performed

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