ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

December 21, 2007

Mr. John Hickman
Mail Stop: T-8F5
Office of Federal and State Materials
and Environmental Management Programs
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852

SUBJECT: REVISED—CONFIRMATORY SURVEY REPORT FOR PORTIONS OF THE AUXILIARY BUILDING STRUCTURAL SURFACES AND TURBINE BUILDING EMBEDDED PIPING, RANCHO SECO NUCLEAR GENERATING STATION, HERALD, CALIFORNIA DCN 1695-SR-01-1 (DOCKET NO. 50-312, RFTA NO. 06-003)

Dear Mr. Hickman:

The Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities on the Auxiliary Building structural surfaces (Rooms 23 to 25 and Rooms 43 through 49) and Turbine Building embedded piping at the Rancho Seco Nuclear Generating Station in Herald, California on October 15 through 18, 2007. These survey activities were requested and approved by the U.S. Nuclear Regulatory Commission (NRC). Enclosed are the confirmatory survey results documenting these survey activities. The surveys included beta and gamma surface scans and direct measurements for total net beta activity within the Auxiliary Building; embedded piping beta-gamma or gamma scans and gross beta activity measurements within the Turbine Building; and limited gamma scans and the collection of a soil sample adjacent to the Lower Mixing Box in the southeastern corner of the facility. This revision incorporates changes to figures that indicated the wrong north direction (Figures 13 and 14), corrects some road and building information on the overview figures (Figures 1 and 2) and changes the statement concerning the status of the license termination plan (LTP) from in review to having been approved by the NRC.

If you have any questions or comments, please direct them to me at 865.576.0065 or Sarah Roberts at 865.241.8893.

Sincerely,

Wade C. Adams
ORISE Health Physicist/Project Leader
Survey Projects

WCA:km

Enclosure

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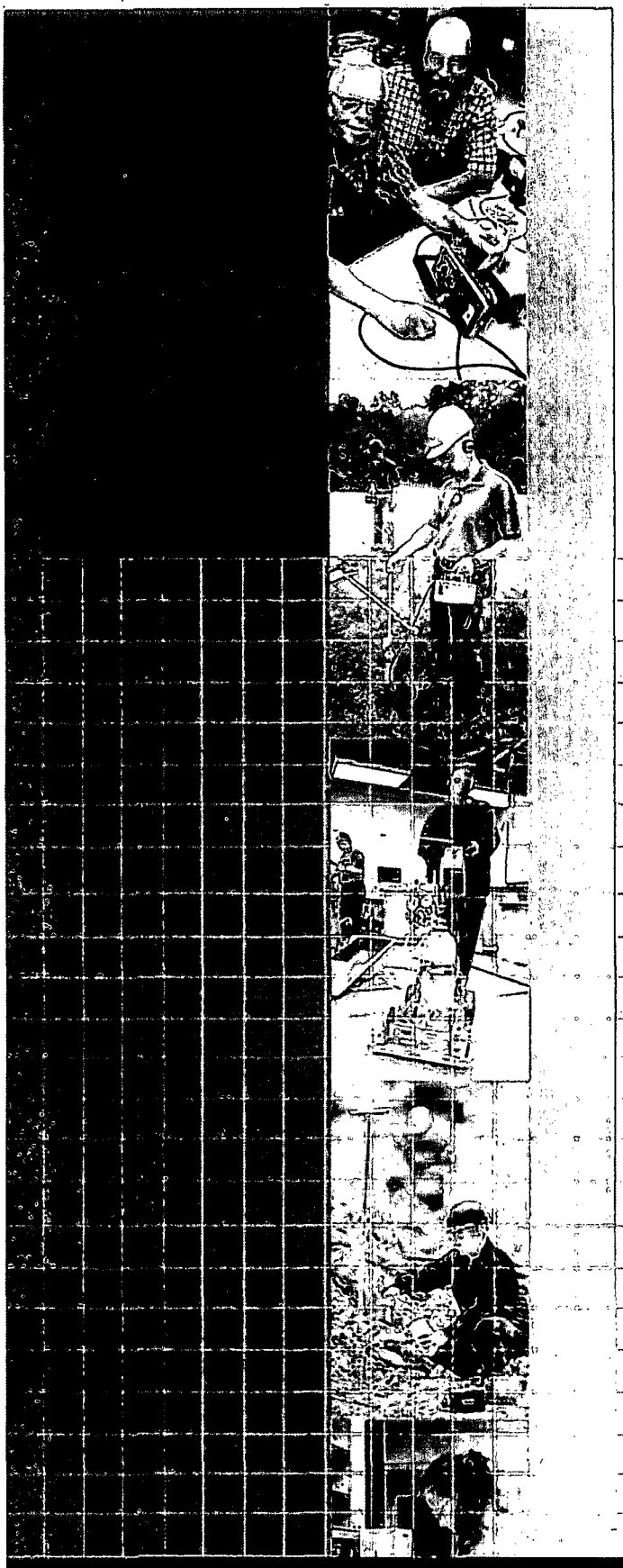

REVISED—CONFIRMATORY SURVEY REPORT FOR PORTIONS OF THE AUXILIARY BUILDING STRUCTURAL SURFACES AND TURBINE BUILDING EMBEDDED PIPING

RANCHO SECO NUCLEAR GENERATING STATION, HERALD, CALIFORNIA

W. C. Adams

Prepared for the
Office of Federal and State Materials and Environmental Management Programs
U.S. Nuclear Regulatory Commission

ORISE
Oak Ridge Institute for Science and Education

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Prepared for the
Office of Federal and State Materials and Environmental Management Programs
U.S. Nuclear Regulatory Commission

DECEMBER 2007

This report is based on work performed under an Interagency Agreement (NRC Fin. No. F-1008) between the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy. The Oak Ridge Institute for Science and Education performs complementary work under a contract with the U.S. Department of Energy.

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INTRODUCTION

The Sacramento Municipal Utility District (SMUD) operated the Rancho Seco Nuclear Generating Station (RSNGS) from 1976 to 1989 under Atomic Energy Commission Docket Number 50-312 and License Number DPR-54. In August 1989, SMUD notified the U.S. Nuclear Regulatory Commission (NRC) that they shut down RSNGS permanently. In May 1991, SMUD submitted the Rancho Seco Decommissioning Plan which was approved by the NRC in March 1995. SMUD began decommissioning activities in February 1997 and completed transfer of all the spent nuclear fuel in August 2002 (SMUD 2006a).

RSNGS was a 913-MWe pressurized water reactor (PWR) designed by Bechtel Power Corporation. The plant incorporated a pressurized water type nuclear steam supply system (NSSS) supplied by Babcock and Wilcox Company; a turbine generator and electrical systems; engineered safety features; radioactive waste systems; fuel handling systems; instrumentation and control systems; the necessary auxiliaries; and structures to house plant systems and other onsite facilities.

Due to a public vote the previous day, on June 7, 1989, RSNGS permanently shut down after approximately 14 years of operation. On August 29, 1989, SMUD formally notified the NRC of the permanent cessation of operations at the RSNGS. SMUD submitted the Post Shutdown Decommissioning Activities Report (PSDAR), in accordance with 10 CFR 50.82 (a) (4), in March 1997. In April 2006, SMUD submitted a license termination plan (LTP) that was recently approved by the NRC on November 26, 2007 (SMUD 2006a and NRC 2007). SMUD currently is conducting decontamination efforts and performing final status surveys (FSS) on the remaining structural surfaces and in open land areas.

The NRC requested that the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory surveys of structural surfaces in the Auxiliary Building and embedded piping in the Turbine Building at the RSNGS (Figures 1 and 2). While on site, the NRC site representative also requested that ORISE perform cursory gamma surface scans and collect a soil sample adjacent to the Lower Mixing Box in the southeast corner of the site grounds. The confirmatory surveys were performed on October 15 through 18, 2007.

PROCEDURES

Confirmatory surveys were performed in accordance with a site-specific survey plan that was submitted to and approved by the NRC (ORISE 2007a). The site-specific survey plan follows the guidance provided in the ORISE Survey Procedures and Quality Program Manuals (ORISE 2007b and ORAU 2007).

ORISE judgmentally selected ten Auxiliary Building rooms (Figures 3 through 12) and twelve Turbine Building embedded pipes (Figures 13 and 14) for confirmatory surveys based upon preliminary FSS results. At the request of the NRC site representative, ORISE performed limited

radiological surveys of the clay soils adjacent to the Lower Mixing Box in the southeastern portion of the site grounds.

SURFACE SCANS

Auxiliary Building Structural Surfaces

Gamma surface scans were performed using sodium iodide, thallium-activated [NaI(Tl)] gamma scintillation detectors coupled to ratemeters with audible indicators. Beta surface scans were performed using large area gas proportional, hand-held gas proportional, and Geiger-Muller (GM) detectors coupled to ratemeter-scalers with audible indicators. Particular attention was given to cracks, joints, embedded piping openings and horizontal surfaces in the evaluated structural surfaces where material may have accumulated.

