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Mr. James Kottan
U.S Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406

SUBJECT: INTERIM CONFIRMATORY SURVEY LETTER REPORT FOR THE QUEHANNA DECOMMISSIONING PROJECT KARTHAUS, PENNSYLVANIA [DOCKET NO. 30-29288; RFTA NO. 04-008]

Dear Mr. Kottan:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities of the Quehanna Facility in Karthaus, Pennsylvania during the period of November 8 through 10, 2004. The results of these survey activities are summarized in this interim letter report and will be presented in a final report that incorporates all confirmatory survey activities at the site.

The Quehanna facility had multiple owners who manufactured products such as thermo generator power sources containing high strontium-90 (Sr-90) specific activity and wood products which were hardened using a large cobalt-60 (Co-60) irradiator. These activities resulted in the radiological contamination of areas of the site. The Commonwealth of Pennsylvania currently owns the Quehanna facility and the surrounding real estate and the Department of Conservation and Natural Resources (DCNR) Bureau of Forestry administers the land; the Pennsylvania Department of Environmental Protection (PADEP) assumed the official license since the former owner filed for bankruptcy in December 2002 (SCIENTECH 2004).

Currently, the site decommissioning contractor, SCIENTECH, Inc., is performing final status surveys (FSS) of the Quehanna facility. Decommissioning activities have included the removal of the Hot Cell 4 process system, the removal of the Co-60 irradiator sources from the reactor pool and hot cells, and the decontamination of areas such as the laboratories and production and storage areas. Interior structures north of the reactor bay and cell face have been surveyed and demolished (e.g. walls, ceiling and floor tiles, etc.) and debris has been disposed of either as clean waste or low-level radioactive waste (LLRW) (SCIENTECH 2004).

The Quehanna facility is located at 115 Reactor Road, Karthaus, Clearfield County, Pennsylvania. The site is approximately 35 kilometers [km (21 miles)] northeast of Clearfield, Pennsylvania and is located in the 20,000-hectare [ha (50,000-acre)] Quehanna Wild Area of the Moshannon State Forest (Figure 1). The area is heavily wooded and sparsely populated. The Quehanna facility has a basement, main floor, and second floor area of approximately 3,700 square meters [m^2 (40,000 square feet)] (Figure 2).

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ESSAP performed confirmatory survey activities in selected survey units (SU) for which FSS data have been provided in accordance with the NRC-approved site-specific survey plan and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2004a, b, and c). These SUs included the Mezzanine Area, the Administration Area, the Dungeon Room, the Pump Room and the Waste Water Treatment Building [WWTB (Figure 3)].

Survey activities consisted of beta and gamma surface scans, total beta surface activity measurements, and smear sampling for removable alpha and beta activity. ESSAP also performed side-by-side direct measurements for direct data/instrument comparisons with SCIENTECH. In addition, at ESSAP's request, SCIENTECH provided five subsurface soil samples from the WWTB area for confirmatory analyses and six surface soil samples that included characterization samples from other site areas for interlaboratory comparison analyses.

ESSAP performed gamma and beta surfaces scans using gas proportional, GM, and NaI scintillation detectors coupled to ratemeters or ratemeter-scalers with audible indicators. Locations of elevated direct radiation detected by surface scans were marked for further investigation that included additional surface scans, as deemed necessary, to delineate contamination boundaries.

ESSAP performed direct measurements at 48 judgmentally selected locations on various surfaces throughout the facility. Beta direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable gross alpha and gross beta activity levels, were collected at each direct measurement location. Figures 4 through 8 document direct measurement and smear sampling locations. In addition, instrument comparison direct measurements were performed at six judgmentally selected locations and on one SCIENTECH check source.

Soil and smear samples and data were returned to ESSAP's Oak Ridge, Tennessee facility for analysis and interpretation. Samples were analyzed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2004d). Soil samples were analyzed by gamma spectroscopy and wet chemistry and results reported in units of picocuries per gram (pCi/g). The gamma-emitting radionuclide of interest was Co-60; however, spectra were reviewed for other identifiable photopeaks. Separate wet chemistry analyses were performed to determine Sr-90 concentrations in the soil samples. Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear data and direct measurements for surface activity were converted to units of disintegrations per minute per 100 square centimeters (dpm/100 cm^2).

ESSAP compared confirmatory data to the applicable NRC guidelines for surface contamination for Sr-90 and Co-60 (NRC 1987):

	Surface Activity (dpm/100 cm^2)		
Radionuclide Contaminant	Average[a]	Maximum[b]	Removable[c]
Cobalt-60	5,000	15,000	1,000
Strontium-90	1,000	3,000	200

[a]Measurement of average activity should not be averaged over more than 1 m^2.
[b]The maximum contamination level applies to an area of not more than 100 cm^2.
[c]The removable contamination level applies to an area of not more than 100 cm^2.

ESSAP used the more restrictive guidelines for strontium contamination for comparison against confirmatory survey surface activity data.

The applicable site soil guidelines are as follows (NRC 1992):

	Soil Concentration Above Background (pCi/g)	
Radionuclide Contaminant	Average[a]	Maximum[b]
Cobalt-60	8	24
Strontium-90	5	15

The instrument comparison results are presented in Table 1. The results indicate that SCIENTECH's direct measurement data are conservative in comparison with ESSAP's direct measurement data and averaged 50% higher than ESSAP's direct measurement results; this was also evident on the calibration source.

Total and removable confirmatory surface activity levels are presented in Table 2. Initial total beta surface activity levels ranged from -275 to 5,110 dpm/100 cm^2, with five locations exceeding the 1,000 dpm/100 cm^2 average guideline and of those, three locations exceeded the 3,000 dpm/100 cm^2 maximum guideline. SCIENTECH was notified and additional remedial activities were performed. ESSAP's total beta surface activity levels ranged from -275 to 3,300 dpm/100 cm^2 after this additional remediation—two locations exceeding 3,000 dpm/100 cm^2 in the WWTB were to be investigated by SCIENTECH personnel. Removable surface activity levels ranged from 0 to 3 dpm/100 cm^2 for alpha and -5 to 6 dpm/100 cm^2 for beta.

