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2025 Annual BONUS Reactor Radiological Survey Report

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This document is designed for online viewing.

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Abbreviations

BONUS	Boiling Nuclear Superheater
CFR	*Code of Federal Regulations*
cm^2	square centimeters
DOE	U.S. Department of Energy
dpm	disintegrations per minute
LM	Office of Legacy Management
LMFSC	LM Field Support Center
LMS	Legacy Management Support
µrem/h	microrem per hour
mrem/h	millirem per hour
PPE	personal protective equipment
PREPA	Puerto Rico Electric Power Authority
RCT	radiological control technician

Executive Summary

The week of May 13, 2025, Legacy Management Support (LMS) radiological control technicians (RCTs) mobilized to the Boiling Nuclear Superheater (BONUS), Puerto Rico, Decommissioned Reactor Site and performed the annual radiological survey of the interior of the reactor containment building. The radiological survey was performed in accordance with the *Annual LMS Radiological Characterization Survey Plan for the BONUS, Puerto Rico, Decommissioned Reactor, LMS RadCon Survey Plan Number: 24-001*, June 2024 (LMS/BON/48092) and LMS Radiological Control organization procedures, manuals, and plans.

Comparison of the 2025 radiological survey results to 2024 results proved to be very similar. The two previously identified contamination areas in the reactor containment building remain contamination areas and are radiologically posted as such. No new radiological areas were identified during the survey. No previously posted radiological areas were deposted.

The 2025 radiological survey results, along with the two radiologically posted and controlled contamination areas at the site, provide continued confidence that human health and the environment remain protected from radiological hazards at the site. Furthermore, the 2025 radiological survey results obtained in the nonposted areas are below regulatory surface contamination and radiation dose limits.

1.0 Introduction

The Boiling Nuclear Superheater (BONUS) Puerto Rico, Decommissioned Reactor Site, located northwest of Rincón, Puerto Rico, was developed as a prototype nuclear power plant to investigate the technical and economic feasibility of the integral boiling-superheating concept. Operation of the BONUS reactor was initiated in 1964 and terminated in 1968. Puerto Rico Electric Power Authority (PREPA) decommissioned the reactor between 1969 and 1970. During decommissioning, special nuclear materials (fuel) and certain highly activated components (e.g., control rods and shims) were removed and transported to the mainland and the piping systems were flushed. The reactor vessel and associated internal components within the biological shield were entombed in concrete. Many contaminated and activated materials were placed in the main circulation pump room beneath the pressure vessel and entombed in concrete.

The BONUS site falls under applicable portions of U.S. Department of Energy (DOE) regulations, specifically Title 10 *Code of Federal Regulations* Part 835 (10 CFR 835), "Occupational Radiation Protection." Radiological surveys conducted within the reactor containment are performed annually to ensure continued worker/public health and environmental hazards remain below established regulatory limits.

The 2025 annual BONUS Reactor radiological survey was performed in accordance with the *Annual LMS Radiological Characterization Survey Plan for the BONUS, Puerto Rico, Decommissioned Reactor Site LMS RadCon Survey Plan Number: 24-001*, June 2024 (Attachment 1). The completed *BONUS Annual Survey Location and Results Data Sheet* identified in the Survey Plan is included in Attachment 2.

1.1 Purpose and Scope

The purpose of this report is to present the radiological survey results obtained during the 2025 site annual radiological survey (hereafter called the survey). Results from the survey are compared to the previous year's survey results to identify if radiological conditions at the site have changed since the last survey performed. Survey results are then compared against established regulatory radiological limits to document whether the site remains protective of human health and the environment.

The scope of this report is specific to the performance of radiological surveys performed by Legacy Management Support (LMS) qualified radiological control technicians (RCTs) internal to the reactor's containment building (dome) and their outcomes. Surveys were performed in accordance with the *Annual LMS Radiological Characterization Survey Plan for the BONUS, Puerto Rico, Decommissioned Reactor Site LMS RadCon Survey Plan Number: 24-001*, June 2024 (Attachment 1), hereafter called the Survey Plan, and LMS Radiological Control organization specific procedures, manuals, and plans. Radiological surveys were not performed outside of the dome.

1.2 Survey Limitations

Beta-gamma contamination and gamma radiation surveys performed during the 2025 annual survey were used as described in the "Introduction" section of the Survey Plan. Survey results obtained at the site were not used to make real property radiological release decisions for the site.

The radiological surveys performed during the 2025 annual survey are considered "characterization" type surveys and not real property, unrestricted release type surveys.

1.3 Survey Considerations

Radiological surveys were performed by DOE-qualified LMS RCTs using functional and calibrated LMS radiological survey instruments and equipment. Radiological surveys, instrument preoperational checks, and recording of the survey results were performed in accordance with the LMS *Radiation Protection Program Plan* (DOE 2024d), *Radiological Control Manual* (DOE 2025b), Radiological Control implementing procedures, and the Survey Plan.

2.0 Radiological Surveys

2.1 Survey Instruments

To perform a removable and total surface contamination and general area gamma radiation dose rate survey in the dome, a Ludlum Model 3030 smear counter (serial no. 330877), Ludlum Model 26 Geiger–Müller (GM) pancake probe (serial no. PF002650), and a ThermoScientific Micro Rem meter instrument (serial no. 19288) were selected and used. The Micro Rem meter and Ludlum Model 26 instruments were used in the dome to perform the total surface contamination and general area gamma radiation dose rate surveys. The Ludlum Model 3030 instrument was used at the Office of Legacy Management (LM) Field Support Center at Grand Junction, Colorado (LMFSC), to count removable surface contamination smears collected at the site.

LMS survey instruments shipped to the site arrived intact and operated as expected. Instruments were in calibration and passed their daily response checks prior to daily use, as required by the *Portable Radiation Survey Instrument Response Checks* procedure (DOE 2024c) and the *Counting Systems Daily Operation* procedure (DOE 2024a). Surveys were performed in accordance with the *Contamination Surveys and Equipment and Material Release* procedure (DOE 2025a) and the Survey Plan.

Instrument annual calibration certificates, *Daily Instrument Response* forms, and other required instrumentation operational check and quality control documents are included in Attachment 3.

2.2 Contamination Survey

Beta-gamma removable and total surface contamination surveys were performed at 73 identified survey locations (per the Survey Plan) and at five nonbiased survey locations selected real-time by the RCT performing the survey using the above identified contamination survey instruments. Instruments were operated in accordance with LMS Radiological Control organization's operating procedures, plans, and manual; specifically, the *Contamination Surveys and Equipment and Material Release* procedure (DOE 2025a). Surface contamination survey results were documented in accordance with the Survey Plan and the *Documenting Radiological Surveys* procedure (DOE 2024b). Surface contamination smears were checked for radioactivity at the time of the survey using the Ludlum Model 26 and then brought to the LMFSC office for nuclear counting on the Ludlum Model 3030.

Direct beta-gamma surface contamination and removable surface contamination survey results were evaluated in real-time using the below criteria; and additional confirmatory, biased beta-gamma surface contamination and removable surface contamination smear surveys performed when any of the following survey result or physical site conditions exist:

- RCT observes excessive deterioration of the structure(s) during the survey compared to the previous year's structural condition
- Survey results from the identified survey locations (outside of radiologically controlled areas) indicate contamination levels in excess of 1000 disintegrations per minute (dpm) (beta/gamma)/square centimeters (100 cm^2) removable contamination or 5000 dpm (beta/gamma)/100 cm^2 total surface contamination
- RCT observes any conditions that justify additional surface contamination surveys be performed, at their discretion

The RCTs performing the contamination survey confirmed location L40 inside the main level posted contamination area (inside the visitor restricted area) still exhibits elevated direct readings and also remains free of removable contamination. The radiological contamination area posting and boundary rope enclosing location L40 was intact and appeared to be in the same configuration as when placed in 2024. No surface contamination was identified outside of the posted radiological contamination area boundary.

The Survey Plan identifies 73 defined locations with 5 additional nonbiased, random locations selected by the RCT. The 2025 contamination survey results of the remaining 72 defined locations were well within regulatory limits and appeared to be consistent to last year's contamination survey results. The five new random locations selected were also well below regulatory limits.

The basement of the facility has one posted radiological contamination area that is intact and appeared to be in the same configuration as when placed in 2024. A single pump exhibiting rust-colored material around the base was identified in 2024 as the reason for the posted contamination area on the basement level. A two-part fixative coating was applied in 2024 over the rust-colored material at the base of the pump, as shown in Figure 1, to secure the material from transfer out of the posted contamination area. The RCTs performing the survey noted the fixative visually appeared different from the initial application, as shown in Figure 2, however, RCTs verified that the fixative is performing as expected with both total contamination and removable contamination values below regulatory limits.

Figure 1. Basement Contamination Area Pump with Fixative Applied from 2024

Figure 2. Basement Contamination Area Pump Close-Up from 2025

Identified survey locations in the Survey Plan were available and located during the 2025 survey. No survey locations had to be moved or relocated due to safety concerns or the unavailability of planned survey locations. The five new nonbiased survey locations picked by the RCTs performing the survey were marked on the floor with indelible marker and annotated with "2025" to differentiate them from the previous year's survey.

Contamination survey results are identified in Table 1 and on the *Radiological Survey Map* (LMS 1553), radiological survey no. 250522-001 (Attachment 4).

2.3 Radiation Survey

General area gamma radiation dose rate surveys were performed at the identified 73 survey locations (per the Survey Plan) and at five nonbiased survey locations using the ThermoScientific Micro Rem meter instrument. The instrument was operated in accordance with LMS Radiological Control operating procedures, plans and manual. General area gamma radiation dose rate results were documented in accordance with the Survey Plan and *Documenting Radiological Surveys* (DOE 2024b).

General area gamma radiation dose rate surveys results were evaluated in real-time using the below criteria; and additional confirmatory, biased general area gamma radiation dose rate surveys performed when any of the following survey result or physical site conditions exist:

- The RCT observes excessive deterioration of the structure(s) during the survey when compared to the previous year's structural condition
- Survey results from the identified survey locations indicate a gamma radiation dose rate in excess of 0.4 millirem per hour (400 µrem/h)
- The RCT observes any conditions that justify an additional gamma radiation dose rate survey be performed, at their discretion

General area gamma radiation dose rate results appeared appropriate to the RCTs performing the surveys; survey results were well within regulatory limits and appeared to be consistent to last year's general area gamma radiation dose rate survey results. General area background dose rates were 20 microrem per hour (µrem/h) on the main level and mezzanine, and 35 µrem/h in the basement level. No biased general area gamma radiation dose rate surveys were performed as none of the triggers to take biased general area gamma radiation dose rate surveys were met.

Gamma radiation dose rate survey results are identified in Table 2 and on the *Radiological Survey Map*, radiological survey no. 250522-001 (Attachment 4).

Table 1. 2025 Contamination Survey Results

Survey ID	Survey Location	Removable Contamination (dpm/100cm^2)	Total Contamination (dpm/100cm^2)	General Location[a]
L1	Pipe Chase Face #1	< Sc	< Sc	Monolith top
L2	Pipe Chase Face #2	< Sc	< Sc	Monolith top
L3	Pipe Chase Face #3	< Sc	< Sc	Monolith top
L4	Pipe Chase Face #4	< Sc	< Sc	Monolith top
L5	Top Plug Face #1, left	< Sc	< Sc	Monolith top
L6	Top Plug Face #1, center	< Sc	< Sc	Monolith top
L7	Top Plug Face #1, right	< Sc	< Sc	Monolith top
L8	Top Plug Face #2, top	< Sc	< Sc	Monolith top
L9	Top Plug Face #2, center	< Sc	< Sc	Monolith top
L10	Top Plug Face #2, bottom	< Sc	379	Monolith top
L11	Top Plug Face #3, right	< Sc	618	Monolith top
L12	Top Plug Face #3, center	< Sc	< Sc	Monolith top
L13	Top Plug Face #3, left	< Sc	< Sc	Monolith top
L14	Top Plug Face #4, bottom	< Sc	< Sc	Monolith top
L15	Top Plug Face #4, center	< Sc	< Sc	Monolith top
L16	Top Plug Face #4, top	< Sc	< Sc	Monolith top
L17	Top Plug Top Surface, upper left	< Sc	< Sc	Monolith top
L18	Top Plug Top Surface, center right	< Sc	< Sc	Monolith top
L19	Top Plug Top Surface, center bottom	< Sc	< Sc	Monolith top
L20	Main Floor, Zone 1	< Sc	738	Main level, public access
L21	Main Floor, Zone 2	< Sc	< Sc	Main level, public access
L22	Main Floor, Zone 3	< Sc	498	Main level, public access
L23	Main Floor, Zone 4	< Sc	< Sc	Main level, public access
L24	Main Floor, Zone 5	< Sc	857	Main level, public access
L25	Main Floor, Zone 6	< Sc	379	Main level, public access
L26	Main Floor, Zone 7	< Sc	< Sc	Main level, public access
L27	Main Floor, Zone 8	< Sc	< Sc	Main level, public access
L28	Main Floor, Zone 9	< Sc	< Sc	Main level, public access

Table 1. 2025 Contamination Survey Results (continued)

Survey ID	Survey Location	Removable Contamination (dpm/100cm^2)	Total Contamination (dpm/100cm^2)	General Location[a]
L29	Main Floor, Zone 10	< Sc	977	Main level, public access
L30	Main Floor, Zone 11	< Sc	498	Main level, public access
L31	Main Floor, Zone 12	< Sc	498	Main level, public access
L32	Main Floor, Zone 13	< Sc	< Sc	Main level, public access
L33	Main Floor, Zone 14	< Sc	< Sc	Main level, public access
L34	Main Floor Water Column, center bottom	< Sc	< Sc	Main level, controlled area
L35	Main Floor Water Column, right middle	< Sc	< Sc	Main level, controlled area
L36	Instrument Thimble #1	< Sc	< Sc	Main level, controlled area
L37	Instrument Thimble #2	< Sc	< Sc	Main level, controlled area
L38	Instrument Thimble #3	< Sc	< Sc	Main level, controlled area
L39	Pipe Chase Exterior Hatch	< Sc	< Sc	Main level, controlled area
L40	Fuel Pool Purifier Floor #1	< Sc	16988	Main level, contaminated area
L41	Fuel Pool Purifier Floor #2	< Sc	618	Main level, controlled area
L42	Fuel Pool Purifier Floor #3	33	618	Main level, controlled area
L43	Fuel Pool Purifier Floor #4	< Sc	< Sc	Main level, controlled area
L44	Basement Floor, Zone 1	< Sc	< Sc	Basement level
L45	Basement Floor, Zone 2	< Sc	< Sc	Basement level
L46	Basement Floor, Zone 3	< Sc	< Sc	Basement level
L47	Basement Floor, Zone 4	< Sc	< Sc	Basement level
L48	Basement Floor, Zone 5	< Sc	< Sc	Basement level
L49	Basement Floor, Zone 6	< Sc	< Sc	Basement level
L50	Basement Floor, Zone 7	< Sc	< Sc	Basement level
L51	Basement Floor, Zone 8	< Sc	< Sc	Basement level
L52	Basement Floor, Zone 9	< Sc	< Sc	Basement level
L53	Basement Floor, Zone 10	< Sc	< Sc	Basement level
L54	Basement Floor, Zone 11	< Sc	< Sc	Basement level
L55	Basement Floor, Zone 12	< Sc	< Sc	Basement level
L56	Basement Floor, Zone 13	< Sc	< Sc	Basement level

Table 1. 2025 Contamination Survey Results (continued)

Survey ID	Survey Location	Removable Contamination (dpm/100cm^2)	Total Contamination (dpm/100cm^2)	General Location[a]
L57	Basement Floor, Zone 14	< Sc	< Sc	Basement level
L58	Basement Floor, Zone 15	< Sc	379	Basement level
L59	Basement Floor, Zone 16	< Sc	< Sc	Basement level
L60	Basement Floor, Zone 17	< Sc	< Sc	Basement level
L61	Basement Floor, Zone 18	< Sc	< Sc	Basement level
L62	Side of Liquid Waste Retention Tank #1	26	< Sc	Basement level
L63	Side of Liquid Waste Retention Tank #2	< Sc	379	Basement level
L64	Column 4 and 5 inside room	< Sc	< Sc	Basement level
L65	F.W. Heater Room (wall)	< Sc	< Sc	Basement level
L66	Vapor Sphere Room, upper left	< Sc	< Sc	Basement level
L67	Vapor Sphere Room, center right	< Sc	< Sc	Basement level
L68	Water pump room to the right	< Sc	< Sc	Basement level
L69	Condenser Room Entry Wall, block	< Sc	< Sc	Basement level
L70	Condenser Room Entry Wall, concrete	< Sc	379	Basement level
L71	South room with two pumps	< Sc	< Sc	Basement level
L72	Under stairs near north door Floor #1	< Sc	< Sc	Basement level
L73	Under stairs near north door Floor #2	< Sc	< Sc	Basement level
L74	Inlet air plenum room floor	< Sc	< Sc	Basement level
L75	Condensate mixed bed area floor	< Sc	< Sc	Basement level
L76	Floor near north stairwell	< Sc	< Sc	Main level, public access
L77	Floor outside fuel storage room	< Sc	< Sc	Main level, public access
L78	Floor near south stairwell	< Sc	379	Main level, public access

Note:
[a] Main level, controlled and contaminated areas (L34-L43) are located behind a barricade restricting public access.