Turbine Building Embedded Piping

ORISE performed 100 percent beta-gamma radiation scans of approximately 44 horizontal linear feet of the 4" internal diameter (ID) of Turbine Building Drain (TBD) 3-1-27 embedded pipe using the ORISE-designed GM detector pipe monitor array.

Limited gamma scans were performed in eleven vertical (drop down) 4" inner diameter (ID) embedded pipes and conduits at various locations on the ground level as well as the +40 foot level elevations using a cesium iodide, thallium-activated [CsI(Tl)] gamma scintillation detector coupled to a ratemeter with an audible indicator. ORISE performed surveys in the conduits at the request of the NRC site representative and used the collected data as background gamma scan ranges for embedded piping.

Lower Mixing Box Soil

Gamma scans of the clay soils adjacent to the Lower Mixing Box were performed using a NaI(Tl) gamma scintillation detector coupled to a ratemeter with an audible indicator.

SURFACE ACTIVITY MEASUREMENTS

Auxiliary Building Structural Surfaces

Based on beta and gamma surface scan results, direct measurements for beta activity were performed at 57 judgmentally-selected locations on the evaluated structural surfaces which were available for confirmatory survey activities. Direct measurements locations are indicated on Figures 3 through 12.

Surface Activity Data Comparison

ORISE performed direct beta measurements at five SMUD direct measurement locations in Room 25 for direct measurement data comparison (Figure 5).

Turbine Building Embedded Piping

Direct measurements for beta-gamma activity were performed at 14 locations at approximately 1 meter (3.3 feet) intervals within TBD 3-1-27. The ORISE-designed pipe monitor array was equipped with three GM detectors spaced at 120° intervals and coupled individually to portable ratemeter-scalers. Measurement data were collected for each individual detector as well as totaled for the array. The location of TBD 3-1-27 is indicated on Figure 13.

ORISE performed gamma scans and recorded the gamma scan range for the remaining embedded piping surveys

SOIL SAMPLING

Lower Mixing Box

At the request of the NRC site representative, ORISE collected a clay soil sample adjacent to the Lower Mixing Box in the southeastern portion of the site grounds.

SAMPLE ANALYSIS AND DATA INTERPRETATION

Radiological data and sample media were returned to the ORISE laboratory in Oak Ridge, TN for analysis and interpretation. Radioassays were performed in accordance with the ORISE Laboratory Procedures Manual (ORISE 2007c). The soil sample was analyzed by gamma spectroscopy for the primary radionuclides-of-concern (ROC), Co-60 and Cs-137. However, spectra were also reviewed for additional gamma-emitting fission and activation products associated with the RSNGS and other identifiable total absorption peaks. The soil sample results were reported in units of picocuries per gram (pCi/g). Direct measurements for total surface activity were converted to units of disintegrations per minute per 100 square centimeters (dpm/100 cm^2). Embedded piping scan data were reported in units of counts per minute (cpm).

FINDINGS AND RESULTS

SURFACE SCANS

Auxiliary Building Structural Surfaces

The scan percent coverage and room area classification are provided in Table 1. Beta surface scans determined that localized areas of residual elevated beta-gamma radiation were present on floor, lower wall and upper surfaces within the evaluated survey units. In general, the contamination was limited to small areas that were interspersed throughout the rooms.

Turbine Building Embedded Piping

Beta-gamma scans of TBD 3-1-27 did not detect beta-gamma radiation levels in excess of the embedded piping derived concentration guideline levels (DCGLs).

Gamma scans of the drop down 4" embedded pipes on the ground level and +40 level elevations did not detect gamma radiation levels in excess of the detector background as determined in the Turbine Building +40 level elevation east side conduits and Exciter conduits.

Lower Mixing Box

Gamma scans of the clay soils adjacent to the Lower Mixing Box did not detect any elevated gamma radiation levels.

SURFACE ACTIVITY LEVELS

Auxiliary Building Structural Surfaces

Beta surface activity measurements were performed at locations of residual elevated beta-gamma radiation determined during surface scans. Total net beta activity measurements ranged from 5,900 to 240,000 dpm/100 cm^2. Surface activity level results are presented in Table 2.

Surface Activity Data Comparison

ORISE surface activity levels for the comparison data set ranged from 2,000 to 5,000 dpm/100 cm^2; and the SMUD surface activity levels ranged from 2,500 to 4,300 dpm/100 cm^2. The data indicate that ORISE and SMUD surface activity levels collected from approximately the same locations are within 25% of the respective FSS and confirmatory survey values. The surface activity data comparison results are presented in Table 3.

Turbine Building Embedded Piping

Gross surface activity levels for TBD 3-1-27 are summarized in Table 4. The gross surface activity levels for each measurement location over the assessed area (168 cm^2) for the pipe monitor array ranged from 4,500 to 6,700 dpm/100 cm^2. ORISE did not subtract background activity from the gross surface activity due in part to the total activity levels within the pipe being well below the guideline levels.

Gamma scans of the drop down 4" embedded pipes did not detect significant gamma radiation levels in excess of the detector background as determined in Turbine Building conduits. For comparison, the CsI(Tl) detector background range for the conduits along the east side of the +40 level elevation was 200 to 800 cpm and the gamma radiation levels observed within the Turbine Building drains ranged from 200 to 1,600 cpm. The confirmatory gamma scan ranges are provided in Table 5.

SOIL SAMPLE

The radionuclide concentrations for the soil sample collected near the mixing box were 0.00 pCi/g for Co-60 and 0.03 pCi/g for Cs-137.

COMPARISON OF SURVEY RESULTS WITH GUIDELINES

The major contaminants identified by SMUD at RSNGS are beta-gamma emitters—fission and activation products—resulting from reactor operation. Cesium-137 and Co-60 have been identified during characterization as the predominant radionuclides present on structural surfaces. SMUD developed site-specific derived concentration guideline levels (DCGLs), which were recently approved by the NRC, based on a dose modeling to future occupants not to exceed 25 mrem/year total effective dose equivalent (TEDE) as presented in Section 6 of the LTP (SMUD 2006a and

NRC 2007). The DCGLs for surfaces were modified by SMUD to reflect the ratio of radionuclide concentrations (account for the presence of unmeasured contaminants based on contaminant ratios) in the specific survey units (SU) that were being evaluated.

STRUCTURAL SURFACE ACTIVITY LEVELS

SMUD used site-specific supplemental DCGLs for Co-60 and Cs-137 for determining surface release criteria. The applicable surface activity guidelines for the structural surfaces within specific rooms/survey units within the Auxiliary Building are provided in Table 6. These DCGLs were provided in the preliminary FSS data packages for each survey unit that was evaluated and were derived from the LTP and decommissioning technical basis documents (DTBD)-05-015 (SMUD 2006a and b).

Confirmatory survey data for Auxiliary Building structural surfaces were compared with the site-specific DCGL for the evaluated Auxiliary Building survey units. Twelve of the 57 direct beta activity measurement results on the concrete structural surfaces exceeded the Gross Beta DCGL of 43,000 dpm/100 cm^2. Using the gross activity DCGL as determined in DTBD-05-015 (SMUD 2006b) and the area factor determined for each survey unit, SMUD calculated Design and Actual DCGL elevated measurement comparison ($DCGL_{EMC}$) values which are also provided in Table 6. All confirmatory direct surface activity measurements on the Auxiliary Building structural surfaces in the evaluated SUs were within the site-specific survey unit $DCGL_{EMC}$ as provided by SMUD in the preliminary FSS data packages for each SU.

EMBEDDED PIPING

Co-60 is the primary ROC within the embedded piping. SMUD has established a dose-based restriction for embedded piping not to exceed 25 mrem/year that assumes a building occupancy scenario within rooms where embedded piping is present. The corresponding modeled DCGL is 100,000 dpm/100 cm^2. SMUD's grouting action level for embedded piping is 21,000 dpm/100 cm^2 (SMUD 2007).

Confirmatory survey data for the TBD 3-1-27 were compared with the site-specific DCGL for embedded piping. The results indicated that gross surface activity levels (i.e., assuming all detected activity attributed to ROCs) within the pipe were well below the DCGL. Gamma scans of the other evaluated Turbine Building drains did not detect gamma radiation levels in excess of the detector background.

SOIL SAMPLE

Table 6-5 from the LTP provides the single nuclide DCGL's for soil at RSNGS. The $DCGL_w$ is 12.6 pCi/g for Co-60 and 52.8 pCi/g for Cs-137 (SMUD 2006a). The Lower Mixing Box soil sample concentrations were well below the respective single radionuclide DCGLs.

SUMMARY

During the period of October 15 and 18, 2007, ORISE performed confirmatory radiological survey activities which included beta and gamma structural surface scans and beta activity direct measurements within the Auxiliary Building, beta or gamma scans within Turbine Building embedded piping, beta activity determinations within Turbine Building Drain 3-1-27, and gamma

scans and the collection of a soil sample from the clay soils adjacent to the Lower Mixing Box.