Co-60 and Sr-90 soil concentrations are summarized in Table 3. The ESSAP radionuclide concentrations for individual confirmatory samples ranged from -0.01 to 0.01 pCi/g for Co-60 and 0.20 to 0.70 pCi/g for Sr-90. The ESSAP radionuclide concentrations for the interlaboratory comparison analyses samples ranged from -0.01 to 0.03 pCi/g for Co-60 and -0.09 to 12.65 pCi/g for Sr-90. The SCIENTECH radionuclide concentrations for the interlaboratory comparison analyses samples ranged from -0.01 to 0.02 pCi/g for Co-60 and 0.02 to 10.0 pCi/g for Sr-90.

The analytical results for the comparative evaluation of the SCIENTECH samples indicated that the SCIENTECH contractor laboratory data were consistent and in agreement with ESSAP's analytical results and were within expected limits of the sampling and analytical procedures.

The confirmatory survey activities determined that, with the exception of the two direct measurement locations in the WWTB, that site confirmatory direct measurements and confirmatory site soil sample concentrations for the selected locations meet the guideline values for unrestricted release.

If you have any questions or comments, please direct them to me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073.

Sincerely,

Wade C. Adams

Wade C. Adams
Health Physicist/Project Leader
Environmental Survey and
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WCA:dh

Enclosures

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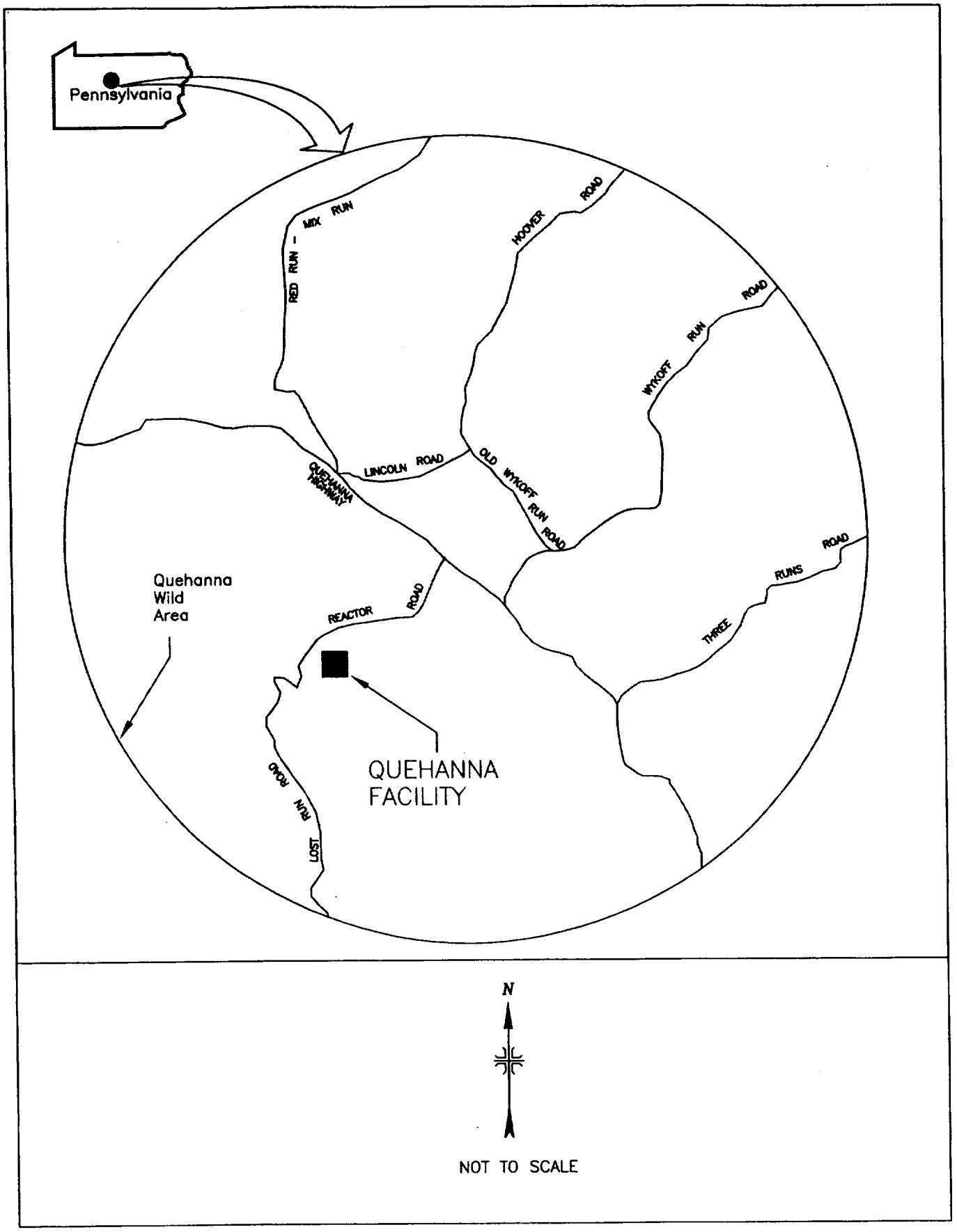