Abbreviation:
Sc = instrument critical value

Table 2. 2025 Dose Rate Survey Results

Survey ID	Survey Location	Dose Result (µrem/h)	General Location[a]
L1	Pipe Chase Face #1	20	Monolith top
L2	Pipe Chase Face #2	26	Monolith top
L3	Pipe Chase Face #3	25	Monolith top
L4	Pipe Chase Face #4	20	Monolith top
L5	Top Plug Face #1, left	15	Monolith top
L6	Top Plug Face #1, center	20	Monolith top
L7	Top Plug Face #1, right	20	Monolith top
L8	Top Plug Face #2, top	20	Monolith top
L9	Top Plug Face #2, center	25	Monolith top
L10	Top Plug Face #2, bottom	25	Monolith top
L11	Top Plug Face #3, right	25	Monolith top
L12	Top Plug Face #3, center	20	Monolith top
L13	Top Plug Face #3, left	25	Monolith top
L14	Top Plug Face #4, bottom	20	Monolith top
L15	Top Plug Face #4, center	25	Monolith top
L16	Top Plug Face #4, top	25	Monolith top
L17	Top Plug Top Surface, upper left	25	Monolith top
L18	Top Plug Top Surface, center right	30	Monolith top
L19	Top Plug Top Surface, center bottom	25	Monolith top
L20	Main Floor, Zone 1	30	Main level, public access
L21	Main Floor, Zone 2	30	Main level, public access
L22	Main Floor, Zone 3	30	Main level, public access
L23	Main Floor, Zone 4	30	Main level, public access
L24	Main Floor, Zone 5	30	Main level, public access
L25	Main Floor, Zone 6	30	Main level, public access
L26	Main Floor, Zone 7	30	Main level, public access
L27	Main Floor, Zone 8	30	Main level, public access
L28	Main Floor, Zone 9	35	Main level, public access
L29	Main Floor, Zone 10	35	Main level, public access
L30	Main Floor, Zone 11	30	Main level, public access
L31	Main Floor, Zone 12	30	Main level, public access
L32	Main Floor, Zone 13	35	Main level, public access
L33	Main Floor, Zone 14	35	Main level, public access
L34	Main Floor Water Column, center bottom	30	Main level, controlled area
L35	Main Floor Water Column, right middle	30	Main level, controlled area
L36	Instrument Thimble #1	32	Main level, controlled area
L37	Instrument Thimble #2	32	Main level, controlled area
L38	Instrument Thimble #3	32	Main level, controlled area
L39	Pipe Chase Exterior Hatch	30	Main level, controlled area
L40	Fuel Pool Purifier Floor #1	40	Main level, contaminated area
L41	Fuel Pool Purifier Floor #2	35	Main level, controlled area

Table 2. 2025 Dose Rate Survey Results (continued)

Survey ID	Survey Location	Dose Result (µrem/h)	General Location[a]
L42	Fuel Pool Purifier Floor #3	35	Main level, controlled area
L43	Fuel Pool Purifier Floor #4	35	Main level, controlled area
L44	Basement Floor, Zone 1	40	Basement level
L45	Basement Floor, Zone 2	40	Basement level
L46	Basement Floor, Zone 3	40	Basement level
L47	Basement Floor, Zone 4	38	Basement level
L48	Basement Floor, Zone 5	40	Basement level
L49	Basement Floor, Zone 6	40	Basement level
L50	Basement Floor, Zone 7	40	Basement level
L51	Basement Floor, Zone 8	42	Basement level
L52	Basement Floor, Zone 9	40	Basement level
L53	Basement Floor, Zone 10	40	Basement level
L54	Basement Floor, Zone 11	38	Basement level
L55	Basement Floor, Zone 12	36	Basement level
L56	Basement Floor, Zone 13	38	Basement level
L57	Basement Floor, Zone 14	40	Basement level
L58	Basement Floor, Zone 15	38	Basement level
L59	Basement Floor, Zone 16	40	Basement level
L60	Basement Floor, Zone 17	42	Basement level
L61	Basement Floor, Zone 18	42	Basement level
L62	Side of Liquid Waste Retention Tank #1	38	Basement level
L63	Side of Liquid Waste Retention Tank #2	40	Basement level
L64	Column 4 and 5 inside room	40	Basement level
L65	F.W. Heater Room (wall)	42	Basement level
L66	Vapor Sphere Room, upper left	38	Basement level
L67	Vapor Sphere Room, center right	38	Basement level
L68	Water pump room to the right	40	Basement level
L69	Condenser Room Entry Wall, block	40	Basement level
L70	Condenser Room Entry Wall, concrete	40	Basement level
L71	South room with two pumps	40	Basement level
L72	Under stairs near north door Floor #1	40	Basement level
L73	Under stairs near north door Floor #2	40	Basement level
L74	Inlet air plenum room floor	38	Basement level
L75	Condensate mixed bed area floor	40	Basement level
L76	Floor near north stairwell	42	Main level, public access
L77	Floor outside fuel storage room	40	Main level, public access
L78	Floor near south stairwell	40	Main level, public access

Note:
[a] Main level, controlled and contaminated areas (L34-L43) are located behind a barricade restricting public access.

2.4 Survey Quality

Radiological survey and results quality is obtained and demonstrated through several methods and techniques, including using senior level DOE-qualified RCTs to perform the survey, using approved survey procedures and plan, using industry standard calibrated and daily response-checked survey instruments, calculating counting instrument critical values, and performing peer-review and senior health physics reviews of the survey results.

Two senior LMS RCTs mobilized to the site and performed the identified radiological surveys in accordance with the approved Survey Plan and LMS Radiological Control organization procedures. Daily instrument response checks were performed at the beginning of the day ensuring that the instruments were functioning properly during the daily surveys. *Daily Instrument Response* forms (LMS 1974a) were used to record the morning's response checks and are included in Attachment 3. In addition to the *Daily Instrument Response* forms, instrument *After-Calibration Source Response Check Data Sheet* forms (LMS 1974) and instrument calibration certificates are also included in Attachment 3 for the instruments used during the surveys. Survey results were recorded on an LMS *Radiological Survey Map* form and are included in Attachment 4. This form has been in use for numerous years at LMS and is an electronic-based form that automatically performs the complex calculations required to convert raw instrument results data (i.e., counts per unit time) into disintegrations per unit time and survey area results data (i.e., dpm/100 cm^2) that can then be compared against established regulatory limits for the surveys. The *Radiological Survey Map* form also automatically calculates the critical values of the instruments used, given the instrument's efficiency and background values. Using an electronic-based form like the LMS *Radiological Survey Map* helps ensure the accuracy of required calculations and adds an additional level of survey results quality.

Last, the survey results are formally reviewed by a senior-level LMS health physicist and signed off as reviewed and proved on the *Radiological Survey Map*. If errors are identified on the *Radiological Survey Map*, then the form is returned to the RCT who performed the survey and corrections to the results are requested.

2.5 Survey Regulatory Limits

Radiological survey results were compared against the established regulatory limits of 10 CFR 835 Appendix D, "Surface Contamination Values," for surface radioactive contamination (both removable and total) (Table 3) and against the radiation levels identified in 10 CFR 835 for a radiation area (i.e., any area, accessible to individuals, in which radiation levels could result in an individual receiving an equivalent dose to the whole body in excess of 5 mrem in 1 hour at 30 centimeters from the source or from any surface that the radiation penetrates).

Only one survey location (L40) exceeded the total surface contamination limit of 5000 dpm/100 cm^2, with a value of 16,988 dpm/100 cm^2. This survey location is inside an identified and posted contamination area and is therefore not a radiological control concern and does not exceed the removable contamination regulatory limit.

No survey locations exceeded 5 mrem in 1 hour at 30 centimeters from the source or from any surface.

Table 3. Summary of Surface Contamination Values[1] in dpm/100 cm^2 (10 CFR 835 Appendix D)

Radionuclide	Removable[2,4]	Total (Fixed + Removable)[2,3]
U-natural, U-235, U-238, and associated decay products	1000[7]	5000[7]
Transuranics, radium-226, radium-228, thorium-230, thorium-228, protactinium-231, actinium-227, iodine-125, iodine-129	20	500
Th-natural, thorium-232, strontium-90, radium-223, radium-224, U-232, iodine-126, iodine-131, iodine-133	200	1000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except strontium-90 and others noted above[5]	1000	5000
Tritium and STCs[6]	10,000	See footnote 6

Notes:

1. The values in this appendix, with the exception noted in footnote 6, apply to radioactive contamination deposited on, but not incorporated into the interior or matrix of, the contaminated item. Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides apply independently.
2. 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.
3. The levels may be averaged over 1 square meter provided the maximum surface activity in any area of 100 cm^2 is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the surface contamination value if: (1) from measurements of a representative number of sections it is determined that the average contamination level exceeds the applicable value; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm^2 area exceeds three times the applicable value.
4. The amount of removable radioactive material per 100 cm^2 of surface area should be determined by swiping the area with dry filter or soft absorbent paper, applying moderate pressure, and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note: The use of dry material may not be appropriate for tritium.) When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area shall be based on the actual area and the entire surface shall be wiped. It is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.
5. This category of radionuclides includes mixed fission products, including the strontium-90 which is present in them. It does not apply to strontium-90 which has been separated from the other fission products or mixtures where the strontium-90 has been enriched.
6. Tritium contamination including STCs may diffuse into the volume or matrix of materials. Evaluation of surface contamination shall consider the extent to which such contamination may migrate to the surface in order to ensure the surface contamination value provided in this appendix is not exceeded. Once this contamination migrates to the surface, it may be removable not fixed; therefore, a "Total" value does not apply. In certain cases, a “Total” value of 10,000 dpm/100 cm^2 may be applicable either to metals of the types from which insoluble special tritium compounds are formed, that have been exposed to tritium, or to bulk materials to which insoluble special tritium compound particles are fixed to a surface.
7. These limits apply only to the alpha emitters within the respective decay series.

Abbreviations:

STC= special tritium compound
U = uranium

2.6 Survey Result Comparisons (2025 to 2024)

In accordance with the Survey Plan, results from the 2025 survey are to be compared to the previous year's survey results to identify whether radiological conditions at the site have changed since the last survey was performed.

2.6.1 Removable Surface Contamination Comparison

The 2025 removable surface contamination results are very similar to the 2024 removable surface contamination results (Table 4). Given the insignificance of the survey results greater than either the 2025 or the 2024 instrument's critical value, a two-sigma value was not determined for the survey result populations nor used as a comparison tool. The 2025 survey results indicate approximately 97% of the survey results are below the instrument's critical value of 25 dpm/100 cm^2. By comparison, the 2024 survey results show that approximately 92% of the survey results are below the instrument's critical value of 24 dpm/100 cm^2. The highest removable surface contamination result identified in the 2025 survey was 33 dpm/100 cm^2, well below the 1000 dpm/100 cm^2 limit.

It can be concluded that removable surface contamination is not migrating from one area to another area and that removable surface contamination levels are significantly below regulatory removable surface contamination limit values and do not pose human health concerns or environmental risks.

Table 4. 2025 Versus 2024 Removable Contamination Survey Results

Survey ID[a]	Survey Location	2025 Removable Contamination (dpm/100cm^2)	2024 Removable Contamination (dpm/100cm^2)	General Location[b]
L1	Pipe Chase Face #1	< Sc	26	Monolith top
L2	Pipe Chase Face #2	< Sc	< Sc	Monolith top
L3	Pipe Chase Face #3	< Sc	< Sc	Monolith top
L4	Pipe Chase Face #4	< Sc	< Sc	Monolith top
L5	Top Plug Face #1, left	< Sc	< Sc	Monolith top
L6	Top Plug Face #1, center	< Sc	< Sc	Monolith top
L7	Top Plug Face #1, right	< Sc	< Sc	Monolith top
L8	Top Plug Face #2, top	< Sc	< Sc	Monolith top
L9	Top Plug Face #2, center	< Sc	< Sc	Monolith top
L10	Top Plug Face #2, bottom	< Sc	< Sc	Monolith top
L11	Top Plug Face #3, right	< Sc	< Sc	Monolith top
L12	Top Plug Face #3, center	< Sc	< Sc	Monolith top
L13	Top Plug Face #3, left	< Sc	< Sc	Monolith top
L14	Top Plug Face #4, bottom	< Sc	< Sc	Monolith top
L15	Top Plug Face #4, center	< Sc	< Sc	Monolith top
L16	Top Plug Face #4, top	< Sc	< Sc	Monolith top
L17	Top Plug Top Surface, upper left	< Sc	< Sc	Monolith top
L18	Top Plug Top Surface, center right	< Sc	< Sc	Monolith top
L19	Top Plug Top Surface, center bottom	< Sc	35	Monolith top
L20	Main Floor, Zone 1	< Sc	< Sc	Main level, public access
L21	Main Floor, Zone 2	< Sc	< Sc	Main level, public access
L22	Main Floor, Zone 3	< Sc	< Sc	Main level, public access
L23	Main Floor, Zone 4	< Sc	< Sc	Main level, public access
L24	Main Floor, Zone 5	< Sc	< Sc	Main level, public access
L25	Main Floor, Zone 6	< Sc	< Sc	Main level, public access
L26	Main Floor, Zone 7	< Sc	< Sc	Main level, public access
L27	Main Floor, Zone 8	< Sc	< Sc	Main level, public access
L28	Main Floor, Zone 9	< Sc	< Sc	Main level, public access

Table 4. 2025 Versus 2024 Removable Contamination Survey Results (continued)

Survey ID[a]	Survey Location	2025 Removable Contamination (dpm/100cm^2)	2024 Removable Contamination (dpm/100cm^2)	General Location[b]
L29	Main Floor, Zone 10	< Sc	28	Main level, public access
L30	Main Floor, Zone 11	< Sc	< Sc	Main level, public access
L31	Main Floor, Zone 12	< Sc	< Sc	Main level, public access
L32	Main Floor, Zone 13	< Sc	< Sc	Main level, public access
L33	Main Floor, Zone 14	< Sc	< Sc	Main level, public access
L34	Main Floor Water Column, center bottom	< Sc	28	Main level, controlled area
L35	Main Floor Water Column, right middle	< Sc	< Sc	Main level, controlled area
L36	Instrument Thimble #1	< Sc	< Sc	Main level, controlled area
L37	Instrument Thimble #2	< Sc	< Sc	Main level, controlled area
L38	Instrument Thimble #3	< Sc	< Sc	Main level, controlled area
L39	Pipe Chase Exterior Hatch	< Sc	26	Main level, controlled area
L40	Fuel Pool Purifier Floor #1	< Sc	< Sc	Main level, contaminated area
L41	Fuel Pool Purifier Floor #2	< Sc	< Sc	Main level, controlled area
L42	Fuel Pool Purifier Floor #3	33	< Sc	Main level, controlled area
L43	Fuel Pool Purifier Floor #4	< Sc	< Sc	Main level, controlled area
L44	Basement Floor, Zone 1	< Sc	< Sc	Basement level
L45	Basement Floor, Zone 2	< Sc	< Sc	Basement level
L46	Basement Floor, Zone 3	< Sc	< Sc	Basement level
L47	Basement Floor, Zone 4	< Sc	35	Basement level
L48	Basement Floor, Zone 5	< Sc	< Sc	Basement level
L49	Basement Floor, Zone 6	< Sc	< Sc	Basement level
L50	Basement Floor, Zone 7	< Sc	< Sc	Basement level
L51	Basement Floor, Zone 8	< Sc	< Sc	Basement level
L52	Basement Floor, Zone 9	< Sc	< Sc	Basement level
L53	Basement Floor, Zone 10	< Sc	< Sc	Basement level
L54	Basement Floor, Zone 11	< Sc	< Sc	Basement level
L55	Basement Floor, Zone 12	< Sc	< Sc	Basement level
L56	Basement Floor, Zone 13	< Sc	< Sc	Basement level