Beta and gamma surface scans identified several areas of elevated beta activity on the structural surfaces of the evaluated survey units with the Auxiliary Building. Additional investigation of these locations indicated that the majority of the elevated radiation levels were attributable to localized areas of residual beta-gamma radiation. In general, the contamination was limited to small areas that were interspersed throughout the rooms. Direct measurements were performed at 62 locations of which five locations were for direct measurement data comparison with the licensee's data. Several direct measurements exceeded the site-specific gross beta DCGL but all were within the $DCGL_{EMC}$ criteria. A review of the preliminary FSS data packaged indicated that SMUD personnel had also found the elevated residual radiation levels and had based their FSS data package release for those locations using the determined $DCGL_{EMC}$ values for those SUs. Therefore, the results of the confirmatory survey activities for the evaluated structural surfaces of the Auxiliary Building confirmed the radiological status of the evaluated areas as presented in the licensee's preliminary FSS data packages.

ORISE performed survey data comparisons on five RSNGS direct measurement locations within Auxiliary Building Room 25; the results indicated that SMUD's radiological survey data were consistent and in agreement with ORISE's direct measurement results.

Beta and gamma surface scans of the evaluated Turbine Building drains did not indicate any areas of elevated radiation levels; all scan results and direct measurement results within the embedded piping were less that the applicable DCGL of 100,000 dpm/100 cm^2.

The clay soil sample results from the Lower Mixing Box were below the individual radionuclide DCGLs and meet the soil release criteria.

FIGURES

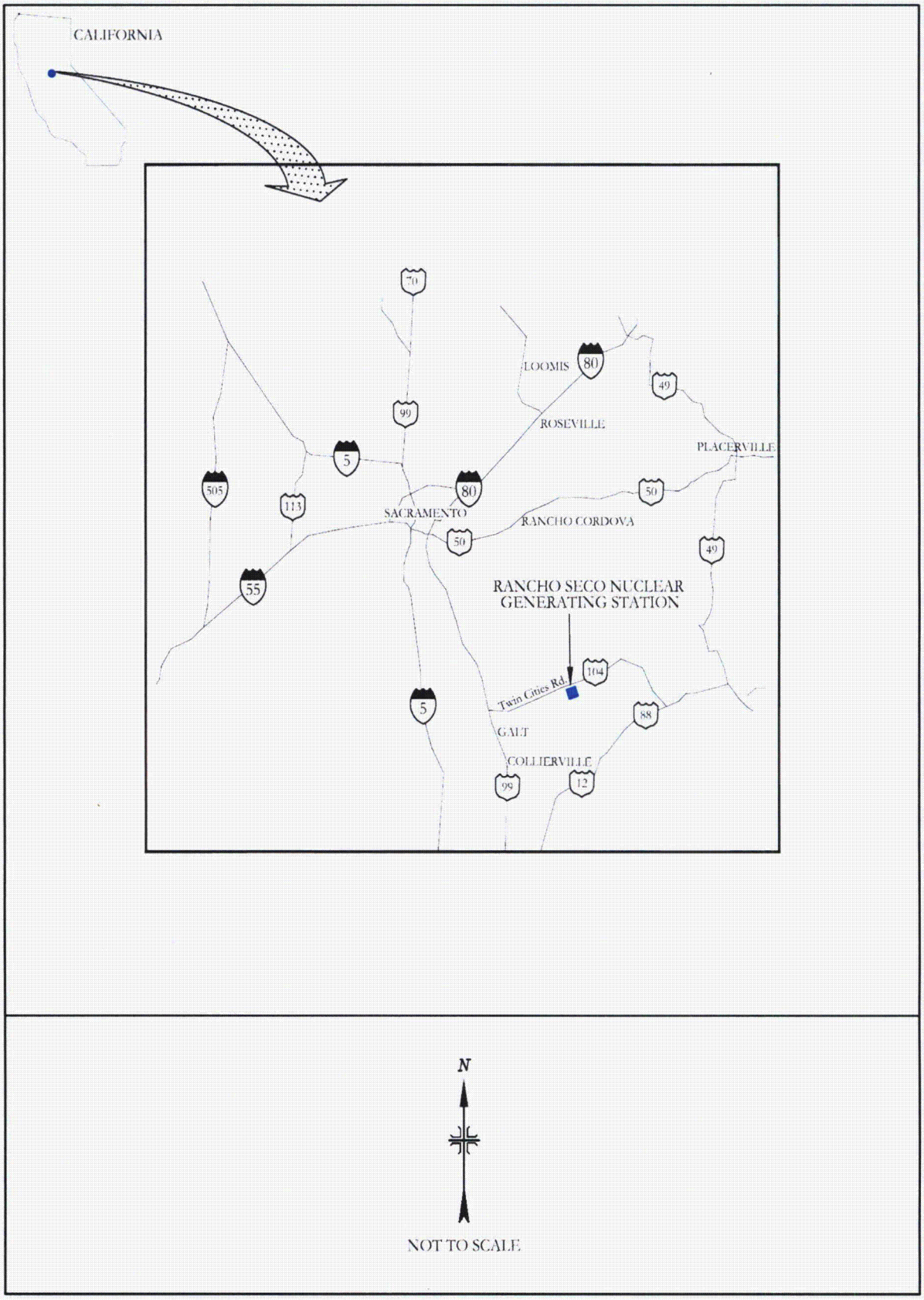


FIGURE 1: Location of Rancho Seco Nuclear Generating Station, Herald, California

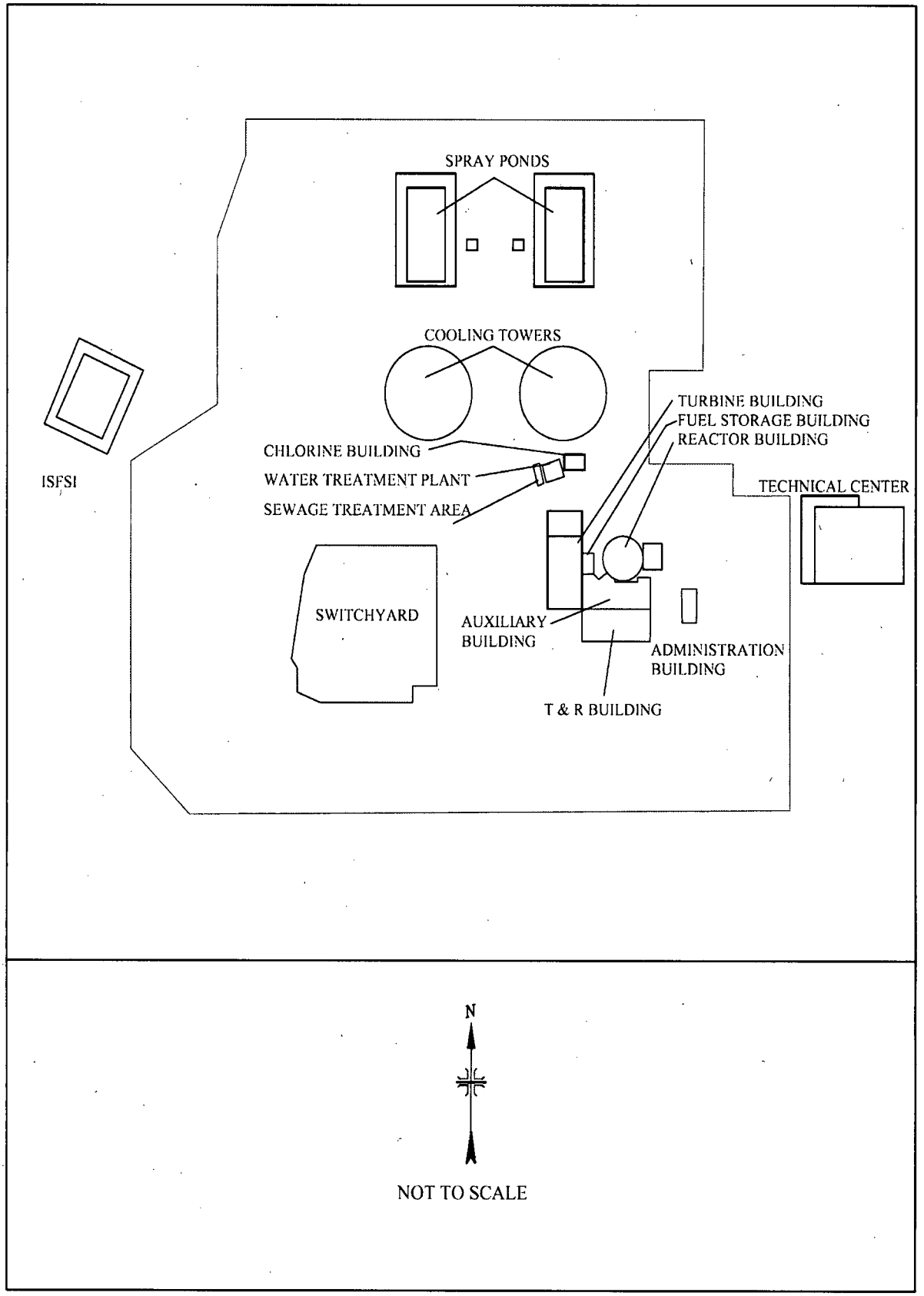


FIGURE 2: Plot Plan of the Industrial Area at Rancho Seco Nuclear Generating Station