FIGURE 1: Location of the Quehanna Facility – Karthaus, Pennsylvania

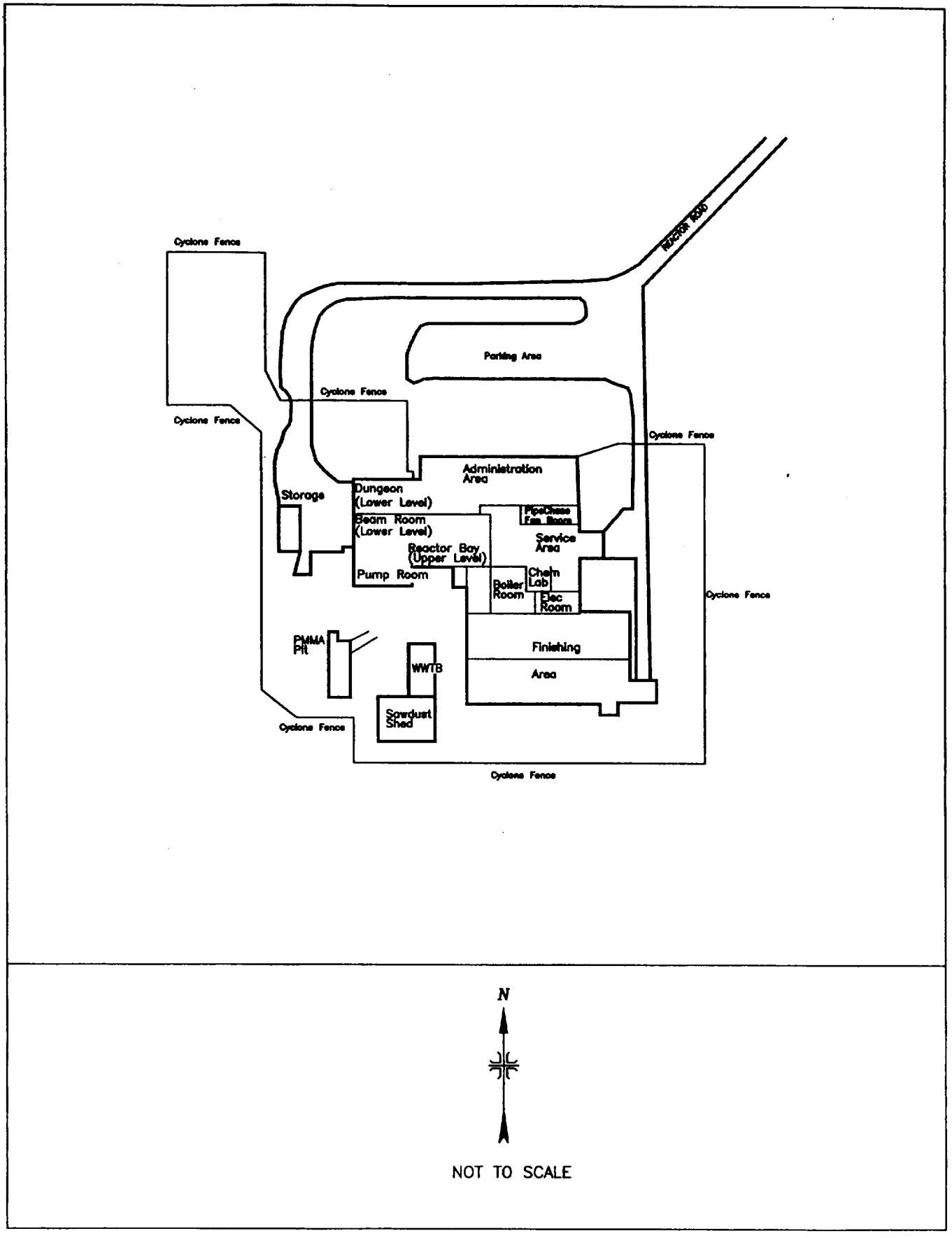

FIGURE 2: Plot Plan of the Quehanna Facility – Karthaus, Pennsylvania

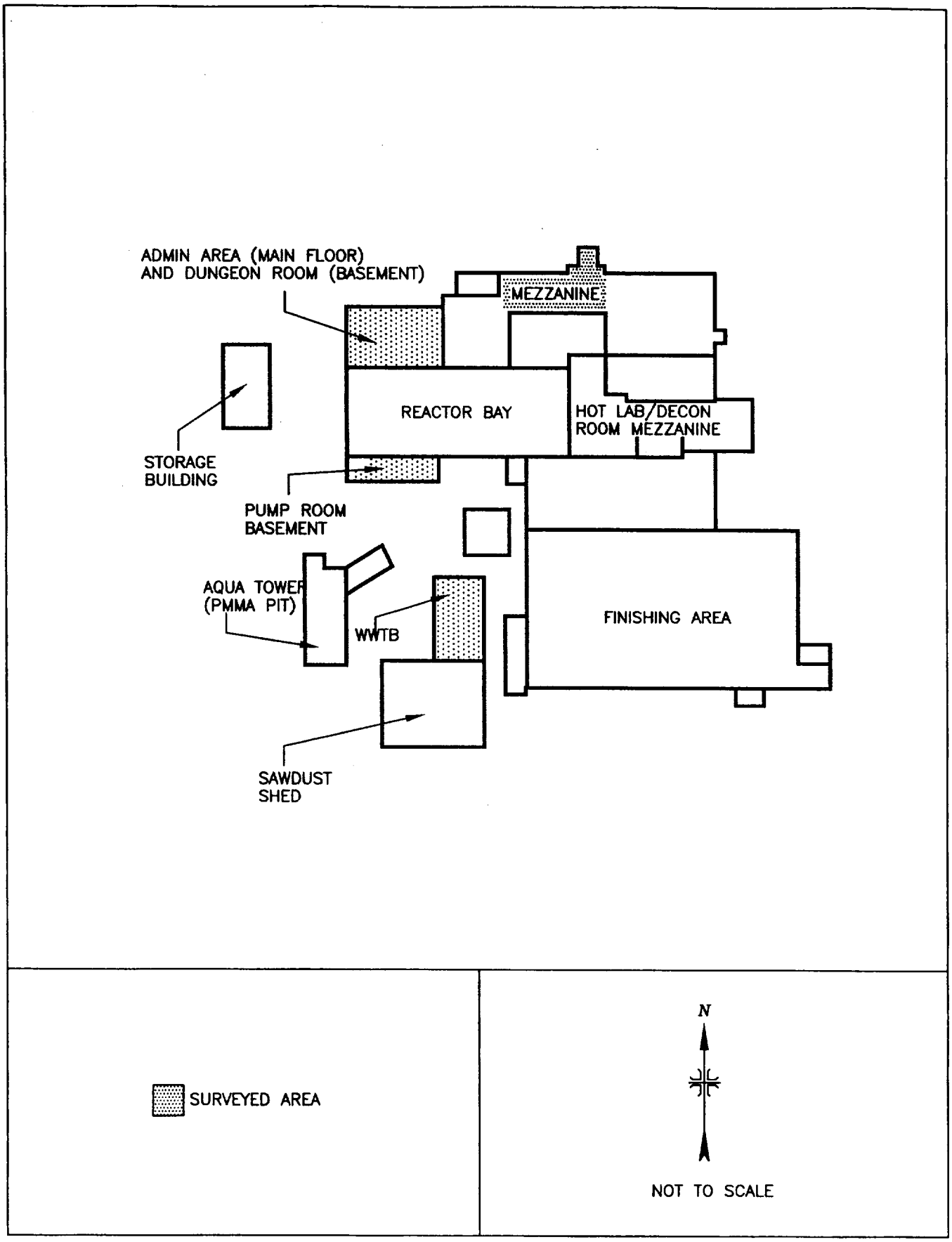

FIGURE 3: Quehanna Facility Floor Plan Indicating Surveyed Areas

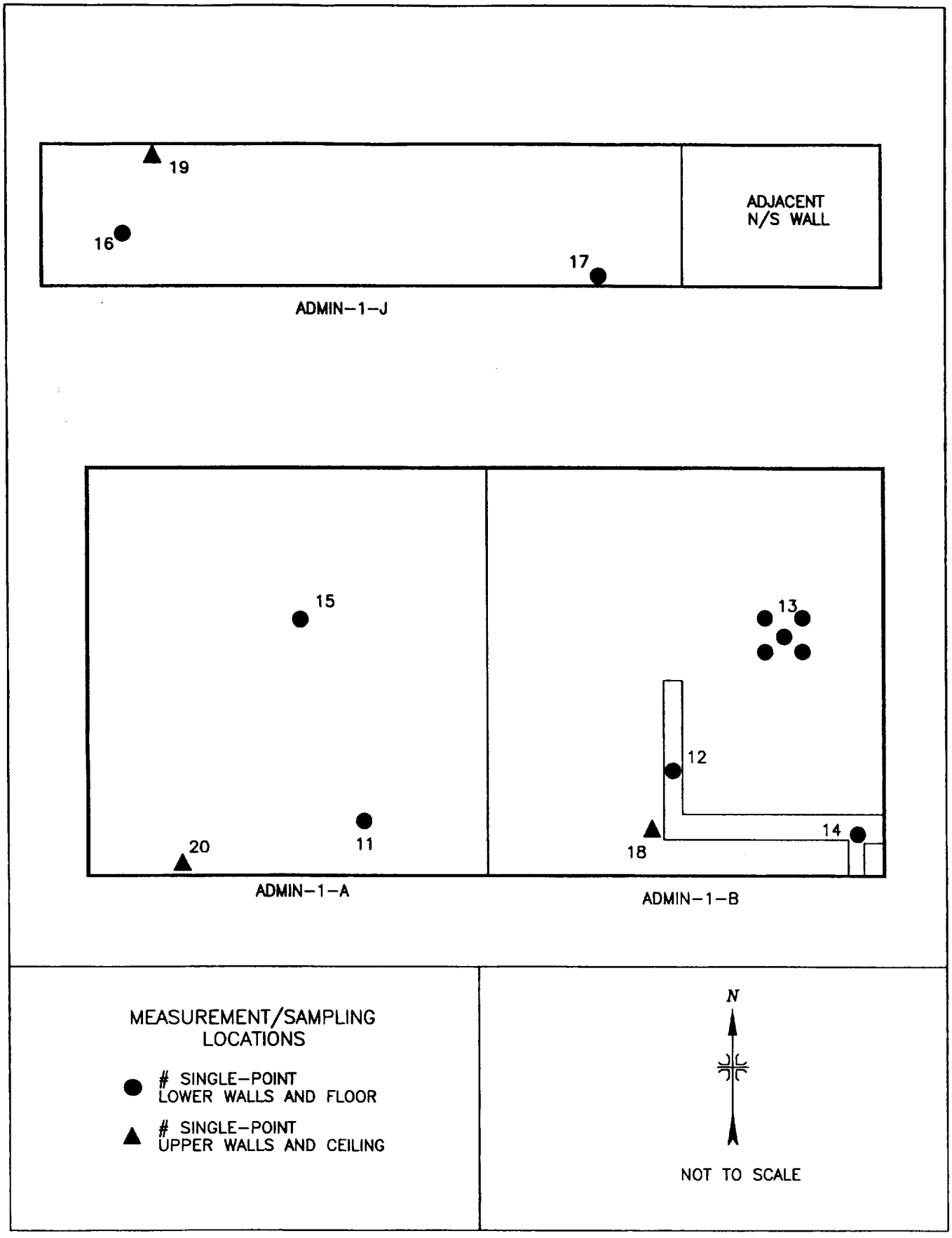

FIGURE 4: Administration Area – Measurement and Sampling Locations