Table 4. 2025 Versus 2024 Removable Contamination Survey Results (continued)

Survey ID[a]	Survey Location	2025 Removable Contamination (dpm/100cm^2)	2024 Removable Contamination (dpm/100cm^2)	General Location[b]
L57	Basement Floor, Zone 14	< Sc	< Sc	Basement level
L58	Basement Floor, Zone 15	< Sc	< Sc	Basement level
L59	Basement Floor, Zone 16	< Sc	< Sc	Basement level
L60	Basement Floor, Zone 17	< Sc	< Sc	Basement level
L61	Basement Floor, Zone 18	< Sc	< Sc	Basement level
L62	Side of Liquid Waste Retention Tank #1	26	< Sc	Basement level
L63	Side of Liquid Waste Retention Tank #2	< Sc	< Sc	Basement level
L64	Column 4 and 5 inside room	< Sc	< Sc	Basement level
L65	F.W. Heater Room (wall)	< Sc	< Sc	Basement level
L66	Vapor Sphere Room, upper left	< Sc	< Sc	Basement level
L67	Vapor Sphere Room, center right	< Sc	< Sc	Basement level
L68	Water pump room to the right	< Sc	< Sc	Basement level
L69	Condenser Room Entry Wall, block	< Sc	< Sc	Basement level
L70	Condenser Room Entry Wall, concrete	< Sc	< Sc	Basement level
L71	South room with two pumps	< Sc	< Sc	Basement level
L72	Under stairs near north door Floor #1	< Sc	< Sc	Basement level
L73	Under stairs near north door Floor #2	< Sc	< Sc	Basement level
L74	Inlet air plenum room floor	< Sc	—	Basement level
L75	Condensate mixed bed area floor	< Sc	—	Basement level
L76	Floor near north stairwell	< Sc	—	Main level, public access
L77	Floor outside fuel storage room	< Sc	—	Main level, public access
L78	Floor near south stairwell	< Sc	—	Main level, public access

Notes:

[a] Locations L74 through L78 are nonbiased points randomly selected by the RCT performing the survey and will differ each year the survey is performed. No comparison is made of these five points between survey years.

[b] Main level, controlled and contaminated areas (L34-L43) are located behind a barricade restricting public access.

Abbreviation:

Sc = instrument critical value

2.6.2 Total Surface Contamination Comparison

The 2025 total surface contamination survey results are not very different from the 2024 total surface contamination survey results (Table 5). While differences in results appear in several locations, the evaluation of the population is not statistically different.

The two-sigma value of the 2024 total surface contamination survey results yielded a range of 83–1311 dpm/100 cm^2, which does not include the outlying highest reading (at survey location L40). The 2025 total surface contamination results were compared to the 2024 range to determine whether a significant change in results was identified. With the exception of location L40, none of the 2025 total surface contamination results exceeded 1311 dpm/100 cm^2 of the two-sigma range and can be considered statistically similar.

Considering location L40, the total surface contamination result for 2024 was 18,699 dpm/100 cm^2 while the 2025 result was 16,899 dpm/100 cm^2 (both above the 5000 dpm/100 cm^2 regulatory total surface contamination limit). The L40 survey location is located within a radiological posted contamination area. Removable contamination levels at and around survey location L40 were well below regulatory removable surface contamination limits and below the critical value for the instrument used to count that smear in 2025. The L40 survey location is already identified, posted and controlled in an LMS contamination area, is also within another physical barrier area (a plexiglass half-wall) that prevents unauthorized personnel or visitor access, and is physically identified as fixed contamination. The surface contamination at survey location L40 does not pose human health concerns or environmental risks.

Compared to the total surface contamination limit of 5000 dpm/100 cm^2, total surface contamination levels at the 77 remaining locations are well within regulatory limits and do not pose human health concerns or environmental risks.

Table 5. 2025 Versus 2024 Total Contamination Survey Results

Survey ID[a]	Survey Location	2025 Total Contamination (dpm/100cm^2)	2024 Total Contamination (dpm/100cm^2)	General Location[b]
L1	Pipe Chase Face #1	< Sc	< Sc	Monolith top
L2	Pipe Chase Face #2	< Sc	< Sc	Monolith top
L3	Pipe Chase Face #3	< Sc	< Sc	Monolith top
L4	Pipe Chase Face #4	< Sc	495	Monolith top
L5	Top Plug Face #1, left	< Sc	< Sc	Monolith top
L6	Top Plug Face #1, center	< Sc	< Sc	Monolith top
L7	Top Plug Face #1, right	< Sc	495	Monolith top
L8	Top Plug Face #2, top	< Sc	730	Monolith top
L9	Top Plug Face #2, center	< Sc	1908	Monolith top
L10	Top Plug Face #2, bottom	379	683	Monolith top
L11	Top Plug Face #3, right	618	447	Monolith top
L12	Top Plug Face #3, center	< Sc	565	Monolith top
L13	Top Plug Face #3, left	< Sc	< Sc	Monolith top
L14	Top Plug Face #4, bottom	< Sc	< Sc	Monolith top
L15	Top Plug Face #4, center	< Sc	612	Monolith top
L16	Top Plug Face #4, top	< Sc	612	Monolith top
L17	Top Plug Top Surface, upper left	< Sc	471	Monolith top
L18	Top Plug Top Surface, center right	< Sc	< Sc	Monolith top
L19	Top Plug Top Surface, center bottom	< Sc	< Sc	Monolith top
L20	Main Floor, Zone 1	738	< Sc	Main level, public access
L21	Main Floor, Zone 2	< Sc	< Sc	Main level, public access
L22	Main Floor, Zone 3	498	< Sc	Main level, public access
L23	Main Floor, Zone 4	< Sc	707	Main level, public access
L24	Main Floor, Zone 5	857	777	Main level, public access
L25	Main Floor, Zone 6	379	942	Main level, public access
L26	Main Floor, Zone 7	< Sc	< Sc	Main level, public access
L27	Main Floor, Zone 8	< Sc	< Sc	Main level, public access
L28	Main Floor, Zone 9	< Sc	< Sc	Main level, public access

Table 5. 2025 Versus 2024 Total Contamination Survey Results (continued)

Survey ID[a]	Survey Location	2025 Total Contamination (dpm/100cm^2)	2024 Total Contamination (dpm/100cm^2)	General Location[b]
L29	Main Floor, Zone 10	977	683	Main level, public access
L30	Main Floor, Zone 11	498	< Sc	Main level, public access
L31	Main Floor, Zone 12	498	< Sc	Main level, public access
L32	Main Floor, Zone 13	< Sc	542	Main level, public access
L33	Main Floor, Zone 14	< Sc	777	Main level, public access
L34	Main Floor Water Column, center bottom	< Sc	542	Main level, controlled area
L35	Main Floor Water Column, right middle	< Sc	< Sc	Main level, controlled area
L36	Instrument Thimble #1	< Sc	< Sc	Main level, controlled area
L37	Instrument Thimble #2	< Sc	< Sc	Main level, controlled area
L38	Instrument Thimble #3	< Sc	< Sc	Main level, controlled area
L39	Pipe Chase Exterior Hatch	< Sc	< Sc	Main level, controlled area
L40	Fuel Pool Purifier Floor #1	16988	18699	Main level, contaminated area
L41	Fuel Pool Purifier Floor #2	618	942	Main level, controlled area
L42	Fuel Pool Purifier Floor #3	618	495	Main level, controlled area
L43	Fuel Pool Purifier Floor #4	< Sc	< Sc	Main level, controlled area
L44	Basement Floor, Zone 1	< Sc	< Sc	Basement level
L45	Basement Floor, Zone 2	< Sc	< Sc	Basement level
L46	Basement Floor, Zone 3	< Sc	< Sc	Basement level
L47	Basement Floor, Zone 4	< Sc	< Sc	Basement level
L48	Basement Floor, Zone 5	< Sc	< Sc	Basement level
L49	Basement Floor, Zone 6	< Sc	< Sc	Basement level
L50	Basement Floor, Zone 7	< Sc	< Sc	Basement level
L51	Basement Floor, Zone 8	< Sc	< Sc	Basement level
L52	Basement Floor, Zone 9	< Sc	< Sc	Basement level
L53	Basement Floor, Zone 10	< Sc	< Sc	Basement level
L54	Basement Floor, Zone 11	< Sc	< Sc	Basement level
L55	Basement Floor, Zone 12	< Sc	< Sc	Basement level
L56	Basement Floor, Zone 13	< Sc	< Sc	Basement level

Table 5. 2025 Versus 2024 Total Contamination Survey Results (continued)

Survey ID[a]	Survey Location	2025 Total Contamination (dpm/100cm^2)	2024 Total Contamination (dpm/100cm^2)	General Location[b]
L57	Basement Floor, Zone 14	< Sc	< Sc	Basement level
L58	Basement Floor, Zone 15	379	< Sc	Basement level
L59	Basement Floor, Zone 16	< Sc	495	Basement level
L60	Basement Floor, Zone 17	< Sc	< Sc	Basement level
L61	Basement Floor, Zone 18	< Sc	< Sc	Basement level
L62	Side of Liquid Waste Retention Tank #1	< Sc	< Sc	Basement level
L63	Side of Liquid Waste Retention Tank #2	379	< Sc	Basement level
L64	Column 4 and 5 inside room	< Sc	< Sc	Basement level
L65	F.W. Heater Room (wall)	< Sc	< Sc	Basement level
L66	Vapor Sphere Room, upper left	< Sc	< Sc	Basement level
L67	Vapor Sphere Room, center right	< Sc	< Sc	Basement level
L68	Water pump room to the right	< Sc	< Sc	Basement level
L69	Condenser Room Entry Wall, block	< Sc	< Sc	Basement level
L70	Condenser Room Entry Wall, concrete	379	< Sc	Basement level
L71	South room with two pumps	< Sc	< Sc	Basement level
L72	Under stairs near north door Floor #1	< Sc	471	Basement level
L73	Under stairs near north door Floor #2	< Sc	< Sc	Basement level
L74	Inlet air plenum room floor	< Sc	—	Basement level
L75	Condensate mixed bed area floor	< Sc	—	Basement level
L76	Floor near north stairwell	< Sc	—	Main level, public access
L77	Floor outside fuel storage room	< Sc	—	Main level, public access
L78	Floor near south stairwell	379	—	Main level, public access

Notes:

[a] Locations L74 through L78 are nonbiased points randomly selected by the RCT performing the survey and will differ each year the survey is performed. No comparison is made of these five points between survey years.

[b] Main level, controlled and contaminated areas (L34-L43) are located behind a barricade restricting public access.

Abbreviation:

Sc = instrument critical value

2.6.3 Radiation Dose/Exposure Rate Comparison

The 2025 general area gamma exposure rate survey results show no survey locations within the dome that exceed 400 µrem/h, triggering additional investigation by the RCT performing the survey (Table 6). The 2025 gamma exposure rate survey results are also within the two-sigma range of the 2024 gamma exposure rate population of 2–48 µrem/h.

Attention was given to locations L41, L42, L62, L63, and L65 during this year's survey as noted in the 2024 report to better understand changes in exposure rates identified in evaluating 2024 and 2023 gamma exposure rate surveys. The 2025 gamma exposure rate results were nearly identical to the 2024 gamma exposure rate results at these five locations and nothing notable stood out to the RCT performing the survey to provide context to the changes noted from 2023 to 2024. Despite those differences noted in the 2024 report, the overall gamma exposure rates seen in 2025 are within what was expected and well below regulatory limits.

Gamma radiation dose rate levels at the site are significantly below regulatory radiation dose rate limit values and do not pose human health concerns or environmental risks.

Table 6. 2025 Versus 2024 Gamma Radiation Survey Results

Survey ID[a]	Survey Location	2025 Dose Result (µrem/h)	2024 Dose Result (µrem/h)	General Location[b]
L1	Pipe Chase Face #1	20	20	Monolith top
L2	Pipe Chase Face #2	26	20	Monolith top
L3	Pipe Chase Face #3	25	20	Monolith top
L4	Pipe Chase Face #4	20	20	Monolith top
L5	Top Plug Face #1, left	15	12	Monolith top
L6	Top Plug Face #1, center	20	10	Monolith top
L7	Top Plug Face #1, right	20	10	Monolith top
L8	Top Plug Face #2, top	20	11	Monolith top
L9	Top Plug Face #2, center	25	12	Monolith top
L10	Top Plug Face #2, bottom	25	10	Monolith top
L11	Top Plug Face #3, right	25	10	Monolith top
L12	Top Plug Face #3, center	20	12	Monolith top
L13	Top Plug Face #3, left	25	13	Monolith top
L14	Top Plug Face #4, bottom	20	12	Monolith top
L15	Top Plug Face #4, center	25	12	Monolith top
L16	Top Plug Face #4, top	25	12	Monolith top
L17	Top Plug Top Surface, upper left	25	12	Monolith top
L18	Top Plug Top Surface, center right	30	12	Monolith top
L19	Top Plug Top Surface, center bottom	25	14	Monolith top
L20	Main Floor, Zone 1	30	14	Main level, public access
L21	Main Floor, Zone 2	30	14	Main level, public access
L22	Main Floor, Zone 3	30	15	Main level, public access
L23	Main Floor, Zone 4	30	17	Main level, public access
L24	Main Floor, Zone 5	30	17	Main level, public access
L25	Main Floor, Zone 6	30	17	Main level, public access
L26	Main Floor, Zone 7	30	18	Main level, public access
L27	Main Floor, Zone 8	30	17	Main level, public access
L28	Main Floor, Zone 9	35	17	Main level, public access
L29	Main Floor, Zone 10	35	17	Main level, public access

Table 6. 2025 Versus 2024 Gamma Radiation Survey Results (continued)

Survey ID[a]	Survey Location	2025 Dose Result (µrem/h)	2024 Dose Result (µrem/h)	General Location[b]
L30	Main Floor, Zone 11	30	15	Main level, public access
L31	Main Floor, Zone 12	30	17	Main level, public access
L32	Main Floor, Zone 13	35	18	Main level, public access
L33	Main Floor, Zone 14	35	17	Main level, public access
L34	Main Floor Water Column, center bottom	30	18	Main level, controlled area
L35	Main Floor Water Column, right middle	30	15	Main level, controlled area
L36	Instrument Thimble #1	32	22	Main level, controlled area
L37	Instrument Thimble #2	32	20	Main level, controlled area
L38	Instrument Thimble #3	32	16	Main level, controlled area
L39	Pipe Chase Exterior Hatch	30	22	Main level, controlled area
L40	Fuel Pool Purifier Floor #1	40	30	Main level, contaminated area
L41	Fuel Pool Purifier Floor #2	35	30	Main level, controlled area
L42	Fuel Pool Purifier Floor #3	35	30	Main level, controlled area
L43	Fuel Pool Purifier Floor #4	35	30	Main level, controlled area
L44	Basement Floor, Zone 1	40	40	Basement level
L45	Basement Floor, Zone 2	40	40	Basement level
L46	Basement Floor, Zone 3	40	40	Basement level
L47	Basement Floor, Zone 4	38	35	Basement level
L48	Basement Floor, Zone 5	40	35	Basement level
L49	Basement Floor, Zone 6	40	35	Basement level
L50	Basement Floor, Zone 7	40	40	Basement level
L51	Basement Floor, Zone 8	42	40	Basement level
L52	Basement Floor, Zone 9	40	40	Basement level
L53	Basement Floor, Zone 10	40	35	Basement level
L54	Basement Floor, Zone 11	38	35	Basement level
L55	Basement Floor, Zone 12	36	40	Basement level
L56	Basement Floor, Zone 13	38	35	Basement level
L57	Basement Floor, Zone 14	40	35	Basement level
L58	Basement Floor, Zone 15	38	35	Basement level

Table 6. 2025 Versus 2024 Gamma Radiation Survey Results (continued)

Survey ID[a]	Survey Location	2025 Dose Result (µrem/h)	2024 Dose Result (µrem/h)	General Location[b]
L59	Basement Floor, Zone 16	40	40	Basement level
L60	Basement Floor, Zone 17	42	35	Basement level
L61	Basement Floor, Zone 18	42	40	Basement level
L62	Side of Liquid Waste Retention Tank #1	38	40	Basement level
L63	Side of Liquid Waste Retention Tank #2	40	40	Basement level
L64	Column 4 and 5 inside room	40	40	Basement level
L65	F.W. Heater Room (wall)	42	40	Basement level
L66	Vapor Sphere Room, upper left	38	40	Basement level
L67	Vapor Sphere Room, center right	38	35	Basement level
L68	Water pump room to the right	40	40	Basement level
L69	Condenser Room Entry Wall, block	40	40	Basement level
L70	Condenser Room Entry Wall, concrete	40	40	Basement level
L71	South room with two pumps	40	40	Basement level
L72	Under stairs near north door Floor #1	40	40	Basement level
L73	Under stairs near north door Floor #2	40	40	Basement level
L74	Condensate Pump #2 pedestal	38	—	Basement level
L75	Basement Floor, Zone 5	40	—	Basement level
L76	Display Area	42	—	Main level, public access
L77	RadCon Storage Area	40	—	Main level, public access
L78	Building Airlock Main Entry	40	—	Main level, public access

Notes:

[a] Locations L74 through L78 are nonbiased points randomly selected by the RCT performing the survey and will differ each year the survey is performed. No comparison is made of these five points between survey years.