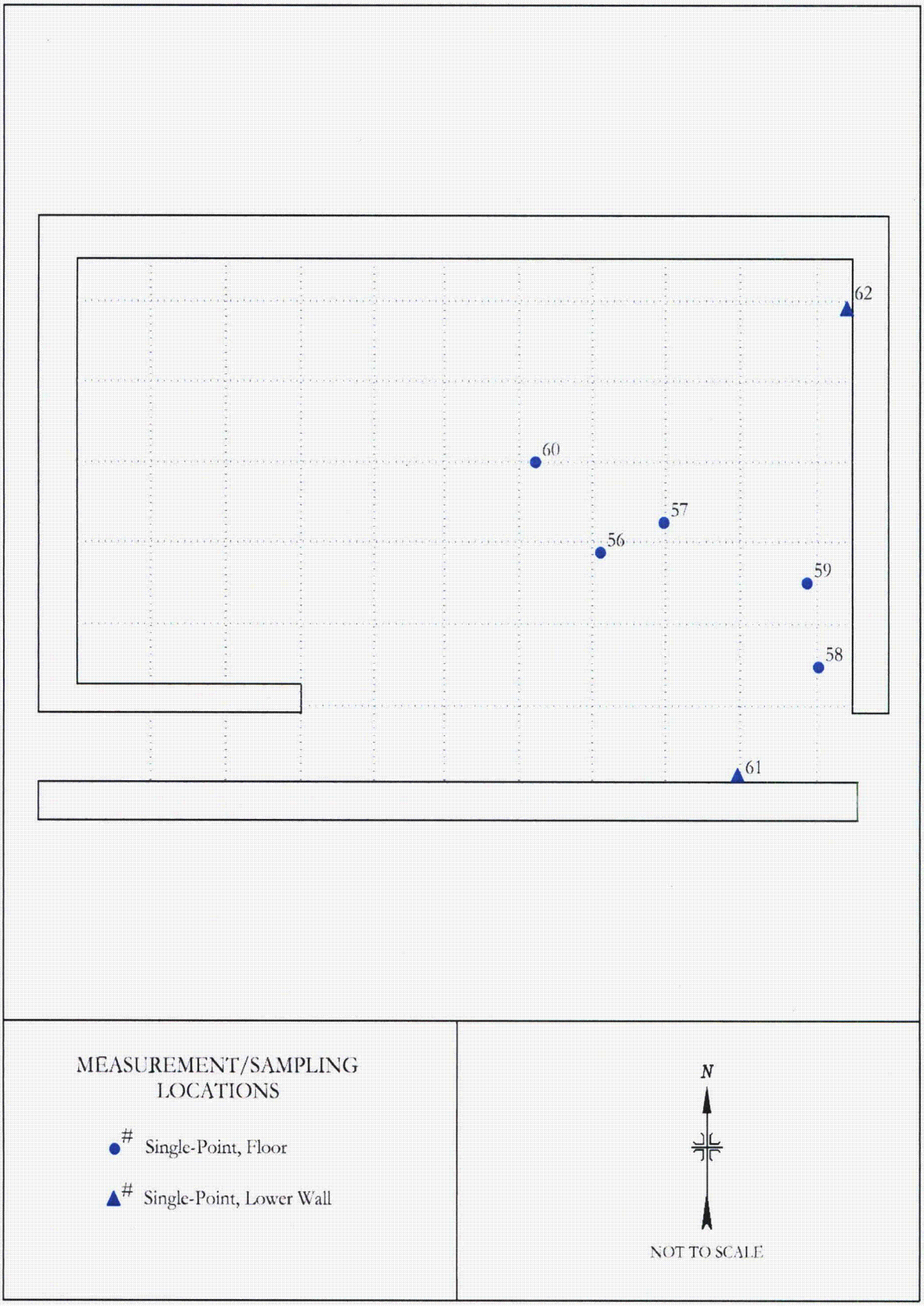
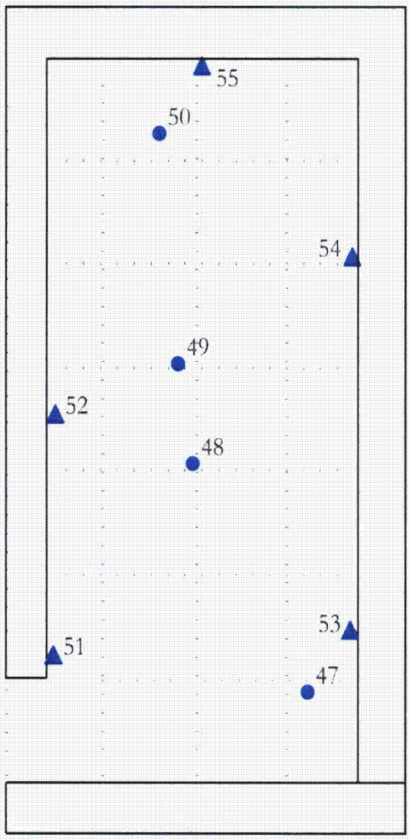