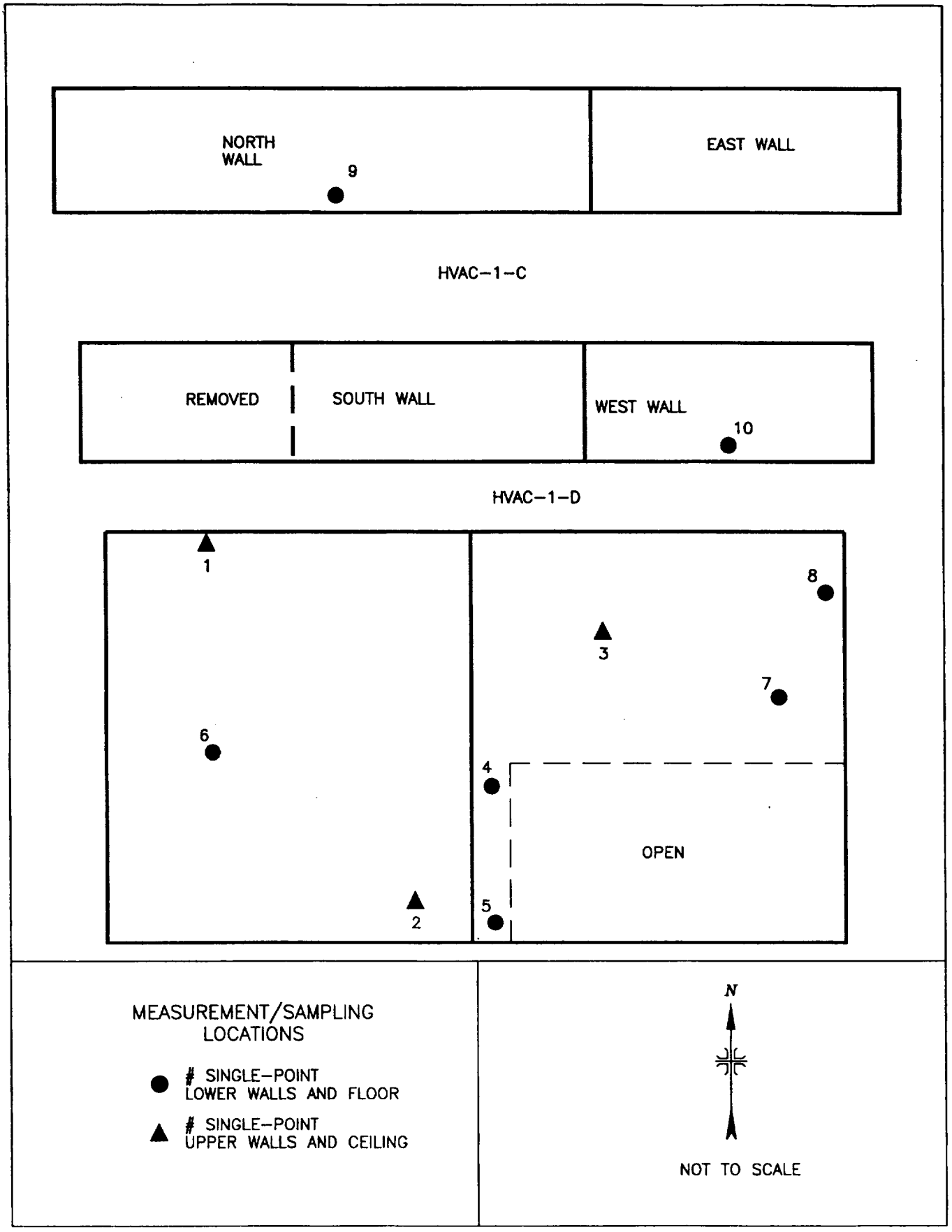

FIGURE 5: Mezzanine (HVAC) Area – Measurement and Sampling Locations

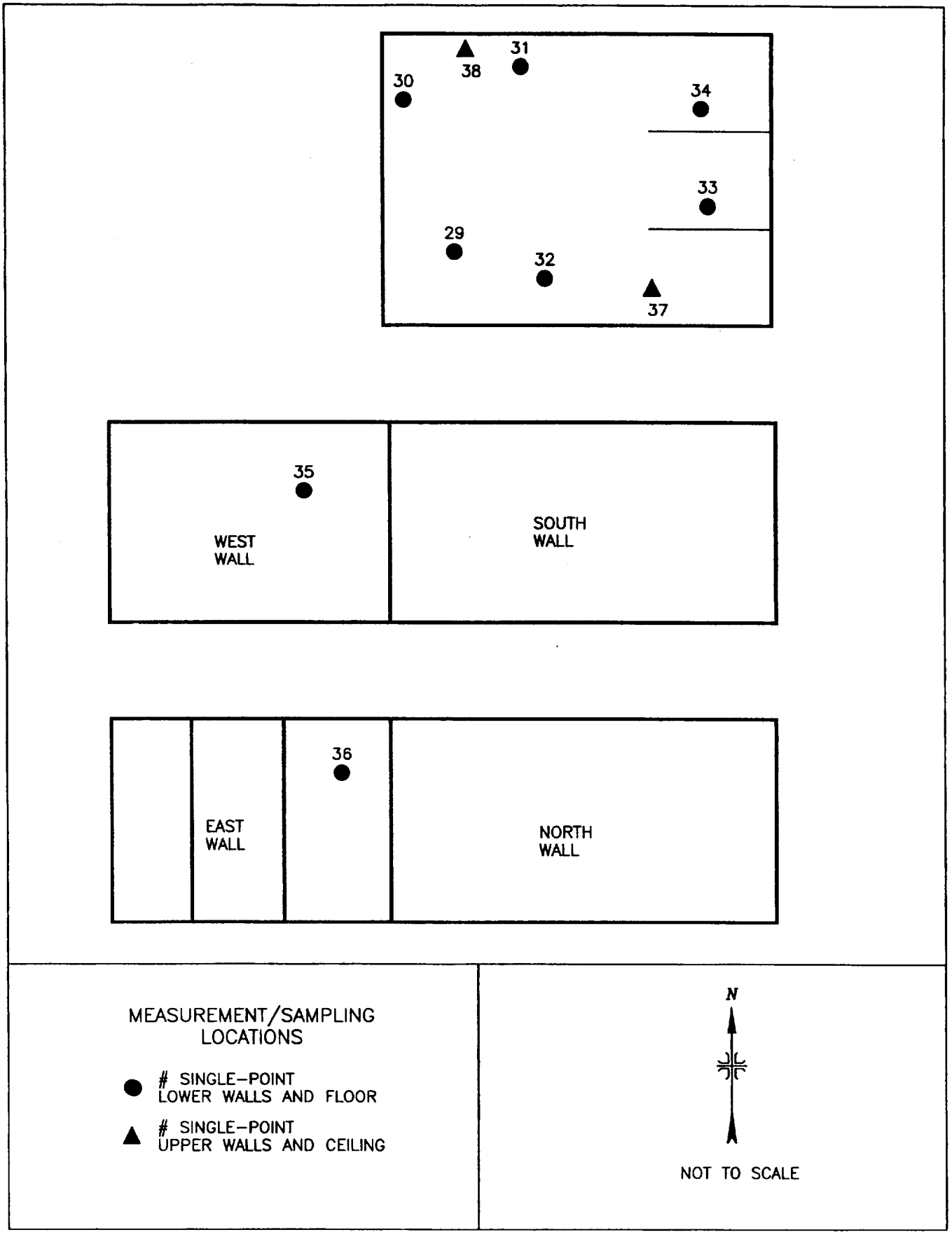

FIGURE 6: Dungeon Room – Measurement and Sampling Locations

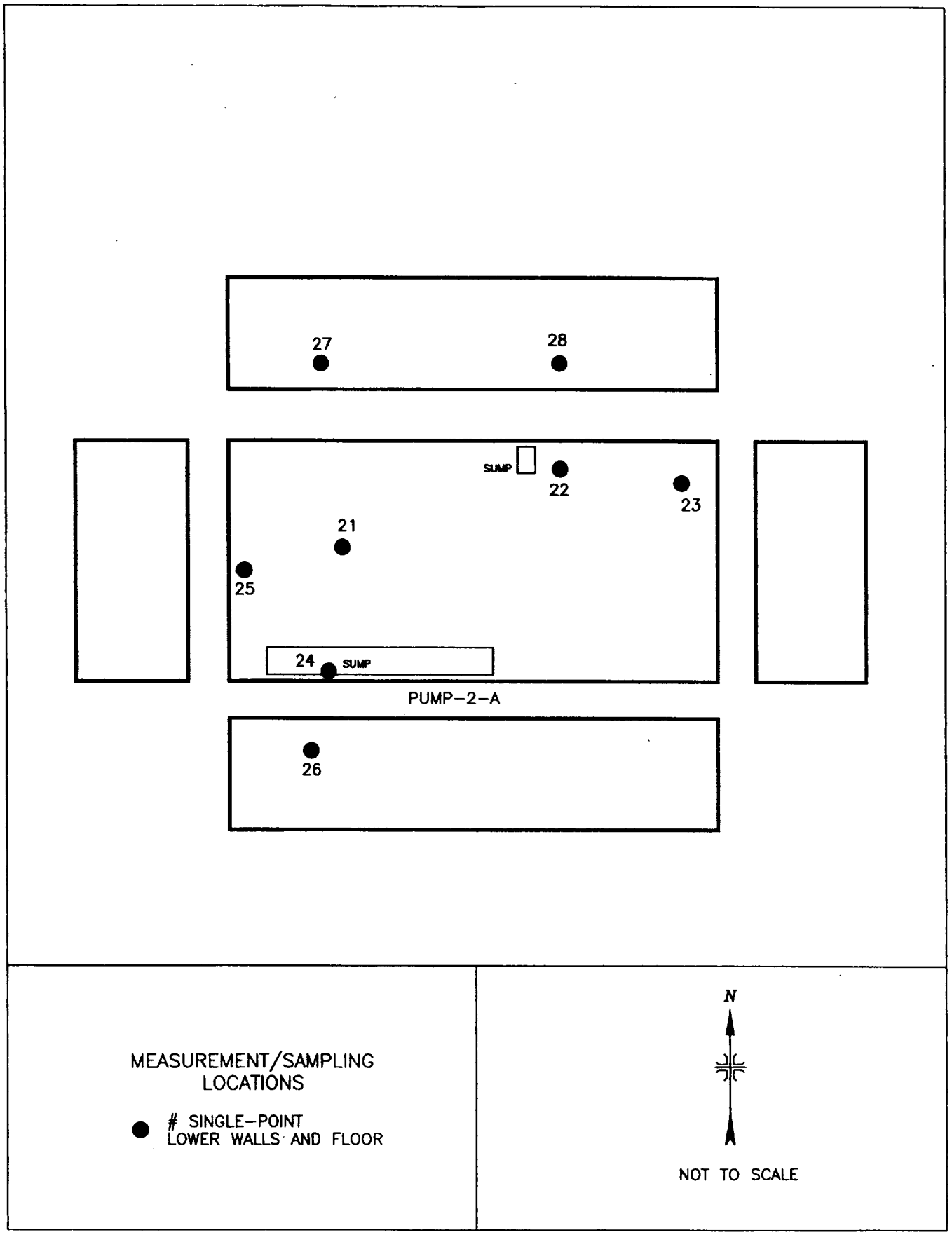

FIGURE 7: Pump Room – Measurement and Sampling Locations

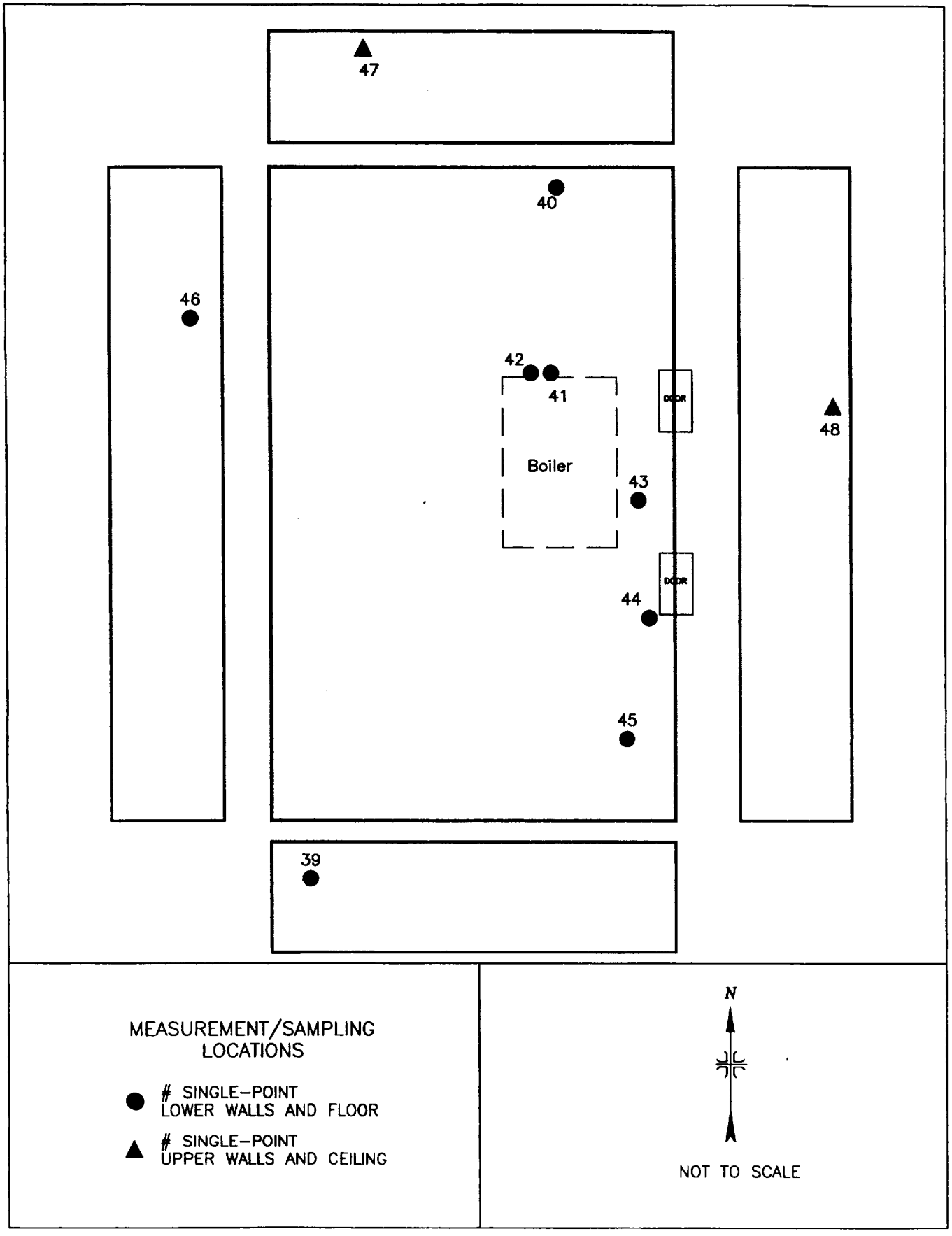

FIGURE 8: Waste Water Treatment Building – Measurement and Sampling Locations

TABLE 1