[b] Main level, controlled and contaminated areas (L34-L43) are located behind a barricade restricting public access.

Abbreviation:

RadCon = Radiological Control

2.7 Remaining Survey and Safety Supplies

At the conclusion of the 2025 radiological survey, survey and safety supplies as well as some equipment were packaged in locked totes (Figure 3) and left at the site in a locked fenced area. The major survey and safety items remaining at the site include an LMS trauma kit, pulse-oximeter monitor, digital thermometer, a selection of radiological and safety personal protective equipment (PPE), two sprayer bottles, and remaining InstaCote surface fixative (approximately 0.25 gallon of CC Fix and 0.5 gallon of CC Wet). The combination to the locks on the totes is 6-4-5-3. LMS radiological survey instruments and radioactive check sources were sent to the office in Grand Junction, Colorado, at the end of the survey.

Used radiological PPE (e.g., rubber shoe covers and nitrile gloves) were radiologically surveyed and found to be free of surface contamination (below regulatory limits) and disposed of as office trash or returned to the radiological PPE inventory.

Figure 3. Remaining Survey and Safety Supplies

3.0 2025 Survey Conclusion

LMS RCTs mobilized to the BONUS site and performed the annual radiological survey of the interior of the reactor containment building. The radiological survey was performed in accordance with the Survey Plan and LMS Radiological Control Organization procedures, manuals, and plans.

Two previously identified contamination areas in the reactor containment building remain contamination areas and are radiologically posted as such. No new radiological areas were identified during the survey. No previously posted radiological areas were deposted.

In accordance with the Survey Plan, it was determined that: (1) non-contamination area accessible site surfaces are below established regulatory limits of 10 CFR 835 Appendix D for surface contamination; (2) general area radiation levels are below established regulatory limits of 10 CFR 835.2; (3) the two surface contamination areas at the site are properly controlled and posted in accordance with *Radiological Control Manual* (DOE 2025b); and (4) the 2025 radiological conditions at the site compare favorably to the 2024 conditions, and where there was

a difference, a review and evaluation of the change(s) were performed and documented in this survey report.

Although no longer required by the 2024 *Annual LMS Radiological Characterization Survey Plan for the BONUS, Puerto Rico, Decommissioned Reactor Site LMS RadCon Survey Plan Number: 24-001* (Attachment 1), PREPA has elected to continue quarterly radiological surveys, which is consistent with their past practices. PREPA provided to LMS staff the 2025 data collected as information only. LMS staff reviewed the provided data and found the results consistent with protection of human health and the environment.

The 2025 LMS radiological survey results, along with the two radiologically posted and controlled contamination areas at the site, provide continued confidence that human health and the environment remain protected from radiological hazards at the site.

4.0 References

10 CFR 835. U.S. Nuclear Regulatory Commission, "Occupational Radiation Protection," *Code of Federal Regulations*.

DOE (U.S. Department of Energy), 2024a. *Counting Systems Daily Operation*, LMS/PRO/S20076-2.0, Office of Legacy Management, May.

DOE (U.S. Department of Energy), 2024b. *Documenting Radiological Surveys*, LMS/PRO/S20073-2.0, Office of Legacy Management, August.

DOE (U.S. Department of Energy), 2024c. *Portable Radiation Survey Instrument Response Checks*, LMS/PRO/S20074-2.0, Office of Legacy Management, July.

DOE (U.S. Department of Energy), 2024d. *Radiation Protection Program Plan*, LMS/POL/S04373-10.0, Office of Legacy Management, June.

DOE (U.S. Department of Energy), 2025a. *Contamination Surveys and Equipment and Material Release*, LMS/PRO/S20079-2.1, Office of Legacy Management, July.

DOE (U.S. Department of Energy), 2025b. *Radiological Control Manual*, LMS/POL/S04322-8.0, Office of Legacy Management, June.

Attachment 1

Annual LMS Radiological Characterization Survey Plan for the BONUS, Puerto Rico, Decommissioned Reactor Site
LMS RadCon Survey Plan Number: 24-001

RSI ENTECH
In Partnership with Amentum and TFE
United for the Legacy Management Mission

LMS/BON/48092-0.0

Annual LMS Radiological Characterization Survey Plan for the BONUS, Puerto Rico, Decommissioned Reactor Site LMS RadCon Survey Plan Number: 24-001

June 2024

Work performed under DOE contract number 89303020DLM000001
for the U.S. Department of Energy Office of Legacy Management.

This document is designed for online viewing.

Contents

Figures

Attachment

Abbreviations

BONUS	Boiling Nuclear Superheater
dpm/100 cm^2	disintegrations per minute per 100 centimeters squared
LMS	Legacy Management Support
µR/h	microroentgens per hour
RadCon	Radiological Control
RCT	radiological control technician
S&H	Safety and Health

Forms Referenced in This Manual

LMS forms are accessible on the **Document Management** homepage > **LMS Forms**.

Radiological Survey Map	LMS 1553

1.0 Introduction

Legacy Management Support (LMS) contractor personnel are responsible for performing the annual LMS radiological characterization survey (characterization survey) at the BONUS, Puerto Rico, Decommissioned Reactor Site in Rincon, Puerto Rico.

This Annual LMS Radiological Characterization Survey Plan provides information and guidance necessary for an LMS qualified radiological control technician (RCT) to perform the survey. The results of the survey will be used to verify that:

1. Accessible site surfaces are below established regulatory limits of Title 10 *Code of Federal Regulations* Section 835 (10 CFR 835) Appendix D, "Surface Contamination Values," for surface radioactive contamination.
2. Accessible area radiation levels are below established regulatory limits of 10 CFR 835.2, "Definitions," for a radiation area.
3. Accessible areas or surfaces that exceed regulatory radiological limits are properly controlled and posted in accordance with *Radiological Control Manual* (LMS/POL/S04322).
4. Survey results have not changed by more than 2 sigma (standard deviations) when compared to the previous year's survey results, and if they have changed by more than 2 sigma, a review and evaluation of the change(s) will be performed and documented by an LMS senior health physicist and the evaluation results shared with the LMS site lead.

1.1 Purpose and Scope

1. The purpose of this survey plan is to provide guidance to the RCT conducting the characterization survey. It also provides the requirements associated with the evaluation of the characterization survey results, including the comparison of the current characterization survey results to the previous year's survey results and to the regulatory limits associated with both surface contamination and general area gamma radiation exposure rates.
2. The scope of the plan pertains only to the characterization survey performed at the site (specifically the internal parts of the enclosed domed building).

1.2 Limitations

- Beta-gamma contamination and gamma radiation surveys performed during this survey should only be used as described in the introduction section of this plan. Survey results shall not be used to make release decisions for the site.
- The characterization survey shall be performed by a qualified LMS RCT using functional and calibrated LMS radiological survey instruments and equipment or appropriate and acceptable vendor-supplied radiological instrumentation.
- Characterization surveys, instrument preoperational checks, and recording of the survey results shall be performed in accordance with the *Radiation Protection Program Plan* (LMS/POL/S04373), *Radiological Control Manual* (LMS/POL/S04322), and Radiological Control (RadCon) implementing procedures. If a conflict exists between this plan and the *Radiation Protection Program Plan*, *Radiological Control Manual*, or the RadCon

implementing procedures, then the RCT shall follow the requirements and guidance identified in the *Radiation Protection Program Plan*, *Radiological Control Manual*, and the RadCon implementing procedures.

- As of 2024, the enclosed domed building is not ventilated or heated or cooled, and ambient outside temperatures likely drive internal dome temperatures. During the summer months, it is expected that internal dome temperatures will reach temperatures at which heat stress monitoring and controls will be required and implemented. During the winter months, it is expected that internal dome temperatures will reach temperatures at which cold stress monitoring and controls will be required and implemented. Work restrictions and controls for heat or cold stress will be identified on the site's job safety analysis and shall be followed in accordance with appropriate LMS Safety and Health (S&H) procedure and requirements.

2.0 Survey and S&H Equipment and Supplies

Knowing that the site is located out of the country and that necessary LMS S&H and RadCon supplies and equipment might be limited or not available in San Juan or Rincón, Puerto Rico, it is necessary to identify needed equipment and supplies and then purchase them in the United States and have the equipment and supplies shipped to the site (if equipment and supplies are not already there) along with other LMS radiological instrumentation.

Recommended S&H and RadCon supplies and equipment include the following:

- 2 each: Bicron/ThermoScientific Microrem Meter instrument or equivalent
- 2 each: Ludlum Model 26 instrument or equivalent
- 200 Rad Dawg smears or equivalent
- 5 radiological waste plastic bags
- 3 each: Radioactive Material Area and Contamination Area signs and attachment mechanisms
- 10 pairs of Tyvek coveralls (appropriate sizes) or equivalent
- 2 boxes of nitrile gloves (appropriate sizes) or equivalent
- 1 roll of duct tape
- 2 pairs of rubber overshoes
- 10 pairs of plastic liners
- 2 one-gallon pump-sprayer bottles
- 4 pairs of clear safety glasses
- 1 Wet Bulb Globe Temperature thermometer or equivalent thermometer

3.0 Survey Requirements

In accordance with the *Long-Term Surveillance and Maintenance Plan for the Boiling Nuclear Superheater (BONUS) Reactor Facility, Rincón, Puerto Rico* (LMS/BON/S01091); *Radiation Protection Program Plan*; and the *Radiological Control Manual*, several different characterization surveys are required for the site and are included as part of this plan.

3.1 Gamma Radiation Exposure Rate Survey

General area gamma radiation exposure rate surveys will be obtained at the 73 defined locations (Figure 1 through Figure 6) to determine the radiation level (in microroentgens per hour [μR/h] or similar dose rate result units) associated with the entombment structure and the accessible enclosed domed building. Additionally, five nonbiased gamma radiation exposure rate surveys will be performed in accessible areas commonly permitted for public access.

Results of the gamma radiation exposure rate surveys will be evaluated in real time and confirmatory, biased gamma radiation exposure rate surveys performed when any of the following survey result or physical site conditions exist:

- The RCT observes excessive deterioration of the structure(s) during the survey when compared to the previous year's structural condition
- Survey results from the identified survey locations indicate a gamma radiation exposure rate in excess of 0.4 milliroentgen per hour (400 μR/h)
- The RCT observes any conditions that justify an additional gamma radiation exposure rate survey be performed, at their discretion

Gamma radiation exposure rate survey results will be reported on the *BONUS Annual Survey Location and Results Data Sheet* (Attachment 1). In addition, gamma radiation exposure rate survey results will be recorded on a *Radiological Survey Map* form (LMS 1553) and be considered the official record of the characterization survey and its results.

If additional gamma radiation exposure rate surveys are performed, then identify the following information on the *BONUS Annual Survey Location and Results Data Sheet* (Attachment 1) and on the *Radiological Survey Map* form in the comments section:

- The reason for performing the additional survey(s)
- The location of the additional survey(s)
- Observations and conclusions relative to the survey(s), such as site conditions or equipment or item physical condition (e.g., extreme rust, paint chipping)

3.2 Contamination Level Survey

Direct beta-gamma surface contamination and transferable surface contamination smear surveys will be obtained at the 73 defined locations (Figure 1 through Figure 6) to determine the surface's contamination levels (in disintegrations per minute per 100 centimeters squared [dpm/100 cm^2] or similar surface contamination result units) for both transferable and total surface activity associated with the entombment structure and the accessible enclosed domed building. Additionally, five nonbiased direct beta-gamma surface contamination and transferable

surface contamination smear surveys will be performed in accessible areas commonly permitted for public access.

Results of the direct beta-gamma surface contamination and transferable surface contamination smear surveys will be evaluated in real-time and confirmatory, biased beta-gamma surface contamination and transferable surface contamination smear surveys will be performed when any of the following survey result or physical site conditions exist:

- The RCT observes excessive deterioration of the structure(s) during the survey when compared to the previous year's structural condition
- Survey results from the identified survey locations indicate contamination levels in excess of 1000 dpm (beta/gamma)/100 cm^2 transferable contamination or 5000 dpm (beta/gamma)/100 cm^2 total surface contamination
- The RCT observes any conditions that justify additional surface contamination surveys be performed, at their discretion

Results of direct beta-gamma surface contamination and transferable surface contamination smear surveys will be reported on the *BONUS Annual Survey Location and Results Data Sheet* (Attachment 1). In addition, the same results will be recorded on a *Radiological Survey Map* form and be considered the official record of the characterization survey and its results.

If additional direct beta-gamma surface contamination and transferable surface contamination smear surveys are performed, then identify the following information on the *BONUS Annual Survey Location and Results Data Sheet* (Attachment 1) and on the *Radiological Survey Map* form in the comments section:

- The reason for performing the additional survey(s)
- The location of the additional survey(s)
- Observations and conclusions relative to the survey result(s), such as site conditions or equipment or item physical condition (e.g., extreme rust, paint chipping)

4.0 Survey Instrumentation

Calibrated and functional radiological survey instruments shall be used to perform the characterization survey at the site. Appropriate beta-gamma surface contamination survey instruments include Ludlum Model 26, Ludlum Model 3000 with 44-9 Geiger Mueller (GM) probe, and Thermo Scientific FH40 Geiger (G) with FHZ 732 GM probe. Appropriate gamma radiation exposure rate survey instruments include Thermo Scientific or Bicron microrem meter, ThermoScientific FH 40 G, and Ludlum ion chamber meters. Instruments shall be operated in accordance with the instrument's operating manual and LMS RadCon implementing procedures.

Knowing that the site is located out of the country and that radiological survey instrumentation is likely not available in San Juan or Rincón, it is recommended that two of each instrument type (gamma radiation exposure rate and surface contamination) be acquired (either from the LMS radiological instrument inventory or from an acceptable radiological instrument vendor), packaged for shipment, and then shipped to the site (if radiological instrumentation is not already there).

5.0 Survey Documentation

Characterization surveys shall be documented on a *Radiological Survey Map* in accordance with the *Radiological Control Manual* and the *Documenting Radiological Surveys* (LMS/PRO/S20073) procedure. In addition, characterization survey results shall be recorded on the *BONUS Annual Survey Location and Results Data Sheet* (Attachment 1).

6.0 Survey Result Evaluation

Characterization survey results shall be evaluated initially for correctness and completeness. This is accomplished by submitting the completed survey documentation (e.g., *Radiological Survey Map*) to an LMS senior health physicist for review and approval.

7.0 Survey Result Comparison

Reviewed and approved characterization survey results shall be compared against regulatory limits and also against the previous year's characterization survey results.

7.1 Regulatory Limit Comparison

[1] Using reviewed and approved characterization survey results, compare surface contamination values against Table 2, "Summary of Surface Contamination Values in dpm/100 cm2 (10 CFR 835 Appendix D)," in the *Radiological Control Manual*.

  [a] If removable or fixed surface contamination characterization survey results exceed *Radiological Control Manual* limits for areas at the site that are not currently radiologically controlled, then contact the RadCon manager immediately.