FIGURE 3: Auxiliary Building, Room 23 - Direct Measurement Locations



MEASUREMENT/SAMPLING LOCATIONS

● # Single-Point, Floor

▲ # Single-Point, Lower Wall

N

NOT TO SCALE

FIGURE 4: Auxiliary Building, Room 24 - Direct Measurement Locations

FIGURE 5: Auxiliary Building, Room 25 - Direct Measurement Locations

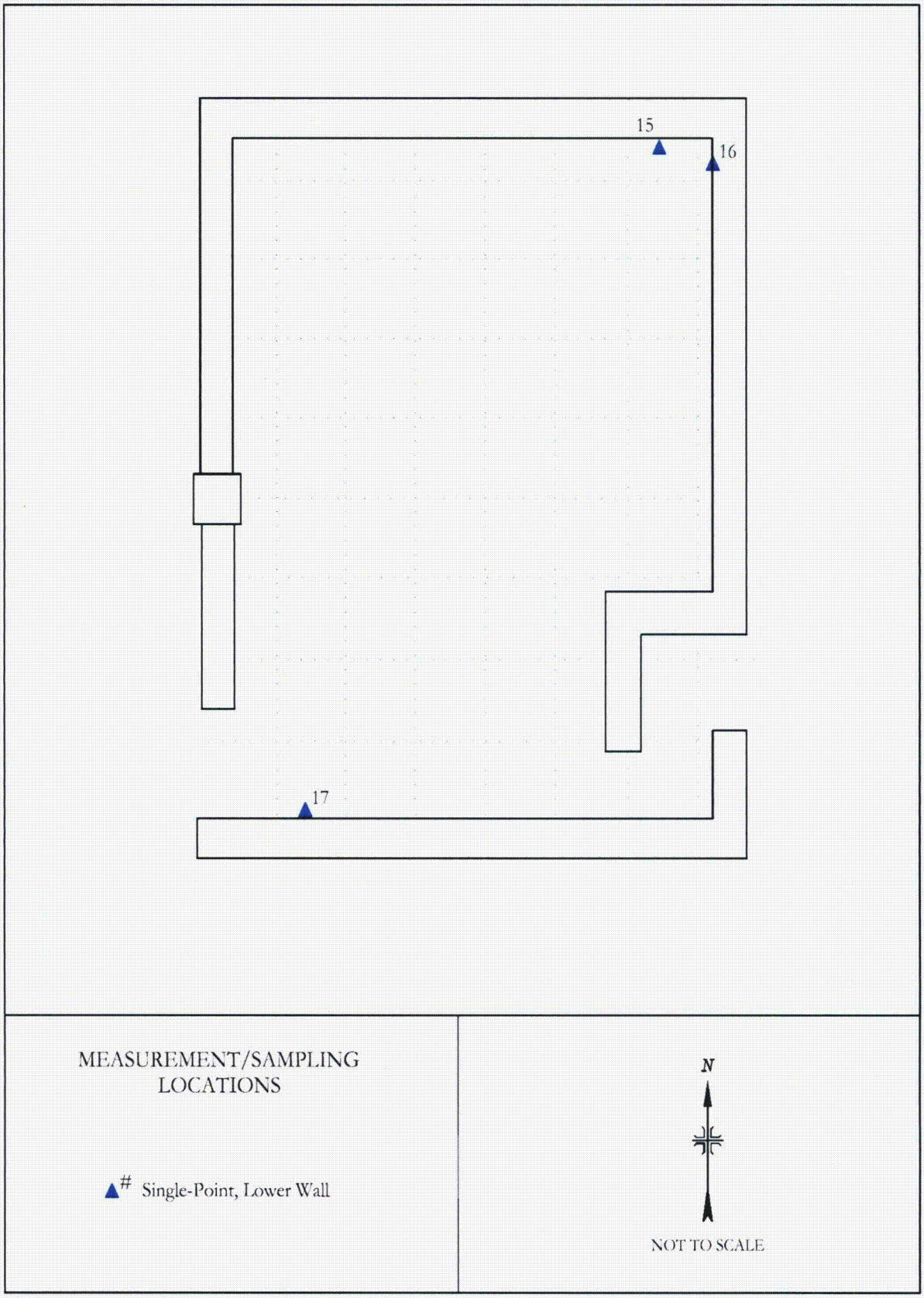


FIGURE 6: Auxiliary Building, Room 43 - Direct Measurement Locations

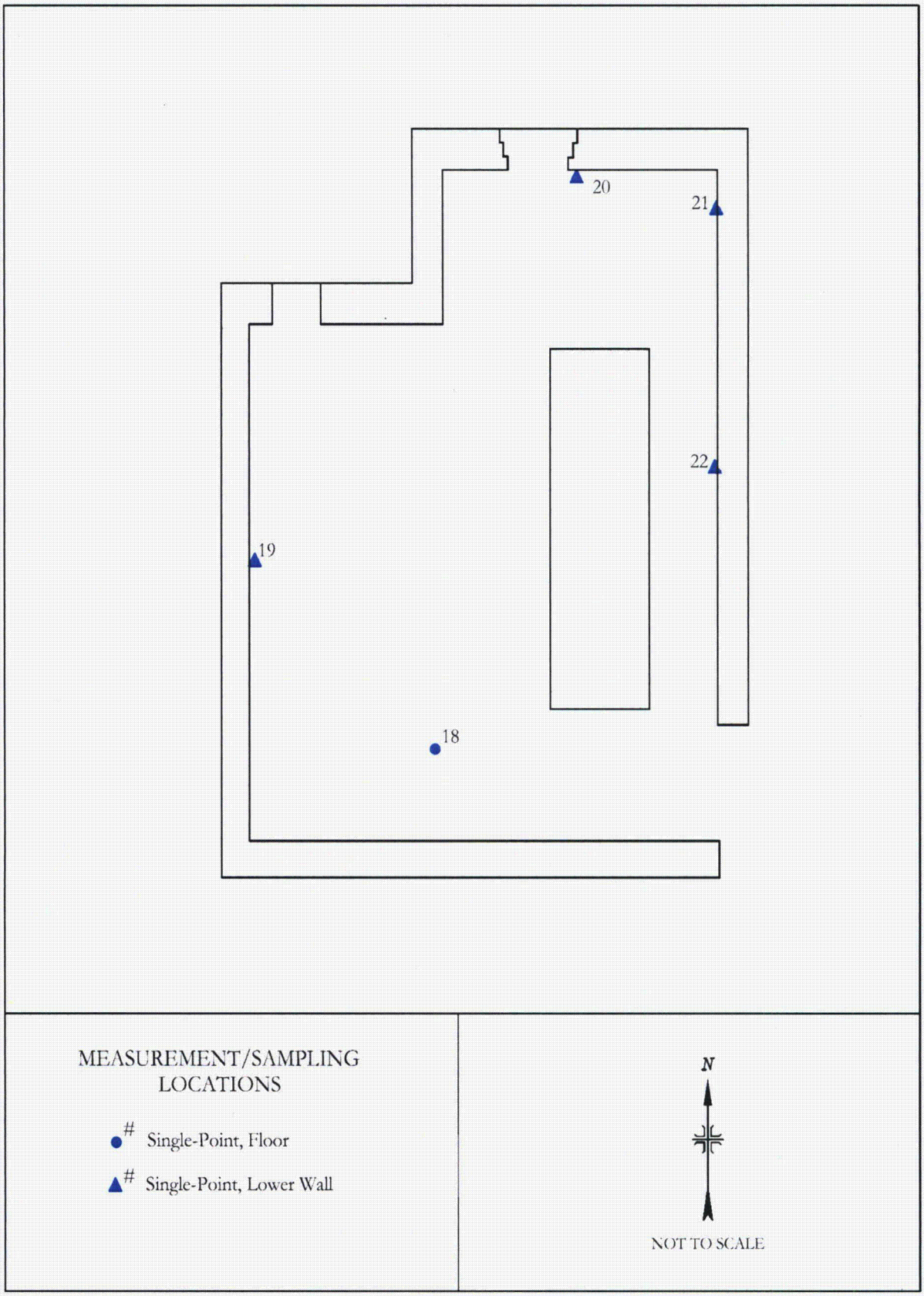


FIGURE 7: Auxiliary Building, Room 44 - Direct Measurement Locations

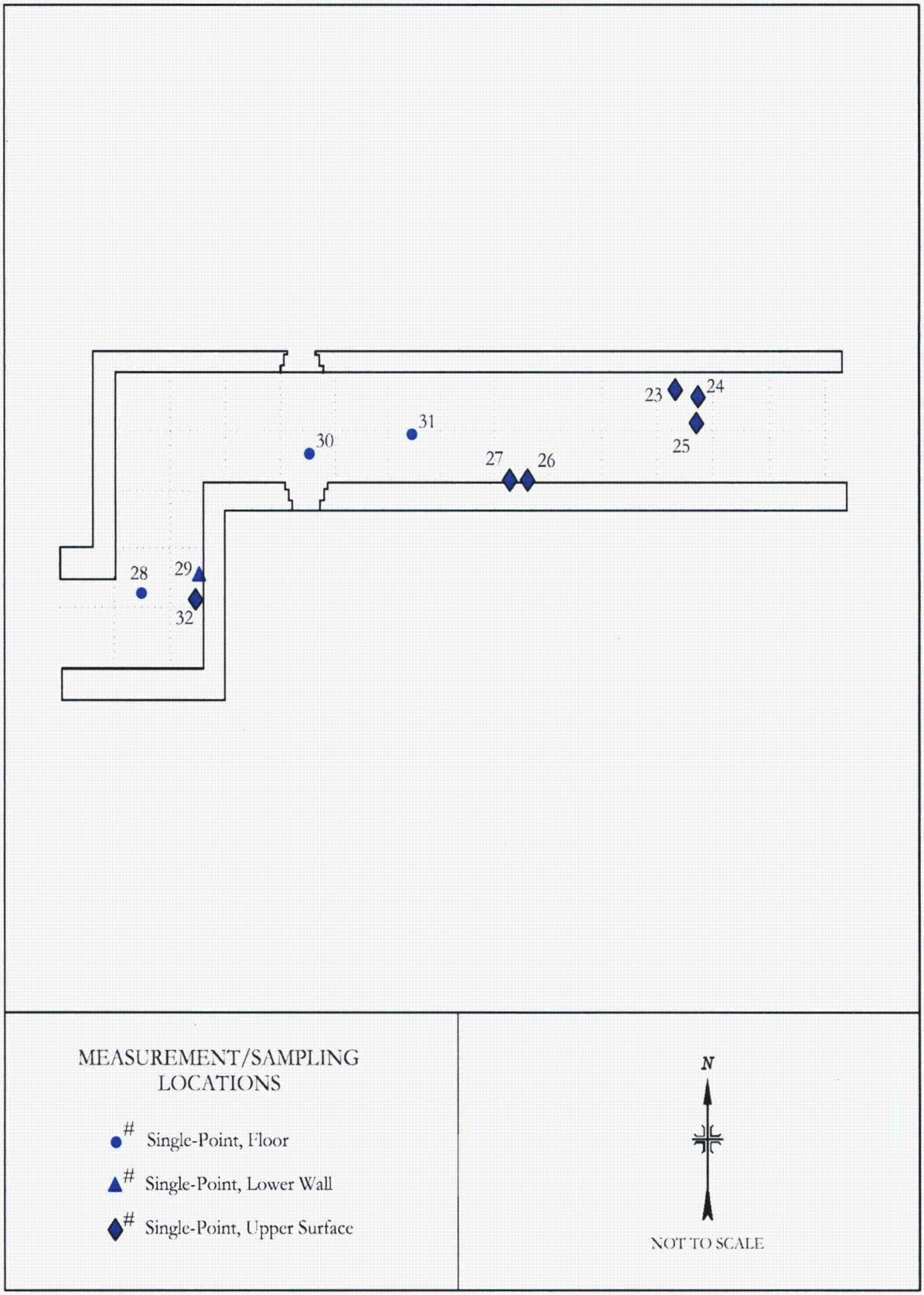
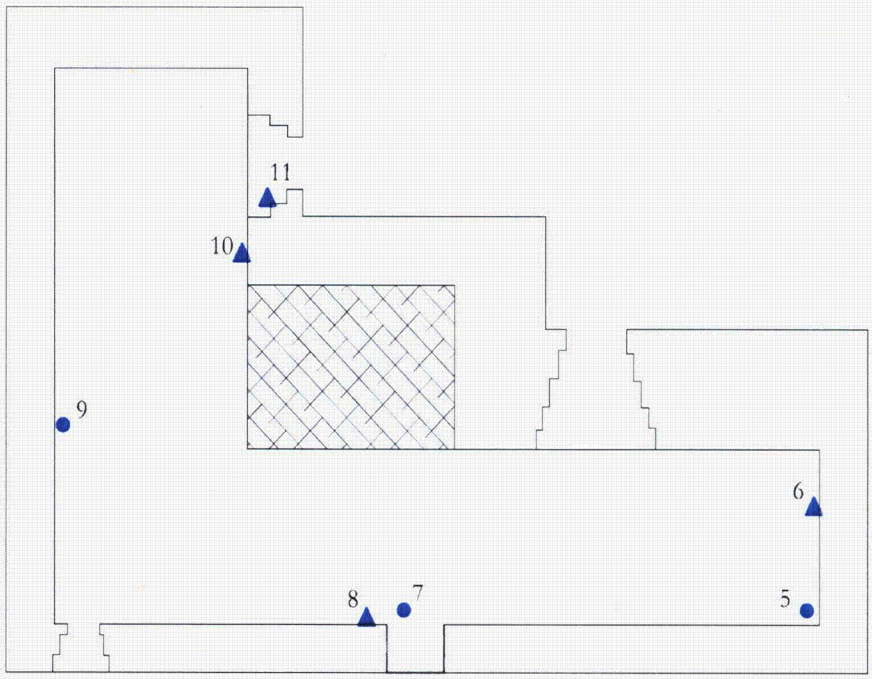