INSTRUMENT COMPARISON ANALYSIS
QUEHANNA DECOMMISSIONING PROJECT
KARTHAUS, PENNSYLVANIA

Area[a]	Surface Material	ESSAP[b]			SCIENTECH[c]		
		Background (cpm)	Counts (cpm)	Beta Activity (dpm/100 cm^2)	Background (cpm)	Counts (cpm)	Beta Activity (dpm/100 cm^2)
Finishing Area	Concrete	255	6,673	18,000	161	6,565	27,000
Finishing Area	Concrete	255	2,885	7,500	161	2,451	9,600
Finishing Area	General	335	5,886	16,000	127	7,275	30,000
Finishing Area	Metal	240	97,705	280,000	125	67,907	280,000
Mezzanine Area	Concrete	255	743	1,400	161	781	2,600
Admin Area	Concrete	255	228	-77	161	161	0
SCIENTECH Calibration Source[d]	General	335	2,043	4,800	127	1,833	7,100

[a]Figure not provided.
[b]ESSAP used a Ludlum Model 2221 ratemeter coupled to a Ludlum Model 43-68 gas proportional detector. The ESSAP total efficiency was 0.28 and the detector geometry factor is 1.26.
[c]SCIENTECH used a Ludlum Model 2360 Data Logger coupled to a Ludlum Model 43-93 scintillator detector. The SCIENTECH total efficiency was 0.24 and the detector geometry factor is 1.0.
[d]SCIENTECH SrY-90 calibration source with serial number 2815-00 was used. Source activity on February 8, 2001 is listed as 5,360 dpm; the decay correction for date of measurement (November 10, 2004) is 4,899 dpm.