  [b] If removable or fixed surface contamination characterization survey results are equal to or below *Radiological Control Manual* limits for areas at the site that are not currently radiologically controlled, then inform the site lead that surface contamination is within regulatory limits.

[2] Using reviewed and approved characterization survey results, compare gamma radiation exposure rate values against 400 µR/h (above background).

  [a] If gamma radiation exposure rate characterization survey results exceed 400 µR/h (above background) for areas at the site that are not currently radiologically controlled, then contact the RadCon manager immediately.

  [b] If gamma radiation exposure rate characterization survey results are equal to or less than 400 µR/h (above background) for areas at the site that are not currently radiologically controlled, then inform the site lead that gamma radiation exposure rates are equal to or below 400 µR/h (above background).

7.2 Previous Year's Results Comparison

Using the characterization survey results recorded on the *BONUS Annual Survey Location and Results Data Sheet* (Attachment 1), compare them against the previous year's characterization survey results.

If current characterization survey results are different by more than 2 sigma of the previous year's characterization survey results, then an LMS senior health physicist shall perform a review of the difference(s), document the review, and submit the review to the LMS site lead.

8.0 Figures

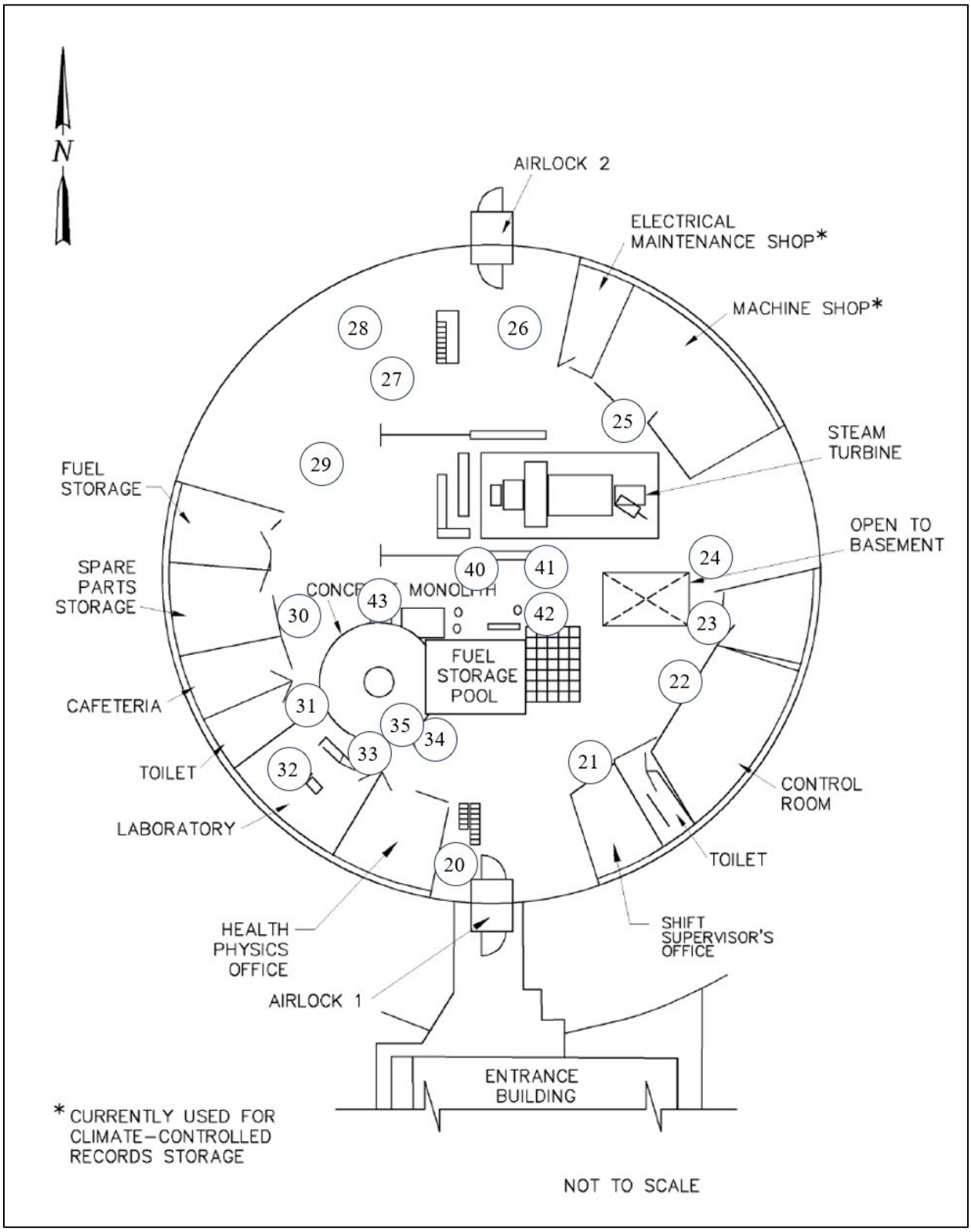


Figure 1. Main Floor Survey Locations

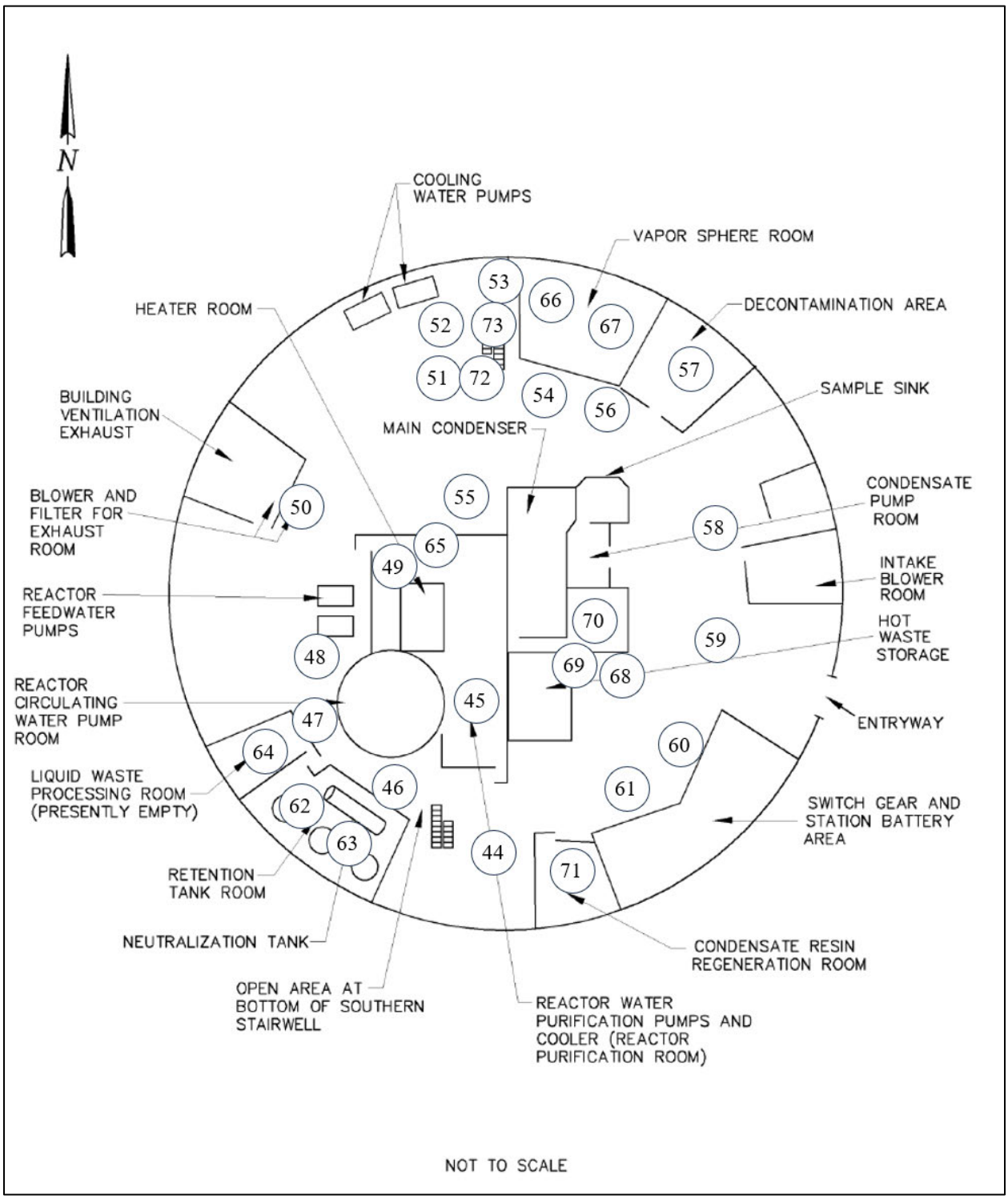


Figure 2. Basement Floor Survey Locations

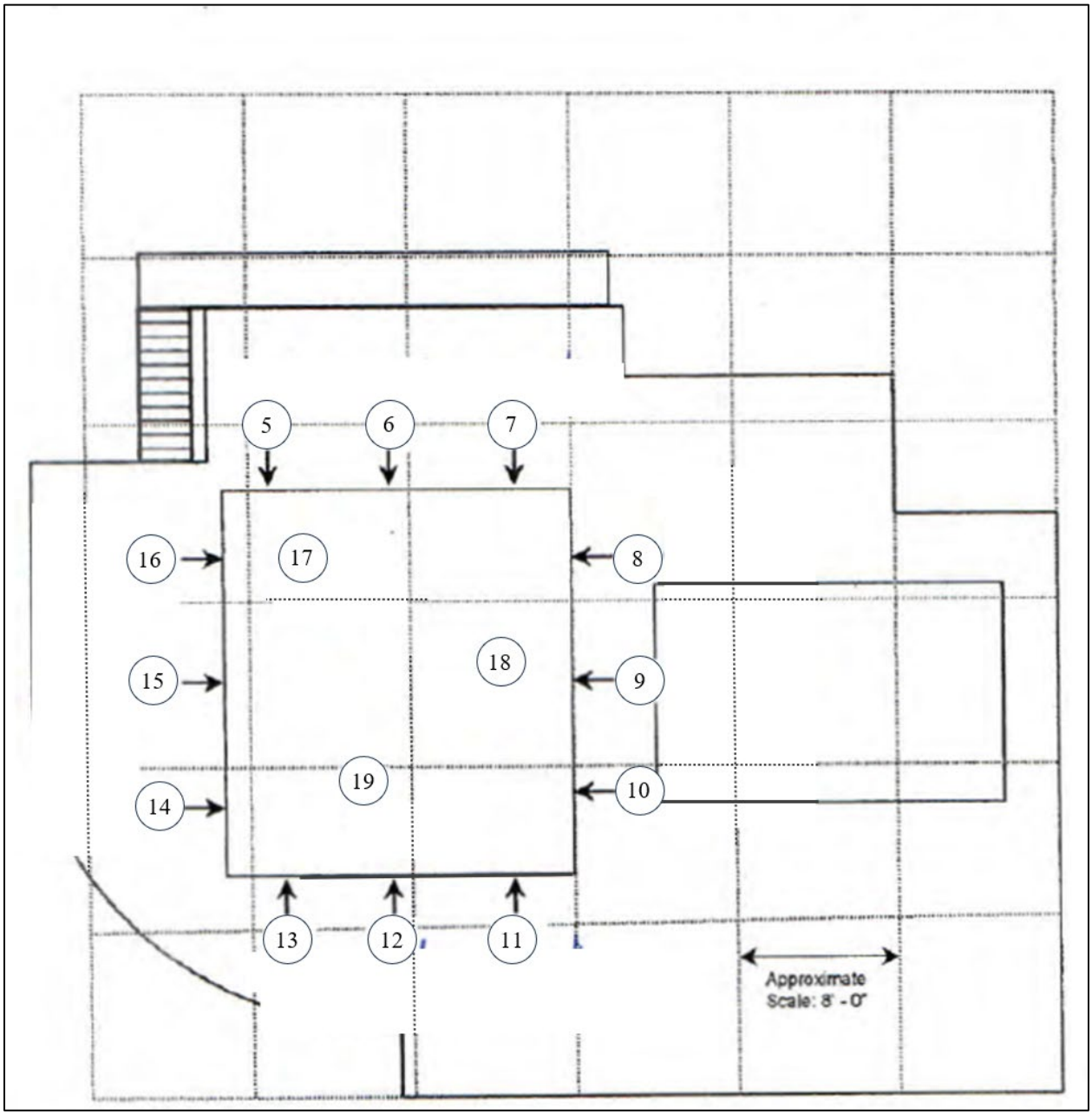


Figure 3. Monolith Top Plug Structure

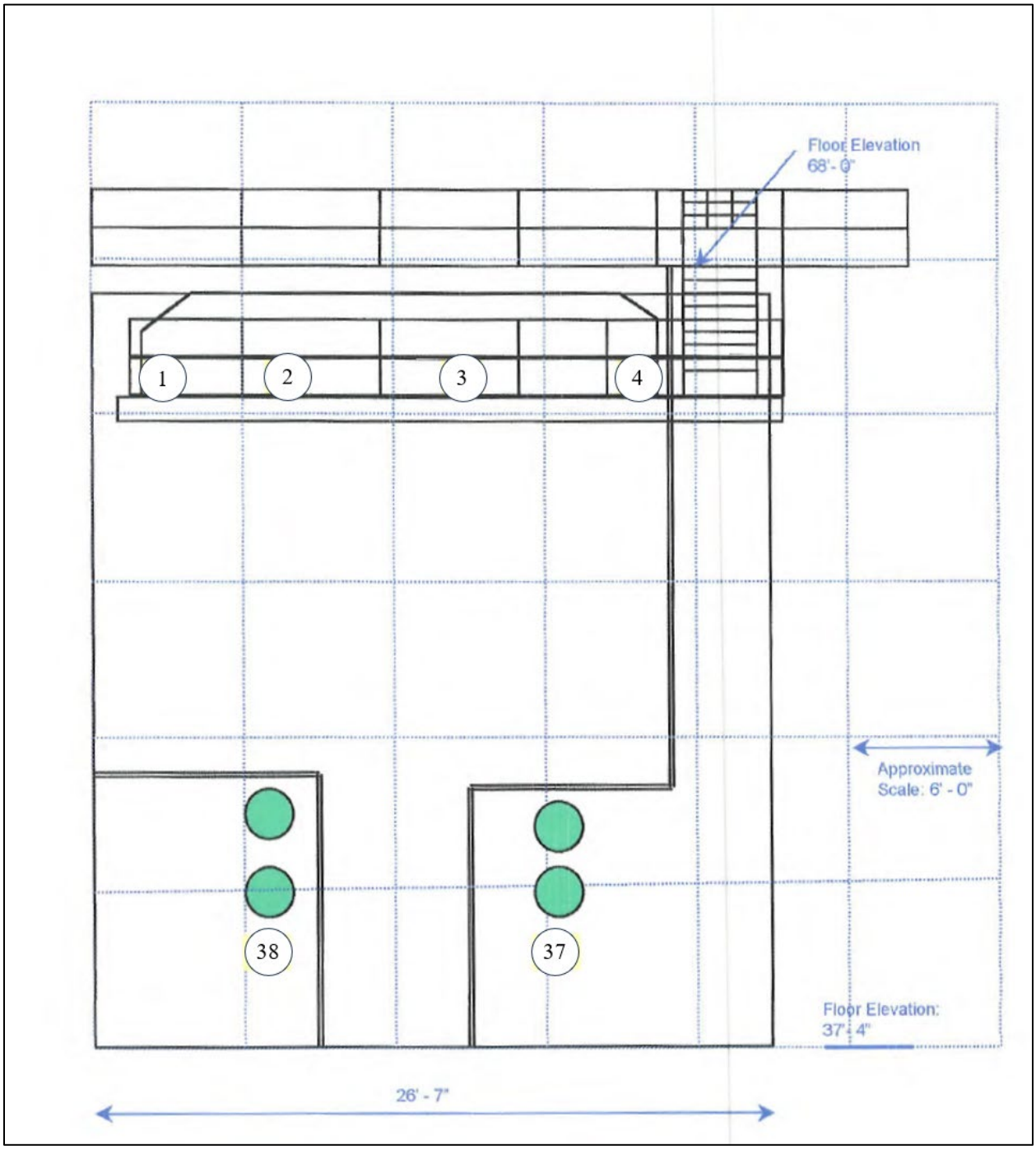


Figure 4. Entombment System—North View

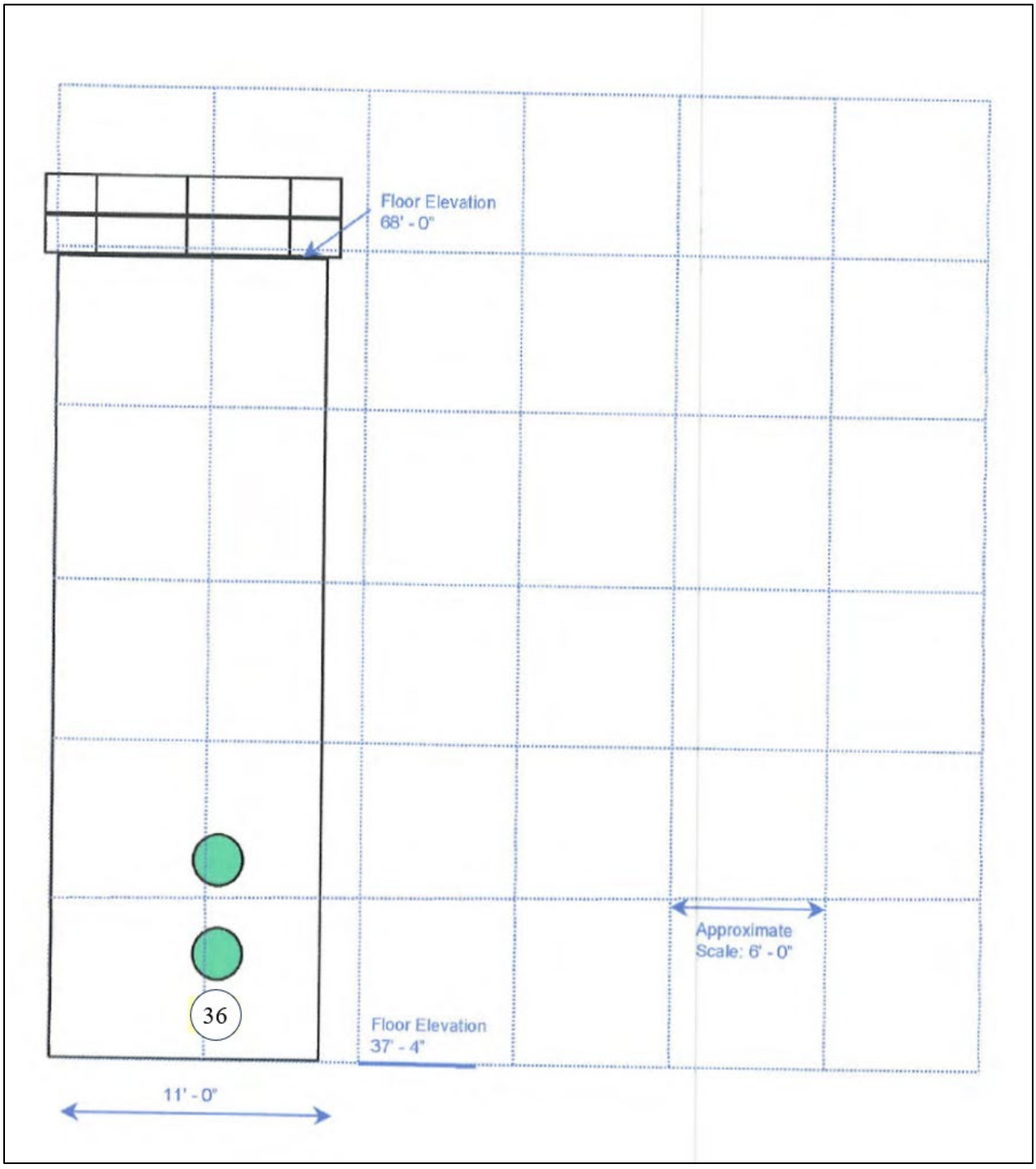


Figure 5. Entombment System—South View

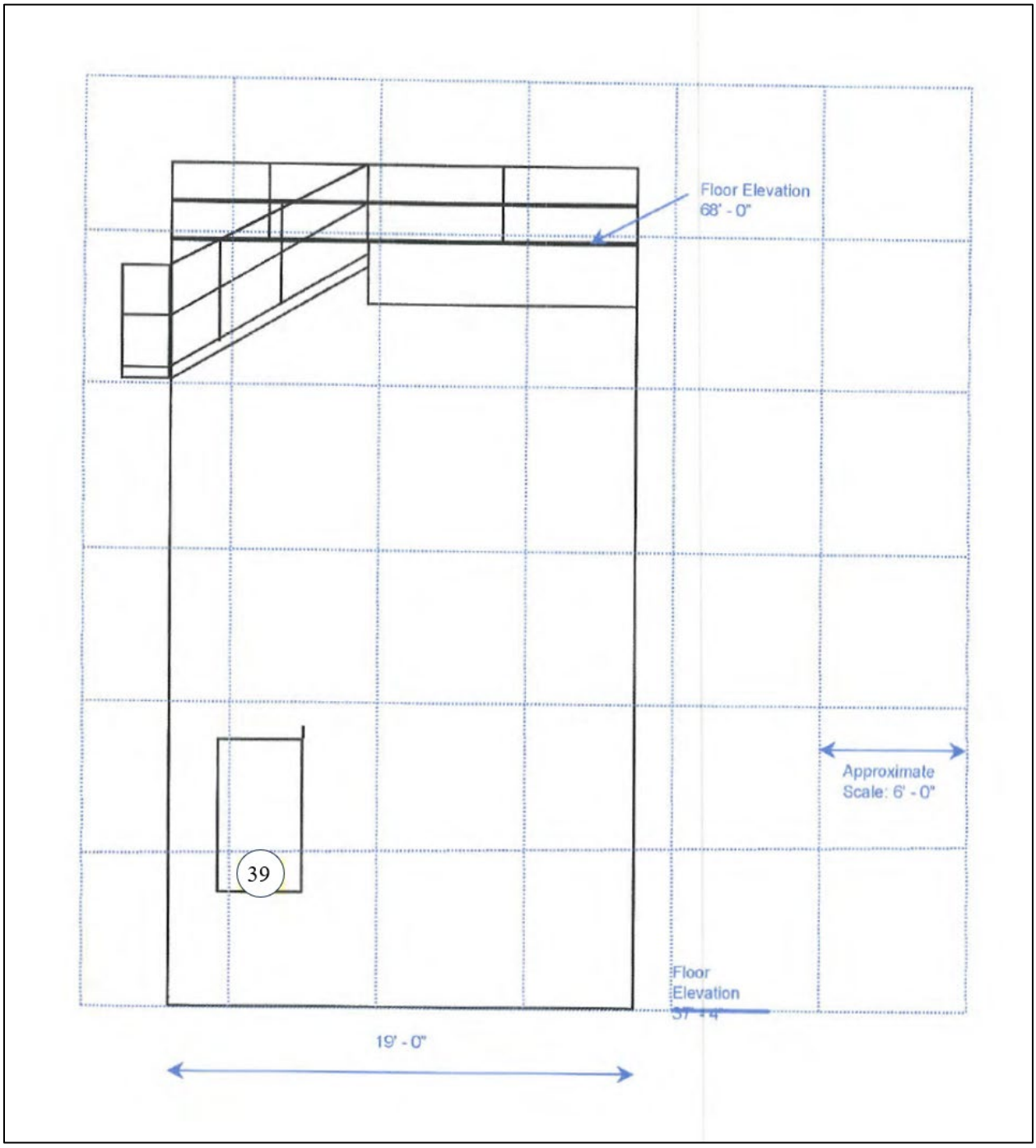


Figure 6. Entombment System—North View

9.0 References

10 CFR 835. "Occupational Radiation Protection," *Code of Federal Regulations*.

Documenting Radiological Surveys, LMS/PRO/S20073, continually updated, prepared by the LMS contractor for the U.S. Department of Energy Office of Legacy Management.

Long-Term Surveillance and Maintenance Plan for the Boiling Nuclear Superheater (BONUS) Reactor Facility, Rincón, Puerto Rico, LMS/BON/S01091, continually updated, prepared by the LMS contractor for the U.S. Department of Energy Office of Legacy Management.

Radiation Protection Program Plan, LMS/POL/S04373, continually updated, prepared by the LMS contractor for the U.S. Department of Energy Office of Legacy Management.

Radiological Control Manual, LMS/POL/S04322, continually updated, prepared by the LMS contractor for the U.S. Department of Energy Office of Legacy Management.

Records and Information Management, LM-Policy-1-11-1.0, continually updated, prepared by the Office of Legacy Management, March.

Attachment 1

BONUS Annual Survey Location and Results Data Sheet

RCT Name: _____ **Survey Date:** _____

Exposure Rate Instrument Information

Survey Instrument Model: _____
Instrument Serial Number: _____
Calibration Due Date: _____
Time of Daily Response Check: _____
Background Exposure Rate (μR/h): _____

Surface Contamination Instrument Information

Survey Instrument Model: _____
Instrument Serial Number: _____
Calibration Due Date: _____
Time of Daily Response Check: _____

Survey ID	Survey Location	Exposure Result (μrem/h)	Removable Contamination (dpm/100cm^2)	Total Contamination (dpm/100cm^2)	Comment
1	Pipe Chase Face #1				Monolith Top
2	Pipe Chase Face #2				Monolith Top
3	Pipe Chase Face #3				Monolith Top
4	Pipe Chase Face #4				Monolith Top
5	Top Plug Face #1—Left				Monolith Top
6	Top Plug Face #1—Center				Monolith Top
7	Top Plug Face #1—Right				Monolith Top
8	Top Plug Face #2—Top				Monolith Top
9	Top Plug Face #2—Center				Monolith Top
10	Top Plug Face #2—Bottom				Monolith Top
11	Top Plug Face #3—Right				Monolith Top
12	Top Plug Face #3—Center				Monolith Top
13	Top Plug Face #3—Left				Monolith Top
14	Top Plug Face #4—Bottom				Monolith Top
15	Top Plug Face #4—Center				Monolith Top
16	Top Plug Face #4—Top				Monolith Top
17	Top Plug Top Surface—Upper Left				Monolith Top
18	Top Plug Top Surface—Center Right				Monolith Top
19	Top Plug Top Surface—Center Bottom				Monolith Top
20	Main Floor—Zone 1				Main Level—Public Access
21	Main Floor—Zone 2				Main Level—Public Access
22	Main Floor—Zone 3				Main Level—Public Access
23	Main Floor—Zone 4				Main Level—Public Access
24	Main Floor—Zone 5				Main Level—Public Access
25	Main Floor—Zone 6				Main Level—Public Access

Survey ID	Survey Location	Exposure Result (µrem/h)	Removable Contamination (dpm/100cm^2)	Total Contamination (dpm/100cm^2)	Comment
26	Main Floor—Zone 7				Main Level—Public Access
27	Main Floor—Zone 8				Main Level—Public Access
28	Main Floor—Zone 9				Main Level—Public Access
29	Main Floor—Zone 10				Main Level—Public Access
30	Main Floor—Zone 11				Main Level—Public Access