FIGURE 8: Auxiliary Building, Room 45 - Direct Measurement Locations



MEASUREMENT/SAMPLING LOCATIONS

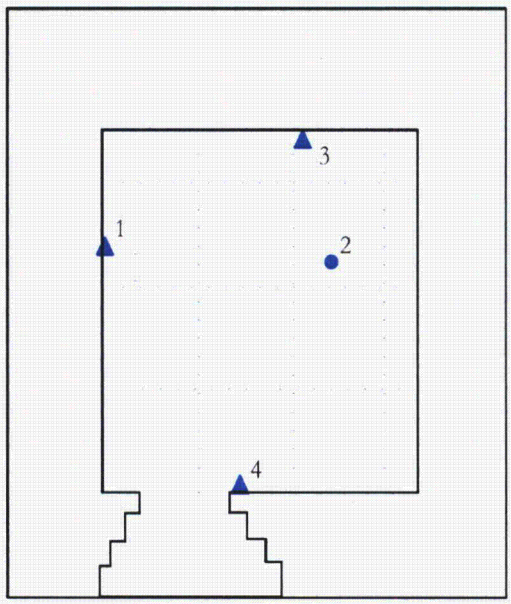
● # Single-Point, Floor

▲ # Single-Point, Lower Wall

N

NOT TO SCALE

FIGURE 9: Auxiliary Building, Room 46 - Direct Measurement Locations



MEASUREMENT/SAMPLING LOCATIONS

● # Single-Point, Floor

▲ # Single-Point, Lower Wall

N

NOT TO SCALE

FIGURE 10: Auxiliary Building, Room 47 - Direct Measurement Locations

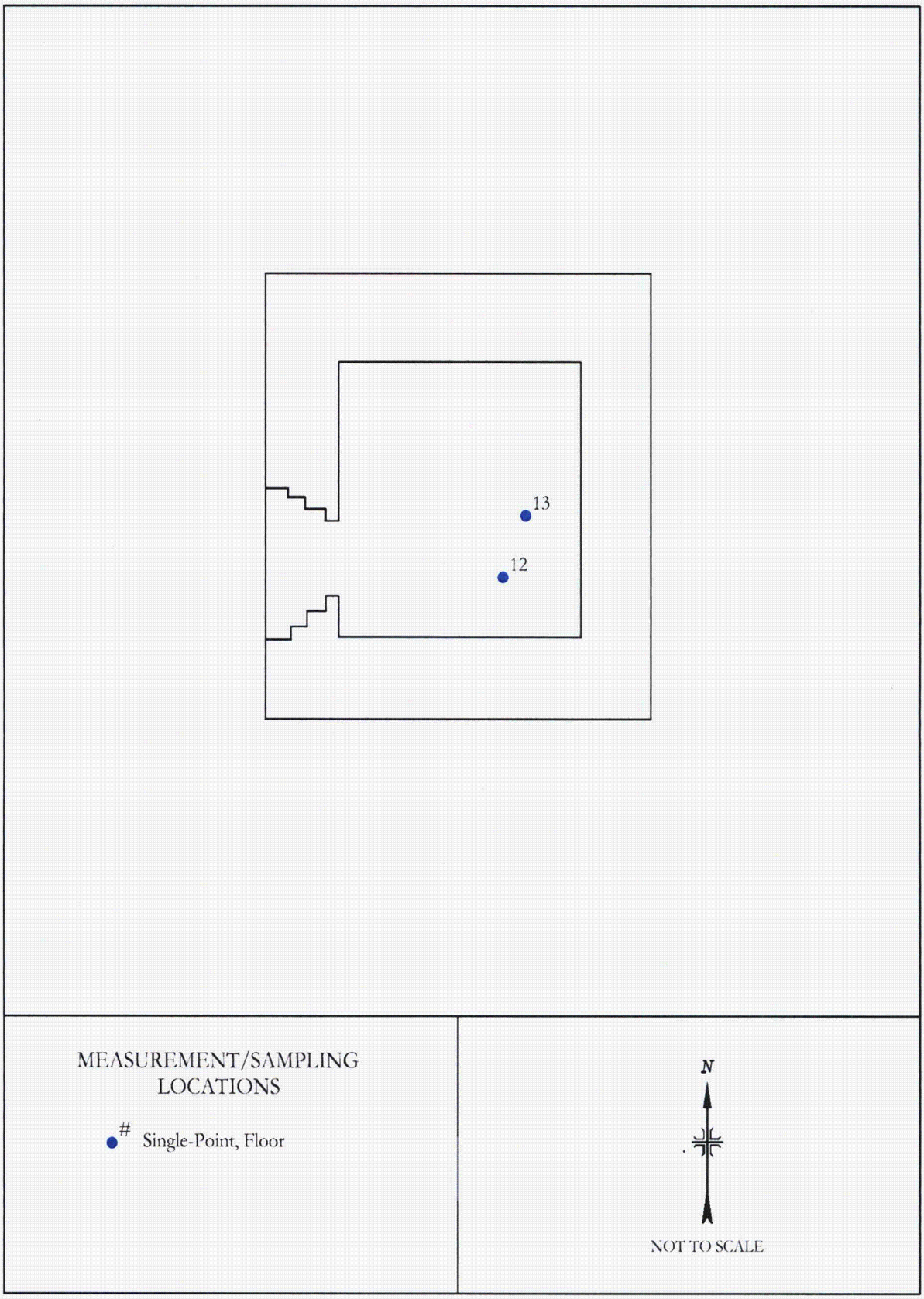
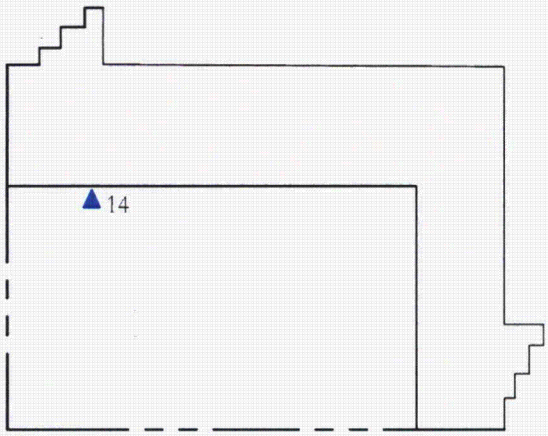