TABLE 2

SURFACE ACTIVITY LEVELS
QUEHANNA DECOMMISSIONING PROJECT
KARTHAUS, PENNSYLVANIA

Location[a]	Total Beta Activity (dpm/100 cm^2)[b]	Removable Activity (dpm/100 cm^2)[c]	
		Alpha	Beta
Mezzanine			
1	-74 ± 88	1 ± 4	1 ± 5
2	-164 ± 82	1 ± 4	1 ± 5
3	-20 ± 91	1 ± 4	-3 ± 4
4	640 ± 130	1 ± 4	-2 ± 5
5	590 ± 120	0 ± 1	3 ± 6
6	77 ± 99	1 ± 4	2 ± 6
7	1,110 ± 150	1 ± 4	-2 ± 5
8	71 ± 99	0 ± 1	-1 ± 5
9	-210 ● 78	1 ± 4	-4 ± 3
10	-60 ± 89	3 ± 5	-1 ± 5
Administration Area			
11	120 ± 100	0 ± 1	3 ± 6
12	260 ± 110	0 ± 1	2 ± 6
13A	260 ± 110	--[d]	--
13B	130 ± 100	--	--
13C	240 ± 110	--	--
13D	290 ± 110	--	--
13E	1,370 ± 160	0 ± 1	1 ± 5
13 (1 m^2 Average)	*460*	--	--
14	85 ± 100	0 ± 1	-2 ± 5
15	-11 ± 94	0 ± 1	4 ± 7
16	5,110 ± 260[e]	0 ± 1	2 ± 6
PRA[f] 16	0 ± 92	--	--
17	74 ± 97	0 ± 1	-1 ± 5
18	40 ± 95	0 ± 1	-3 ± 4
19	-20 ± 91	1 ± 4	-2 ± 5
20	-128 ± 84	0 ± 1	-2 ± 5
Pump Room			
21	300 ± 110	1 ± 4	1 ± 5
22	3 ● 95	0 ± 1	3 ± 6
23	82 ± 100	0 ± 1	-2 ± 5

TABLE 2 (continued)

SURFACE ACTIVITY LEVELS
QUEHANNA DECOMMISSIONING PROJECT
KARTHAUS, PENNSYLVANIA

Location[a]	Total Beta Activity (dpm/100 cm^2)[b]	Removable Activity (dpm/100 cm^2)[c]	
		Alpha	Beta
Pump Room (continued)			
24	440 ± 120	0 ± 1	-1 ± 5
25	420 ± 120	1 ± 4	-1 ± 5
26	-122 ± 84	1 ± 4	1 ± 5
27	-167 ± 84	0 ± 1	2 ± 6
28	-167 ± 84	1 ± 4	1 ± 5
Dungeon Room			
29	-57 ± 91	0 ± 1	3 ± 6
30	-40 ± 92	1 ± 4	-5 ± 3
31	-48 ± 92	0 ± 1	1 ± 5
32	-9 ± 94	0 ± 1	1 ± 5
33	-167 ± 84	0 ± 1	-1 ± 5
34	-167 ± 84	0 ± 1	-1 ± 5
35	-275 ± 77	0 ± 1	-4 ± 3
36	-224 ± 80	0 ± 1	-2 ± 5
37	-43 ± 92	0 ± 1	1 ± 5
38	-196 ± 82	0 ± 1	-3 ± 4
Waste Water Treatment Building			
39	40 ± 95	1 ± 4	-4 ± 3
40	3,140 ± 210[e]	1 ± 4	-2 ± 5
41	3,300 ± 210[e]	0 ± 1	-5 ± 3
42	-139 ± 83	0 ± 1	-3 ± 4
43	280 ± 110	0 ± 1	-1 ± 5
44	-204 ± 79	0 ± 1	6 ± 7
45	280 ± 110	0 ± 1	1 ± 5
46	31 ± 94	0 ± 1	-2 ± 5
47	6 ± 93	0 ± 1	-1 ± 5
48	65 ± 96	1 ± 4	-1 ± 5

[a]Refer to Figures 4 through 8.
[b]Uncertainties represent the 95% confidence level based on counting statistics only.
[c]Uncertainties represent the 95% confidence level, based on total propagated uncertainties.
[d]Measurement not performed.
[e]Measurement locations exceed site-specific guideline values.
[f]PRA = post remedial action measurement.

TABLE 3

SOIL SAMPLE ANALYSES
QUEHANNA DECOMMISSIONING PROJECT
KARTHAUS, PENNSYLVANIA

ESSAP Sample #	SCIENTECH Sample #[a]	Sample Depth (feet)[b]	Radionuclide Concentrations (pCi/g)			
			ESSAP		SCIENTECH	
			Co-60	Sr-90	Co-60	Sr-90
Confirmatory Results						
1	O-1	0 to 11	-0.01 ± 0.02[c]	0.20 ± 0.21	--[d]	--
2	O-2	0 to 11.5	-0.01 ± 0.02	0.56 ± 0.24	--	--
3	O-3	0 to 10	-0.01 ± 0.03	0.50 ± 0.24	--	--
4	O-4	0 to 11	0.01 ± 0.03	0.70 ± 0.25	--	--
5	O-5	0 to 9.5	-0.01 ± 0.02	0.59 ± 0.24	--	--
Comparative Results						
6	STPA 157	0.5 to 1.0	0.03 ± 0.02	1.72 ± 0.22	0.01 ± 0.02	0.86 ± 0.27
7	STPA 235	0 to 0.5	0.02 ± 0.02	0.06 ± 0.13	0.02 ± 0.03	0.45 ± 0.20
8	STPA 242	0 to 0.5	-0.01 ± 0.02	-0.09 ± 0.13	-0.01 ± 0.02	0.02 ± 0.15
9	STPA 195	0 to 0.5	0.02 ± 0.02	0.06 ± 0.13	-0.01 ± 0.02	0.51 ± 0.27
10	STPA 219	0 to 0.5	0.00 ± 0.02	4.87 ± 0.34	0.00 ± 0.02	4.27 ± 0.05
11	SUMP 1[e]	0 to 0.5	0.01 ± 0.02	12.65 ± 0.61	0.01 ± 0.02	10.0 ± 1.0

[a]Sample identification provided by SCIENTECH.
[b]Sample depth information provided by SCIENTECH.
[c]Uncertainties represent the 95% confidence level, based on total propagated uncertainties.
[d]Information not provided.
[e]Not a final status survey sample.

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