31	Main Floor—Zone 12				Main Level—Public Access
32	Main Floor—Zone 13				Main Level—Public Access
33	Main Floor—Zone 14				Main Level—Public Access
34	Main Floor Water Column #1				Main Level—Controlled Area
35	Main Floor Water Column #2				Main Level—Controlled Area
36	Instrument Thimble #1				Main Level—Controlled Area
37	Instrument Thimble #2				Main Level—Controlled Area
38	Instrument Thimble #3				Main Level—Controlled Area
39	Pipe Chase Exit Hatch				Main Level—Controlled Area
40	Fuel Pool Purifier—Floor #1				Main Level—Contaminated Area
41	Fuel Pool Purifier—Floor #2				Main Level—Controlled Area
42	Fuel Pool Purifier—Floor #3				Main Level—Controlled Area
43	Fuel Pool Purifier—Floor #4				Main Level—Controlled Area
44	Basement Floor—Zone 1				Basement Level
45	Basement Floor—Zone 2				Basement Level
46	Basement Floor—Zone 3				Basement Level
47	Basement Floor—Zone 4				Basement Level
48	Basement Floor—Zone 5				Basement Level
49	Basement Floor—Zone 6				Basement Level
50	Basement Floor—Zone 7				Basement Level
51	Basement Floor—Zone 8				Basement Level
52	Basement Floor—Zone 9				Basement Level
53	Basement Floor—Zone 10				Basement Level
54	Basement Floor—Zone 11				Basement Level
55	Basement Floor—Zone 12				Basement Level
56	Basement Floor—Zone 13				Basement Level
57	Basement Floor—Zone 14				Basement Level

Survey ID	Survey Location	Exposure Result (µrem/h)	Removable Contamination (dpm/100cm^2)	Total Contamination (dpm/100cm^2)	Comment
58	Basement Floor—Zone 15				Basement Level
59	Basement Floor—Zone 16				Basement Level
60	Basement Floor—Zone 17				Basement Level
61	Basement Floor—Zone 18				Basement Level
62	Side of Liquid Waste Tank #1				Basement Level
63	Side of Liquid Waste Tank #2				Basement Level
64	Column 4 and 5 Inside Room				Basement Level
65	Heater Room (Wall)				Basement Level
66	Vapor Sphere Room—Upper Left				Basement Level
67	Vapor Sphere Room—Center Right				Basement Level
68	Water Pump Room to the Right, Enter 50A				Basement Level
69	Condenser Room Entry Wall—Block				Basement Level
70	Condenser Room Entry Wall—Concrete				Basement Level
71	South Room with 2 pumps				Basement Level
72	Under Stairs Near North Door—Floor #1				Basement Level
73	Under Stairs Near North Door—Floor #2				Basement Level
74					
75					
76					
77					
78					

Abbreviations: dpm/100cm^2 = disintegrations per minute per 100 square centimeters, ID = identifier, µrem/h = microrems per hour, RCT = radiological control technician

Attachment 2

Completed *BONUS Annual Survey Location and Results Data Sheet*, from the *Annual LMS Radiological Characterization Survey Plan for the BONUS, Puerto Rico, Decommissioned Reactor Site*
LMS RadCon Survey Plan Number: 24-001

Radiological Survey Number: 250522-001

RCT Name: Larry Oeffner/Jeremy Byble **Survey Date:** May 13/14, 2025

Exposure Rate Instrument Info

Survey Instrument Model: Thermo uR meter
Instrument Serial Number: 19288
Calibration Due Date: 9/23/2025
Time of Daily Response Check: 0830/0730
Background Exposure Rate (μR/h): 20 main level / 35 basement level

Surface Contamination Instrument Info

Survey Instrument Model: Ludlum model 26
Instrument Serial Number: PF002650
Calibration Due Date: 9/23/2025
Time of Daily Response Check: 0830/0730

Survey ID	Survey Location	Exposure Result (uR/h)	Removable Contamination (dpm/100cm^2)	Total Contamination (dpm/100cm^2)	Comment
1	Pipe Chase Face #1	20	< Sc	< Sc	Monolith Top
2	Pipe Chase Face #2	26	< Sc	< Sc	Monolith Top
3	Pipe Chase Face #3	25	< Sc	< Sc	Monolith Top
4	Pipe Chase Face #4	20	< Sc	< Sc	Monolith Top
5	Top Plug Face #1 - left	15	< Sc	< Sc	Monolith Top
6	Top Plug Face #1 - center	20	< Sc	< Sc	Monolith Top
7	Top Plug Face #1 - right	20	< Sc	< Sc	Monolith Top
8	Top Plug Face #2 - top	20	< Sc	< Sc	Monolith Top
9	Top Plug Face #2 - center	25	< Sc	< Sc	Monolith Top
10	Top Plug Face #2 - bottom	25	< Sc	379	Monolith Top
11	Top Plug Face #3 - right	25	< Sc	618	Monolith Top
12	Top Plug Face #3 - center	20	< Sc	< Sc	Monolith Top
13	Top Plug Face #3 - left	25	< Sc	< Sc	Monolith Top
14	Top Plug Face #4 - bottom	20	< Sc	< Sc	Monolith Top
15	Top Plug Face #4 - center	25	< Sc	< Sc	Monolith Top
16	Top Plug Face #4 - top	25	< Sc	< Sc	Monolith Top
17	Top Plug Top Surface - upper left	25	< Sc	< Sc	Monolith Top
18	Top Plug Top Surface - center right	30	< Sc	< Sc	Monolith Top
19	Top Plug Top Surface - center bottom	25	< Sc	< Sc	Monolith Top
20	Main Floor Zone 1	30	< Sc	738	Main Level-Public Access
21	Main Floor Zone 2	30	< Sc	< Sc	Main Floor
22	Main Floor Zone 3	30	< Sc	498	Main Floor
23	Main Floor Zone 4	30	< Sc	< Sc	Main Floor
24	Main Floor Zone 5	30	< Sc	857	Main Floor
25	Main Floor-Zone 6	30	< Sc	379	Main Level-Public Access
26	Main Floor-Zone 7	30	< Sc	< Sc	Main Level-Public Access
27	Main Floor-Zone 8	30	< Sc	< Sc	Main Level-Public Access
28	Main Floor-Zone 9	35	< Sc	< Sc	Main Level-Public Access
29	Main Floor-Zone 10	35	< Sc	977	Main Level-Public Access
30	Main Floor-Zone 11	30	< Sc	498	Main Level-Public Access
31	Main Floor-Zone 12	30	< Sc	498	Main Level-Public Access
32	Main Floor-Zone 14	35	< Sc	< Sc	Main Level-Public Access