FIGURE 11: Auxiliary Building, Room 48 - Direct Measurement Locations



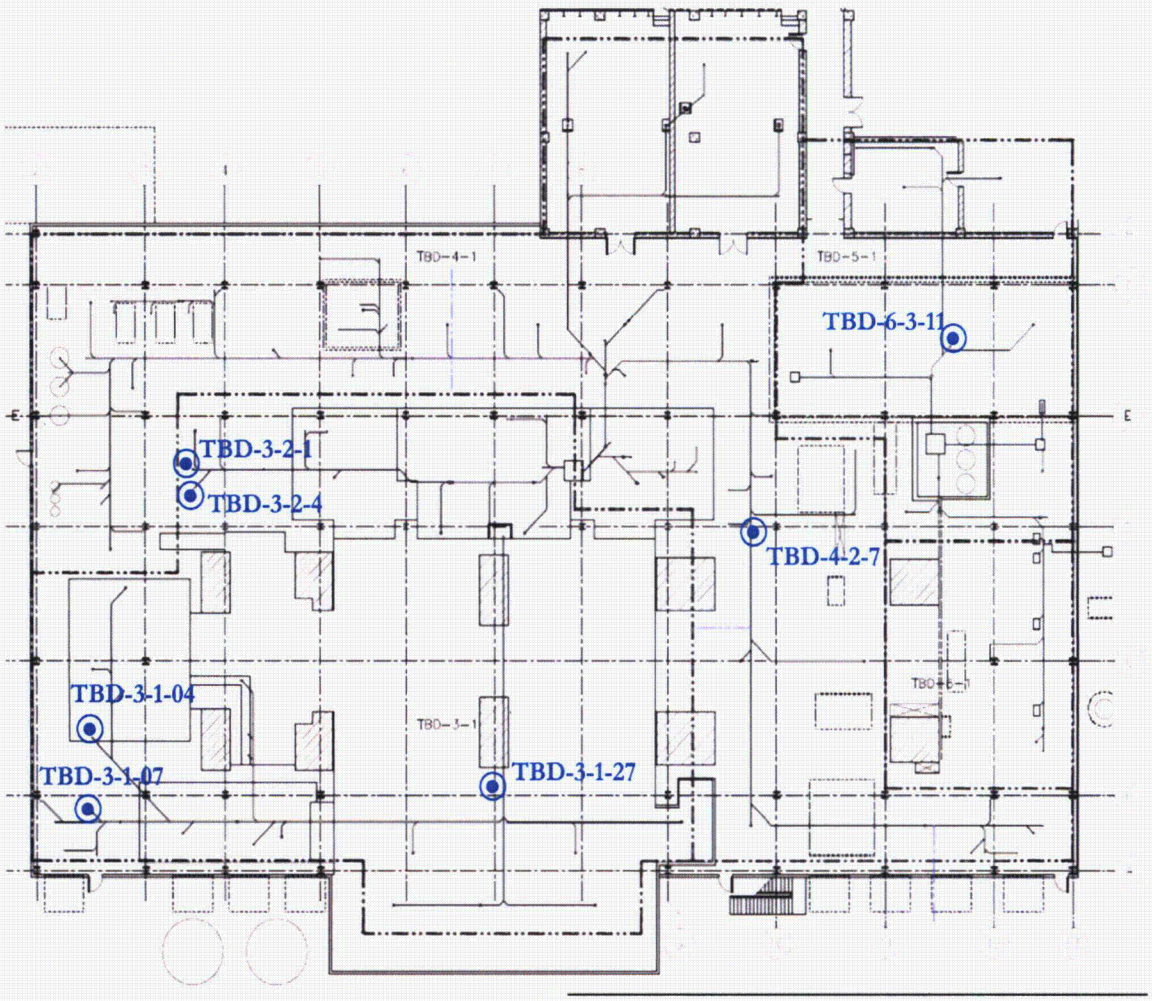
MEASUREMENT/SAMPLING LOCATIONS

▲# Single-Point, Lower Wall

N

NOT TO SCALE

FIGURE 12: Auxiliary Building, Room 49 - Direct Measurement Locations



Drawing provided by SMUD

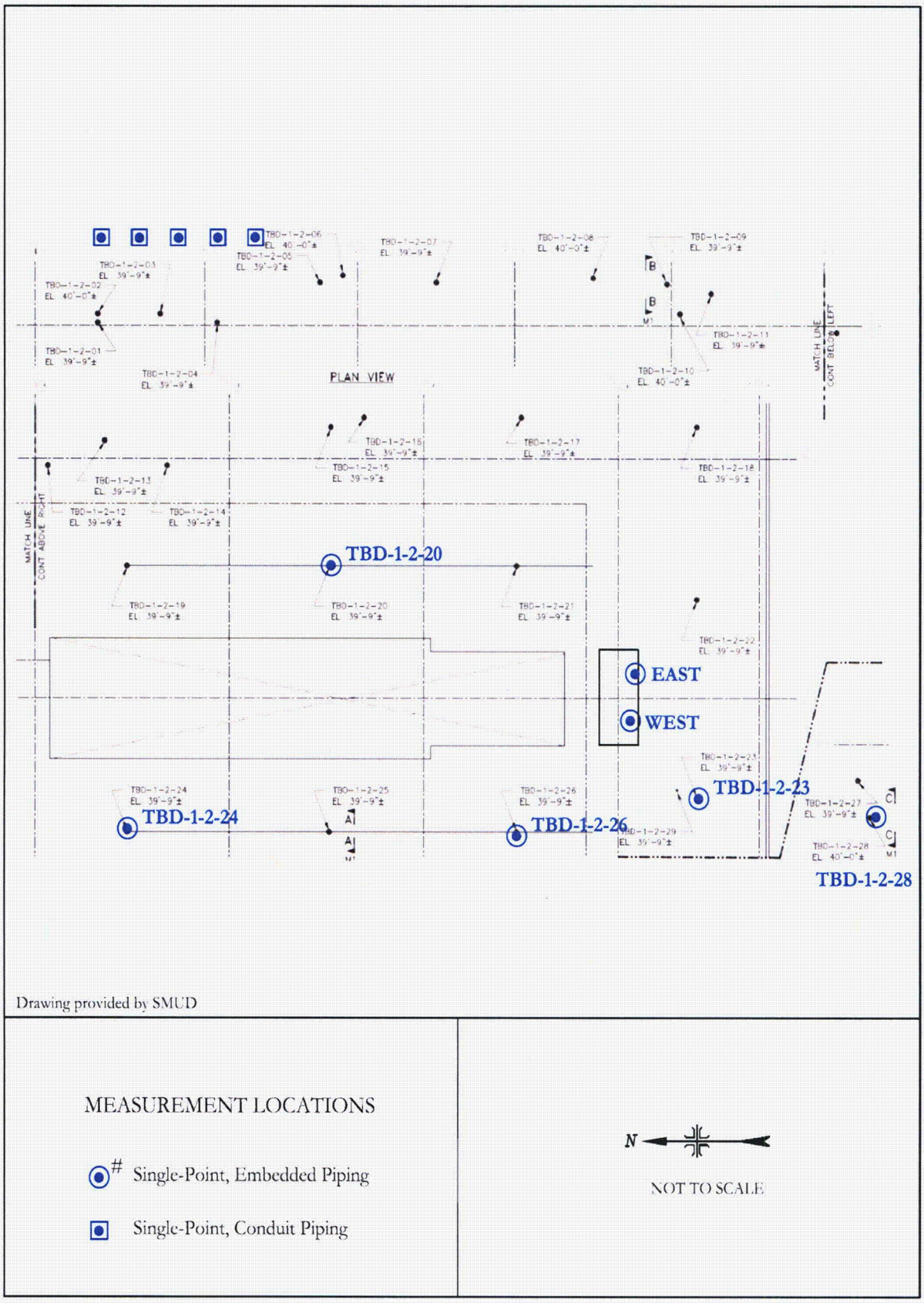
MEASUREMENT LOCATIONS

◉# Single-Point, Embedded Piping

N

NOT TO SCALE

FIGURE 13: Turbine Building; Ground Level Elevation - Embedded Piping Measurement Locations



Drawing provided by SMUD

FIGURE 14: Turbine Building; 40 Foot Elevation - Embedded Piping Measurement Locations

TABLES

TABLE 1

SURVEY UNIT CLASSIFICATION AND SCAN COVERAGE FOR SURVEYED ROOMS IN THE AUXILIARY BUILDING RANCHO SECO NUCLEAR GENERATING STATION HERALD, CALIFORNIA

Auxiliary Building Survey Unit/Room[a]	Class	Percent Scan Coverage			
		Gamma Floor	Beta Floor	Beta Lower Wall	Beta Upper Wall
23 FL and LW	1	50	50	25	---[b]
24	1	100	50	50	---
25 FL and LW	1	100	75	50	---
25 US	1	---	---	---	2
43 FL and LW	1	100	50	50	---
44	1	100	50	50	---
45	1	100	50	50	5
46	1	100	50	50	10
47	1	100	75	50	---
48	1	100	50	50	---
49	1	100	100	100	20

[a]Refer to Figures 3 through 12. FL = floor, LW = lower wall and US = upper surfaces.
[b]Scans not performed.