33	Main Floor-Zone 13	35	< Sc	< Sc	Main Level-Public Access
34	Main Floor Water Column - center bottom	30	< Sc	< Sc	Main Level-Controlled Area
35	Main Floor Water Column - right middle	30	< Sc	< Sc	Main Level-Controlled Area
36	Instrument Thimble #1	32	< Sc	< Sc	Main Level-Controlled Area
37	Instrument Thimble #2	32	< Sc	< Sc	Main Level-Controlled Area
38	Instrument Thimble #3	32	< Sc	< Sc	Main Level-Controlled Area
39	Pipe Chase Ext Hatch	30	< Sc	< Sc	Main Level-Controlled Area
40	Fuel Pool Purifier. Floor #1	40	< Sc	16988	Main Level-Contaminated Area
41	Fuel Pool Purifier. Floor #2	35	< Sc	618	Main Level-Controlled Area
42	Fuel Pool Purifier. Floor #3	35	33	618	Main Level-Controlled Area
43	Fuel Pool Purifier. Floor #4	35	< Sc	< Sc	Main Level-Controlled Area
44	Basement Floor-Zone 1	40	< Sc	< Sc	Basement Level
45	Basement Floor-Zone 2	40	< Sc	< Sc	Basement Level
46	Basement Floor-Zone 3	40	< Sc	< Sc	Basement Level
47	Basement Floor-Zone 4	38	< Sc	< Sc	Basement Level
48	Basement Floor-Zone 5	40	< Sc	< Sc	Basement Level
49	Basement Floor-Zone 6	40	< Sc	< Sc	Basement Level
50	Basement Floor-Zone 7	40	< Sc	< Sc	Basement Level
51	Basement Floor-Zone 8	42	< Sc	< Sc	Basement Level
52	Basement Floor-Zone 9	40	< Sc	< Sc	Basement Level
53	Basement Floor-Zone 10	40	< Sc	< Sc	Basement Level
54	Basement Floor-Zone 11	38	< Sc	< Sc	Basement Level
55	Basement Floor-Zone 12	36	< Sc	< Sc	Basement Level
56	Basement Floor-Zone 13	38	< Sc	< Sc	Basement Level
57	Basement Floor-Zone 14	36	< Sc	< Sc	Basement Level
58	Basement Floor-Zone 15	40	< Sc	379	Basement Level
59	Basement Floor-Zone 16	38	< Sc	< Sc	Basement Level
60	Basement Floor-Zone 17	40	< Sc	< Sc	Basement Level
61	Basement Floor-Zone 18	42	< Sc	< Sc	Basement Level
62	Side of Liq. Waste Ret. Tank #1	42	26	< Sc	Basement Level
63	Side of Liq. Waste Ret. Tank #2	38	< Sc	379	Basement Level
64	Column 4 and 5 inside room	40	< Sc	< Sc	Basement Level
65	F.W. Heater Room (Wall)	40	< Sc	< Sc	Basement Level
66	Vapor Sphere Room - upper left	42	< Sc	< Sc	Basement Level
67	Vapor Sphere Room - center right	38	< Sc	< Sc	Basement Level
68	Water pump room to the right, enter 50A	38	< Sc	< Sc	Basement Level
69	Condenser Room Entry Wall - block	40	< Sc	< Sc	Basement Level
70	Condenser Room Entry Wall - concrete	40	< Sc	379	Basement Level
71	South room with 2 pumps	40	< Sc	< Sc	Basement Level
72	Under stairs near north door. Floor #1	40	< Sc	< Sc	Basement Level
73	Under stairs near north door. Floor #2	40	< Sc	< Sc	Basement Level
74	Inlet air plenum room floor	38	< Sc	< Sc	Basement Level
75	Cond. Mixed bed area floor	40	< Sc	< Sc	Basement Level
76	Floor near north stairwell	42	< Sc	< Sc	Main level - public access
77	Floor outside fuel storage room	40	< Sc	< Sc	Main level - public access
78	Floor near south stairwell	40	< Sc	379	Main level - public access

Attachment 3

Radiological Instrument Calibration Certificates and LMS Radiological Instrument Daily Response Check Sheets

CERTIFICATE OF CALIBRATION
(EXPOSURE RATE INSTRUMENT)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact:	**RSI EnTech, Attn: Anthony Martinez (970) 248-6756**				
Customer Address:	**2597 Legacy Way, Grand Junction, CO 81503**				
Inst. Mfr. & Model	**Thermo Scientific Micro Rem**	Inst. Type	**Survey Meter**	Inst. s/n	**19288**
Det. Mfr. & Model	**not indicated**	Det. Type	**Organic Scintillator**	Det. s/n	**not indicated**
Calibration Date	**23 September 2024**	Due Date	**23 September 2025**	Cal Interval	**1 year**

Environmental conditions: Temperature **70°F** Relative Humidity **60%** Atmospheric Pressure **29.82** inches Hg

Pre-calibration Checks:

[X] Contamination survey	[X] Battery check	[X] Slow response check		
[X] Mechanical check	[X] Audio check	[ ] Window Operation	[ ] Det. Volts	Vdc
[X] Meter zero	[X] Reset check	[ ] Plateau check		
[X] Geotropism check	[X] Fast response check	[ ] Alarm set	[ ] Input sens.	mV

[X] Pulse generator s/n 94926 [ ] Oscilloscope s/n 171-04928 [ ] Voltmeter s/n 574100002

Comments:

Precision check source s/n **5** Isotope **Cs-137** Dedicated Source? [ ] Yes [X] No

Reading #1 **1,400 µrem/h** Reading #2 **1,400 µrem/h** Reading #3 **1,400 µrem/h** Mean **1,400 µrem/h**

Precision: [X] ±<10% [ ] ±10-20% [ ] Out of tolerance

Range Multiplier	Reference Calibration Point	Instrument Indication "As Found"	Instrument Indication "As Left"
x 1000	138,441 µR/h	135,000 µrem/h	140,000 µrem/h
x 1000	44,690 µR/h	45,000 µrem/h	45,000 µrem/h
x 100	13,844 µR/h	13,500 µrem/h	14,000 µrem/h
x 100	5,829 µR/h	6,000 µrem/h	6,000 µrem/h
x 10	1,384 µR/h	1,350 µrem/h	1,400 µrem/h
x 10	398 µR/h	400 µrem/h	400 µrem/h
x 1	160 µR/h	160 µrem/h	160 µrem/h
x 1	49 µR/h	50 µrem/h	50 µrem/h
x 1	4,300 cpm @ 800 mV	160 µrem/h	160 µrem/h
x 1	1,300 cpm @ 800 mV	50 µrem/h	50 µrem/h
x 0.1	430 cpm @ 800 mV	16.0 µrem/h	16.0 µrem/h
x 0.1	130 cpm @ 800 mV	5.0 µrem/h	5.0 µrem/h

x 0.1 range calibrated electronically.

Sources used: ^{137}Cesium 750 mCi s/n KR-6244 and KR-6250, and ^{137}Cesium 750 µCi s/n 163.

Calibration points calculated to center of detector volume unless otherwise specified. Instrument indicates within ±10% of calibration points unless otherwise indicated. RSA Laboratories certifies that the above instrument has been calibrated with standards traceable to the National Institute of Standards and Technology, or have been derived from accepted values of natural physical constants, or have been derived by the ratio-type of calibration techniques.

RSA Laboratories ID# **25100**

Calibrated by: **Kurt D. Newton** [redacted] Date: **23 September 2024**

CERTIFICATE OF CALIBRATION
(COUNT-RATE INSTRUMENT)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact:	**RSI EnTech, Attn: Anthony Martinez (970) 248-6756**				
Customer Address:	**2597 Legacy Way, Grand Junction, CO 81503**				
Inst. Mfr. & Model	**Ludlum Model 26**	Inst. Type	**Survey meter**	Inst. s/n	**PF002650**
Det. Mfr. & Model	**not indicated**	Det. Type	**G-M Pancake**	Det. s/n	**not indicated**
Calibration Date	**23 September 2024**	Due Date	**23 September 2025**	Cal Interval	**1 year**

Environmental conditions: Temperature **70°F** Relative Humidity **60%** Atmospheric Pressure **29.62** inches Hg

Pre-calibration Checks:

☒ Contamination survey	☒ Battery check	☐ Slow response check		
☒ Mechanical check	☒ Audio check	☐ Window Operation	☒ Det. Volts	**900** Vdc
☐ Meter zero	☐ Reset check	☐ Plateau check		
☐ Geotropism check	☐ Fast response check	☐ Alarm set	☒ Input sens.	**1800** mV

☒ Pulse generator s/n 94926 ☐ Oscilloscope s/n 171-04928 ☐ Voltmeter s/n 574100002

Comments: **All efficiencies measured at near contact, cap off.**

Precision check souce s/n **D700** Isotope **Cl-36** Dedicated Source? ☐ Yes ☒ No

Reading #1 **7,890 cpm** Reading #2 **7,630 cpm** Reading #3 **7,730 cpm** Mean **7,750 cpm**

Precision: ☒ ±<10% ☐ ±10-20% ☐ Out of tolerance

Range Multiplier	Reference Calibration Point	Instrument Indication "As Found"	Instrument Indication "As Left"
n/a	80,000 cpm	80.0 kcpm	80.0 kcpm
n/a	20,000 cpm	20.0 kcpm	20.0 kcpm
n/a	8,000 cpm	8.0 kcpm	8.0 kcpm
n/a	2,000 cpm	2.0 kcpm	2.0 kcpm
n/a	800 cpm	800 cpm	800 cpm
n/a	200 cpm	200 cpm	200 cpm
n/a	80 cpm	80 cpm	80 cpm
n/a	20 cpm	20 cpm	20 cpm

All ranges calibrated electronically.

Local background (cpm) ≈ 65

Range Multiplier	Cal. Source Used (isotope and s/n)	Source Activity (dpm)	Instrument Reading (cpm)	4π Instrument Efficiency (%)
1 min. count	C-14 #4456	202,100	8,150	4.00
1 min. count	Pm-147 #1613-32	932	155	9.66
1 min. count	Tc-99 #D702	23,064	3,990	17.02
1 min. count	Cs-137 #2886	11,246	3,640	31.79
1 min. count	Cl-36 #D700	23,598	7,750	32.57
1 min. count	Sr/Y-90 #D711	27,451	10,640	38.52
1 min. count	Th-230 #91TH2200210	38,900	2,890	7.26

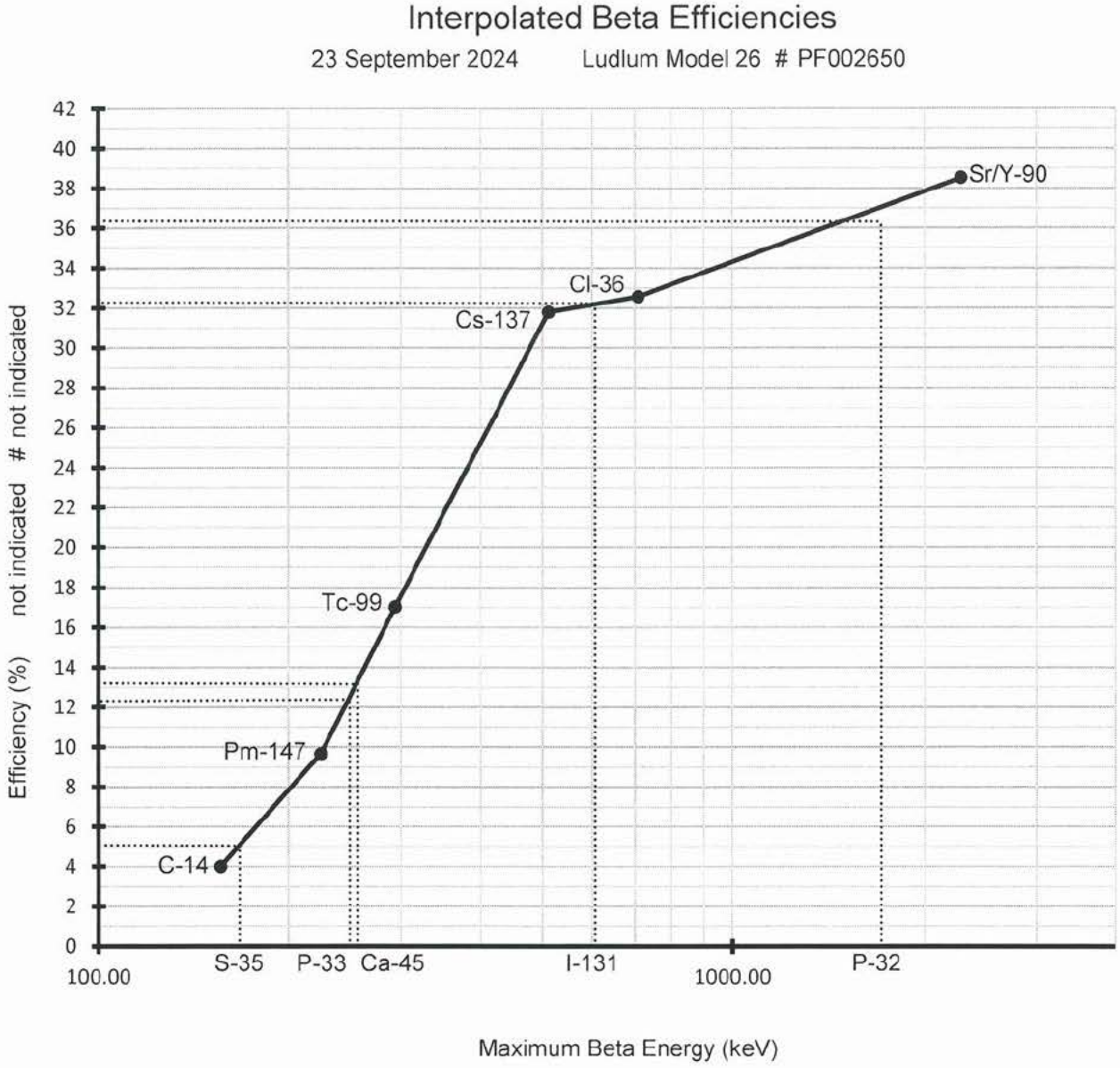
Instrument indicates within ±10% of calibration points unless otherwise indicated. Source-to-detector entry window distance for efficiency determination is 1 cm unless otherwise specified. RSA Laboratories certifies that the above instrument has been calibrated with standards traceable to the National Institute of Standards and Technology, or have been derived from accepted values of natural physical constants, or have been derived by the ratio-type of calibration techniques.