TABLE 2

SURFACE ACTIVITY LEVELS
AUXILIARY BUILDING STRUCTURAL SURFACES
RANCHO SECO NUCLEAR GENERATING STATION
HERALD, CALIFORNIA

Room/ Location[a]	Surface[b]	Total Beta Activity (dpm/100 cm^2)[c]	Activity Meets Gross Beta DCGL[d]	Activity Meets Design $DCGL_{EMC}$[d]	Activity Meets Actual $DCGL_{EMC}$[d]
Room 23					
56	FL	240,000	NO	NO	YES
57	FL	25,000	YES	YES	YES
58	FL	51,000	NO	YES	YES
59	FL	26,000	YES	YES	YES
60	FL	110,000	NO	YES	YES
61	LW	190,000	NO	NO	YES
62	LW	25,000	YES	YES	YES
Room 24					
47	FL	44,000	NO	YES	YES
48	FL	30,000	YES	YES	YES
49	FL	30,000	YES	YES	YES
50	FL	28,000	YES	YES	YES
51	LW	20,000	YES	YES	YES
52	LW	30,000	YES	YES	YES
53	LW	37,000	YES	YES	YES
54	LW	30,000	YES	YES	YES
55	LW	35,000	YES	YES	YES
Room 25					
33	FL	74,000	NO	YES	YES
34	FL	94,000	NO	YES	YES
35	FL	18,000	YES	YES	YES
36	FL	57,000	NO	YES	YES
37	FL	18,000	YES	YES	YES
38	FL	32,000	YES	YES	YES
39	FL	100,000	NO	YES	YES
40	LW	12,000	YES	YES	YES
41	US	100,000	NO	YES	YES
Room 43					
15	LW	12,000	YES	YES	YES
16	LW	12,000	YES	YES	YES
17	LW	17,000	YES	YES	YES
Room 44					
18	FL	12,000	YES	YES	YES
19	LW	20,000	YES	YES	YES
20	LW	22,000	YES	YES	YES
21	LW	8,000	YES	YES	YES
22	LW	11,000	YES	YES	YES

TABLE 2 (continued)

SURFACE ACTIVITY LEVELS
AUXILIARY BUILDING STRUCTURAL SURFACES
RANCHO SECO NUCLEAR GENERATING STATION
HERALD, CALIFORNIA

Room/ Location[a]	Surface[b]	Total Beta Activity (dpm/100 cm^2)[c]	Activity Meets Gross Beta DCGL[d]	Activity Meets Design $DCGL_{EMC}$[d]	Activity Meets Actual $DCGL_{EMC}$[d]
Room 45					
23	US	39,000	YES	YES	YES
24	US	23,000	YES	YES	YES
25	US	30,000	YES	YES	YES
26	US	5,900	YES	YES	YES
27	US	14,000	YES	YES	YES
28	FL	36,000	YES	YES	YES
29	LW	33,000	YES	YES	YES
30	FL	46,000	NO	YES	YES
31	FL	22,000	YES	YES	YES
32	US	13,000	YES	YES	YES
Room 46					
5	FL	24,000	YES	YES	YES
6	LW	38,000	YES	YES	YES
7	FL	36,000	YES	YES	YES
8	LW	12,000	YES	YES	YES
9	FL	47,000	NO	YES	YES
10	LW	31,000	YES	YES	YES
11	LW	34,000	YES	YES	YES
Room 47					
1	LW	37,000	YES	YES	YES
2	FL	26,000	YES	YES	YES
3	LW	16,000	YES	YES	YES
4	LW	21,000	YES	YES	YES
Room 48					
12	FL	9,900	YES	YES	YES
28	FL	8,700	YES	YES	YES
Room 49, Co-60					
14	LW	12,000	YES	YES	YES

[a]Refer to Figures 3 through 12.
[b]Structural surfaces; FL = floor, LW = lower wall and US = upper surfaces.
[c]Direct measurement results rounded to two significant digits.
[d]DCGL values are provided in Table 6.

TABLE 3

SURFACE ACTIVITY DATA COMPARISON
AUXILIARY BUILDING ROOM 25
RANCHO SECO NUCLEAR GENERATING STATION
HERALD, CALIFORNIA

Location[a]		Surface[b]	Total Beta Activity (dpm/100 cm^2)	
ORISE	SMUD		ORISE	SMUD[c]
42	02BD	FL	4,200	4,000
43	01BD	FL	3,500	3,700
44	05BD	FL	2,000	2,500
45	19BD	FL	4,400	4,300
46	04BD	FL	5,000	4,200

[a]Refer to Figure 5. SMUD measurement locations were provided in the preliminary FSS data by SMUD.
[b]FL = floor.
[c]SMUD Total Beta Activity results were provided by SMUD. ORISE and SMUD Total Beta Activity results were rounded to two significant digits.

TABLE 4

TURBINE BUILDING EMBEDDED PIPING CONFIRMATORY SURVEY RESULTS FOR TBD-3-1-27 RANCHO SECO NUCLEAR GENERATING STATION HERALD, CALIFORNIA

TBD 3-1-27[a] Pipe Position (feet)	Gross Total Beta/Gamma Activity (dpm/100 cm^2)[b, c]
3.3	6,700
6.6	5,900
9.8	6,600
13.1	6,100
16.4	5,200
19.7	6,300
23.0	5,500
26.2	5,000
29.5	5,200
32.8	5,200
36.1	5,700
39.4	4,500
42.7	5,400
44.3	6,300

[a]Refer to Figure 13.
[b]Background was not subtracted. ORISE Total Activity results were rounded to two significant digits.
[c]The embedded piping DCGL is 100,000 dpm/100 cm^2 with a grouting action level of 21,000 dpm/100 cm^2. ORISE pipe detector was calibrated with a Tc-99 flexible source. Although the pipes had both Co-60 and Cs-137, ORISE took a conservative approach and considered that all the contamination within the pipe was from Co-60 and used a source efficiency of 0.25.

TABLE 5

TURBINE BUILDING EMBEDDED PIPING CONFIRMATORY GAMMA SCAN RANGES FOR REMAINING EMBEDDED PIPING RANCHO SECO NUCLEAR GENERATING STATION HERALD, CALIFORNIA

Turbine Building Drain Line[a]	Diameter (inches)	Scan Depth (feet)	ORISE Gamma Scan Range (cpm)
Turbine Building Backgrounds[b]			
Conduit, East Side 1	4	1	300 to 600
Conduit, East Side 2	4	1	300 to 600
Conduit, East Side 3	4	1	200 to 600
Conduit, East Side 4	4	1	300 to 600
Penetration, East Side	4	1	300 to 600
Exciter Pad East	4	12	200 to 800
Exciter Pad West	4	12	200 to 800
Background Range	---	---	200 to 800
Turbine Building Ground Level Drains			
TBD 6-3-11	4	8	300 to 1600
TBD 4-2-7	4	13	200 to 600
TBD 3-2-01	4	13	500 to 1600
TBD 3-2-4	4	10	200 to 800
TBD 3-1-7	4	10	200 to 600
TBD 3-1-4	4	13	200 to 800
Turbine Building +40 Level Drains			
TBD 1-2-28	4	1	250 to 450
TBD 1-2-23	4	1	220 to 450
TBD 1-2-26	4	11	200 to 1000
TBD 1-2-24	4	13	400 to 900
TBD 1-2-20	4	13	200 to 1000

[a]Refer to Figures 13 and 14.
[b]Turbine Building embedded piping backgrounds were determined within Turbine Building conduits.

TABLE 6

DERIVED CONCENTRATION GUIDELINE LEVELS AND ELEVATED MEASUREMENT COMPARISONS FOR SURVEYED ROOMS IN THE AUXILIARY BUILDING RANCHO SECO NUCLEAR GENERATING STATION HERALD, CALIFORNIA

Auxiliary Building Survey Unit/Room[a]	Class	Gross Beta DCGL[b] (dpm/100 cm^2)	Design $DCGL_{EMC}$[c] (dpm/100 cm^2)	Actual $DCGL_{EMC}$[c] (dpm/100 cm^2)
23 FL and LW	1	43,000	150,500	6.4E7
24	1	43,000	150,500	N/A[d]
25 FL and LW	1	43,000	146,200	N/A
25 US	1	43,000	141,900	N/A
43 FL and LW	1	43,000	137,600	N/A
44	1	43,000	141,900	N/A
45	1	43,000	141,900	1.11E6
46	1	43,000	141,900	N/A
47	1	43,000	141,900	N/A
48	1	43,000	193,500	N/A
49[e]	1	16,000[e]	142,400	N/A

[a]Refer to Figures 3 through 12. FL = floor, LW = lower wall and US = upper surfaces.
[b]Gross beta DCGL accounts for radionuclide fractions and hard to detects as specified in the DTBD-05-15.
[c]$DCGL_{EMC}$ provided by SMUD and accounted for area factors determined for each specific survey unit.
[d]Due to SMUD FSS findings, Actual $DCGL_{EMC}$ was not applicable for these survey units since all results were less than the gross beta DCGL.
[e]The major contaminant for Room 49 was determined to be Co-60; SMUD accounted for ROCs by calculating an appropriate gross beta DCGL (based on ROC fractions in relation to Co-60) for this room.

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