RSA Laboratories ID# **25099**

Calibrated by: **Kurt D. Newton** [redacted] Date: **23 September 2024**

CERTIFICATE OF CALIBRATION
(COUNT-RATE INSTRUMENT)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402



Calibrated by: **Kurt D. Newton** [redacted] Date: **23 September 2024**

After-Calibration Source Response Checks Data Sheet

Location:	Grand Junction Office	**Date:**	5/5/2025

Survey Instrument Data		**Detector/Probe Data (if applicable)**	
Manufacturer:	Ludlum	**Manufacturer:**	N/A
Model No.:	26	**Model No.:**	N/A
Serial No.:	PF002650	**Serial No.:**	N/A
Calibration Due Date:	9/23/2025	**Calibration Due Date:**	N/A

Instrument Units:	cpm - autoranging	**Source/Detector Distance:**	contact	**Shielding/Geometry:**	no shielding

Check Source Data

#1 Isotope:	Cl-36	**Source ID No.:**	R9-747	**Activity & Units:**	2.71 nCi
#2 Isotope:		**Source ID No.:**		**Activity & Units:**	

Source Response #1 Isotope

1st Reading	2nd Reading	3rd Reading	4th Reading	5th Reading	Total
1679	1587	1666	1684	1661	8277
Average:	1655.4	**–20% of Avg:**	1324.32	**+20% of Avg:**	1986.48

Source Response #2 Isotope

1st Reading	2nd Reading	3rd Reading	4th Reading	5th Reading	Total
Average:		**–20% of Avg:**		**+20% of Avg:**	

Comments

Performed by (print name)	Performed by (signature)	Date
Jeremy Byble	[redacted] Digitally signed by JEREMY BYBLE (Affiliate) Date: 2025.05.06 06:29:10 -06'00'	5/5/2025
Reviewed by (print name)	**Reviewed by (signature)**	**Date**
SCOTT NEWSOM (Affiliate)	Digitally signed by SCOTT NEWSOM (Affiliate) Date: 2025.06.30 06:45:43 -06'00'	

Daily Instrument Response

Instrument model: Lud 26 **Serial number:** PF002650 **Detector model:** 44-9 **Serial number:** N/A

Source ID number: R9-747 **Isotope:** Cl-36 **Scale units:** cpm - autoranging

Calibration due date: 09/23/2025 **Acceptable range (± 20%):** 1,325 - 1,986 cpm

Month May **Year** 2025

Initial if daily response check is satisfactory										
Day	Response (Scale or Decade)						Battery Check	Physical Inspection	In Calibration	Initials
			Satisfactory	Unsatisfactory	2nd Check	Sat/Failed				
1										
2										
3										
4										
5	1593		x				SAT	SAT	YES	JB
6										
7										
8										
9										
10										
11										
12										
13	1648		x				SAT	SAT	YES	LO/JB
14	1613		x				SAT	SAT	YES	LO/JB
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										

SCOTT NEWSOM (Affiliate) Digitally signed by SCOTT NEWSOM (Affiliate)
Date: 2025.06.30 06:48:18 -06'00'

Reviewed by the LMS Radiological Control Manager or designee (print and sign) Date

After-Calibration Source Response Checks Data Sheet

Location:	Grand Junction Office			**Date:**	5/5/2025
Survey Instrument Data			**Detector/Probe Data (if applicable)**		
Manufacturer:	Thermo Scientific		**Manufacturer:**	N/A	
Model No.:	micro rem meter		**Model No.:**	N/A	
Serial No.:	19288		**Serial No.:**	N/A	
Calibration Due Date:	9/23/2025		**Calibration Due Date:**	N/A	
Instrument Units:	urem/hr	**Source/Detector Distance:**	contact	**Shielding/Geometry:**	in source holder
Check Source Data					
#1 Isotope:	Cs-137	**Source ID No.:**	248	**Activity & Units:**	0.25 uCi
#2 Isotope:		**Source ID No.:**		**Activity & Units:**	

Source Response #1 Isotope

1st Reading	2nd Reading	3rd Reading	4th Reading	5th Reading	Total
120	115	115	120	120	590
Average:	118	**–20% of Avg:**	94.4	**+20% of Avg:**	141.6

Source Response #2 Isotope

1st Reading	2nd Reading	3rd Reading	4th Reading	5th Reading	Total
Average:		**–20% of Avg:**		**+20% of Avg:**	

Comments

source in holder, label facing and on contact with the "+" center of detector mark on the front of the instrument; instrument on x1 scale during response check.

Performed by (print name)	Performed by (signature)	Date
Jeremy Byble	[redacted] Digitally signed by JEREMY BYBLE (Affiliate) Date: 2025.05.06 06:25:12 -06'00'	5/5/2025
Reviewed by (print name)	**Reviewed by (signature)**	**Date**
SCOTT NEWSOM (Affiliate)	Digitally signed by SCOTT NEWSOM (Affiliate) Date: 2025.06.30 06:51:06 -06'00'	

Daily Instrument Response

Instrument model: Thermo **Serial number:** 19288 **Detector model:** N/A **Serial number:** N/A

Source ID number: 248 **Isotope:** Cs-137 **Scale units:** urem/hr

Calibration due date: 09/23/2025 **Acceptable range (± 20%):** 95 - 141 urem/hr

Month May **Year** 2025

Initial if daily response check is satisfactory										
Day	**Response (Scale or Decade)**						**Battery Check**	**Physical Inspection**	**In Calibration**	**Initials**
	x1		Satisfactory	Unsatisfactory	2nd Check	Sat/Failed				
1										
2										
3										
4										
5	115		x				SAT	SAT	YES	JB
6										
7										
8										
9										
10										
11										
12										
13	120		x				SAT	SAT	YES	LO/JB
14	138		x				SAT	SAT	YES	LO/JB
15										
16										
17										
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30										
31										

SCOTT NEWSOM (Affiliate) Digitally signed by SCOTT NEWSOM (Affiliate)
Date: 2025.06.30 06:53:58 -06'00'

Reviewed by the LMS Radiological Control Manager or designee (print and sign) Date

Attachment 4

Radiological Survey Map (LMS 1553) for the BONUS, Puerto Rico, Decommissioned Reactor Site, May 2025 (Radiological Survey No. 250522-001)

Radiological Survey Map

Radiological Survey Number: 250522-001 **Page** 1 **of** 4

Purpose: BONUS Reactor 2025 Annual Radiological Survey Truck #: N/A Trailer #: N/A

RWP number: N/A Time: 9:30 AM Date: May 13 & 14, 2025

Site name: BONUS, PR Decommissioned Reactor Site Location: Rincon, Puerto Rico

RCT (printed): Larry Oeffner, Jeremy Byble Reviewer signature: SCOTT NEWSOM (Affiliate) Digitally signed by SCOTT NEWSOM (Affiliate) Date: 2025.06.02 08:17:14 -06'00' Date:

Counting Instruments:	Instrument 1	Instrument 2	Instrument 3	Radiation Instruments:	Instrument 4
Instrument/probe model:	Ludlum 3030		Ludlum Model 26	Instrument/probe model:	Thermo Sci urem meter
Instrument serial number:	330877		PF002650	Instrument serial number:	19288
Probe serial number:	N/A		N/A	Probe serial number:	N/A
Calibration due:	9/17/2025		9/23/2025	Calibration due:	9/23/2025
Efficiency:	α 0.34 β 0.43	α β	α β 0.326	Background (dose rate):	20/35 urem/hr
Background (cpm):	α 0.25 β 40	α β	α β 41	Other info (as needed):	
S_c (dpm/100cm^2):	α 2 β 25	α β	α β 326	Background dose rate main level - 20 urem/hr Background dose rate basement level - 35 urem/hr	
Area probe correction factor:	1.0		6.5		

Surface Contamination and Radiation Survey Results

Item Surveyed / Map Location	Counting Inst. No. Used	Smear Survey (Instrument 1 or 2)						Direct Survey (Instrument 3)						Exposure Rate Survey
		Gross Counts		Net Counts		Activity		Gross Counts		Net Counts		Activity		
		Alpha cpm	Beta/gamma cpm	Alpha cpm	Beta/gamma cpm	Alpha dpm/100cm^2	Beta/gamma dpm/100cm^2	Alpha cpm	Beta/gamma cpm	Alpha cpm	Beta/gamma cpm	Alpha dpm/100cm^2	Beta/gamma dpm/100cm^2	
L1	1		41		1.0		< Sc		24		-17.0		< Sc	20
L2	1		41		1.0		< Sc		24		-17.0		< Sc	26
L3	1		34		-6.0		< Sc		30		-11.0		< Sc	25
L4	1		42		2.0		< Sc		36		-5.0		< Sc	20
L5	1		29		-11.0		< Sc		36		-5.0		< Sc	15
L6	1		40		0.0		< Sc		42		1.0		< Sc	20
L7	1		36		-4.0		< Sc		36		-5.0		< Sc	20
L8	1		31		-9.0		< Sc		36		-5.0		< Sc	20
L9	1		32		-8.0		< Sc		54		13.0		< Sc	25
L10	1		47		7.0		< Sc		60		19.0		379	25
L11	1		38		-2.0		< Sc		72		31.0		618	25
L12	1		32		-8.0		< Sc		54		13.0		< Sc	20
L13	1		44		4.0		< Sc		54		13.0		< Sc	25
L14	1		42		2.0		< Sc		36		-5.0		< Sc	20
L15	1		40		0.0		< Sc		48		7.0		< Sc	25
L16	1		39		-1.0		< Sc		42		1.0		< Sc	25

RCT signature: LAWRENCE OEFFNER (Affiliate) Digitally signed by LAWRENCE OEFFNER (Affiliate) Date: 2025.05.28 10:47:13 -04'00' [redacted] Digitally signed by JEREMY BYBLE (Affiliate) Date: 2025.05.27 10:38:44 -06'00'

Radiological Survey Map

Radiological Survey Number: 250522-001 **Page** 2 **of** 4

Surface Contamination and Radiation Survey Results

Item Surveyed / Map Location	Counting Inst. No. Used	Smear Survey (Instrument 1 or 2)						Direct Survey (Instrument 3)						Exposure Rate Survey
		Gross Counts		Net Counts		Activity		Gross Counts		Net Counts		Activity		
		Alpha cpm	Beta/gamma cpm	Alpha cpm	Beta/gamma cpm	Alpha dpm/100cm^2	Beta/gamma dpm/100cm^2	Alpha cpm	Beta/gamma cpm	Alpha cpm	Beta/gamma cpm	Alpha dpm/100cm^2	Beta/gamma dpm/100cm^2	
L17	1		40		0.0		< Sc		36		-5.0		< Sc	25
L18	1		32		-8.0		< Sc		48		7.0		< Sc	30
L19	1		42		2.0		< Sc		36		-5.0		< Sc	25
L20	1		40		0.0		< Sc		78		37.0		738	30
L21	1		33		-7.0		< Sc		42		1.0		< Sc	30
L22	1		40		0.0		< Sc		66		25.0		498	30
L23	1		42		2.0		< Sc		42		1.0		< Sc	30
L24	1		40		0.0		< Sc		84		43.0		857	30
L25	1		45		5.0		< Sc		60		19.0		379	30
L26	1		39		-1.0		< Sc		42		1.0		< Sc	30
L27	1		40		0.0		< Sc		48		7.0		< Sc	30
L28	1		37		-3.0		< Sc		54		13.0		< Sc	35
L29	1		43		3.0		< Sc		90		49.0		977	35
L30	1		38		-2.0		< Sc		66		25.0		498	30
L31	1		44		4.0		< Sc		66		25.0		498	30
L32	1		38		-2.0		< Sc		54		13.0		< Sc	35
L33	1		38		-2.0		< Sc		42		1.0		< Sc	35
L34	1		39		-1.0		< Sc		54		13.0		< Sc	30
L35	1		31		-9.0		< Sc		36		-5.0		< Sc	30
L36	1		41		1.0		< Sc		42		1.0		< Sc	32
L37	1		44		4.0		< Sc		24		-17.0		< Sc	32
L38	1		33		-7.0		< Sc		24		-17.0		< Sc	32
L39	1		44		4.0		< Sc		30		-11.0		< Sc	30
L40	1		38		-2.0		< Sc		893		852.0		16988	40
L41	1		50		10.0		< Sc		72		31.0		618	35
L42	1		54		14.0		33		72		31.0		618	35
L43	1		41		1.0		< Sc		42		1.0		< Sc	35
L44	1		39		-1.0		< Sc		30		-11.0		< Sc	40
L45	1		43		3.0		< Sc		36		-5.0		< Sc	40
L46	1		49		9.0		< Sc		30		-11.0		< Sc	40
L47	1		30		-10.0		< Sc		18		-23.0		< Sc	38
L48	1		31		-9.0		< Sc		24		-17.0		< Sc	40

Radiological Survey Map

Radiological Survey Number: 250522-001 **Page** 3 **of** 4

Surface Contamination and Radiation Survey Results

Item Surveyed / Map Location	Counting Inst. No. Used	Smear Survey (Instrument 1 or 2)						Direct Survey (Instrument 3)						Exposure Rate Survey
		Gross Counts		Net Counts		Activity		Gross Counts		Net Counts		Activity		
		Alpha cpm	Beta/gamma cpm	Alpha cpm	Beta/gamma cpm	Alpha dpm/100cm^2	Beta/gamma dpm/100cm^2	Alpha cpm	Beta/gamma cpm	Alpha cpm	Beta/gamma cpm	Alpha dpm/100cm^2	Beta/gamma dpm/100cm^2	
L49	1		37		-3.0		< Sc		42		1.0		< Sc	40
L50	1		39		-1.0		< Sc		24		-17.0		< Sc	40
L51	1		36		-4.0		< Sc		36		-5.0		< Sc	42
L52	1		42		2.0		< Sc		42		1.0		< Sc	40
L53	1		33		-7.0		< Sc		42		1.0		< Sc	40
L54	1		35		-5.0		< Sc		30		-11.0		< Sc	38
L55	1		31		-9.0		< Sc		32		-9.0		< Sc	36
L56	1		35		-5.0		< Sc		36		-5.0		< Sc	38
L57	1		33		-7.0		< Sc		42		1.0		< Sc	40
L58	1		29		-11.0		< Sc		60		19.0		379	38
L59	1		37		-3.0		< Sc		26		-15.0		< Sc	40
L60	1		39		-1.0		< Sc		36		-5.0		< Sc	42
L61	1		32		-8.0		< Sc		30		-11.0		< Sc	42
L62	1		51		11.0		26		54		13.0		< Sc	38
L63	1		37		-3.0		< Sc		60		19.0		379	40
L64	1		41		1.0		< Sc		30		-11.0		< Sc	40
L65	1		46		6.0		< Sc		24		-17.0		< Sc	42
L66	1		41		1.0		< Sc		36		-5.0		< Sc	38
L67	1		41		1.0		< Sc		42		1.0		< Sc	38
L68	1		39		-1.0		< Sc		36		-5.0		< Sc	40
L69	1		38		-2.0		< Sc		42		1.0		< Sc	40
L70	1		33		-7.0		< Sc		60		19.0		379	40
L71	1		39		-1.0		< Sc		42		1.0		< Sc	40
L72	1		43		3.0		< Sc		24		-17.0		< Sc	40
L73	1		42		2.0		< Sc		30		-11.0		< Sc	40
L74	1		31		-9.0		< Sc		24		-17.0		< Sc	38
L75	1		36		-4.0		< Sc		36		-5.0		< Sc	40
L76	1		30		-10.0		< Sc		48		7.0		< Sc	42
L77	1		45		5.0		< Sc		40		-1.0		< Sc	40
L78	1		37		-3.0		< Sc		60		19.0		379	40

Radiological Survey Map

Radiological Survey Number: 250522-001 **Page** 4 **of** 4

Surface Contamination and Radiation Survey Results

Item Surveyed / Map Location	Counting Inst. No. Used	Smear Survey (Instrument 1 or 2)						Direct Survey (Instrument 3)						Exposure Rate Survey
		Gross Counts		Net Counts		Activity		Gross Counts		Net Counts		Activity		
		Alpha cpm	Beta/gamma cpm	Alpha cpm	Beta/gamma cpm	Alpha dpm/100cm^2	Beta/gamma dpm/100cm^2	Alpha cpm	Beta/gamma cpm	Alpha cpm	Beta/gamma cpm	Alpha dpm/100cm^2	Beta/gamma dpm/100cm^2	

Applicable Surface Contamination Limits

Check one for alpha, one for beta.

Alpha (removable/total) ☐ 1000/5000 ☐ 200/1000 ☐ 20/500

Beta (removable/total) ☑ 1000/5000 ☐ 200/1000

Activity Equation

Gross count minus BKGD count = Net count

Net count/Eff = dpm

Dpm x Area Probe Correction Factor (APCF) = dpm/100cm^2

APCE

44-9 = 6.5

FHZ 732 (GM) = 6.5

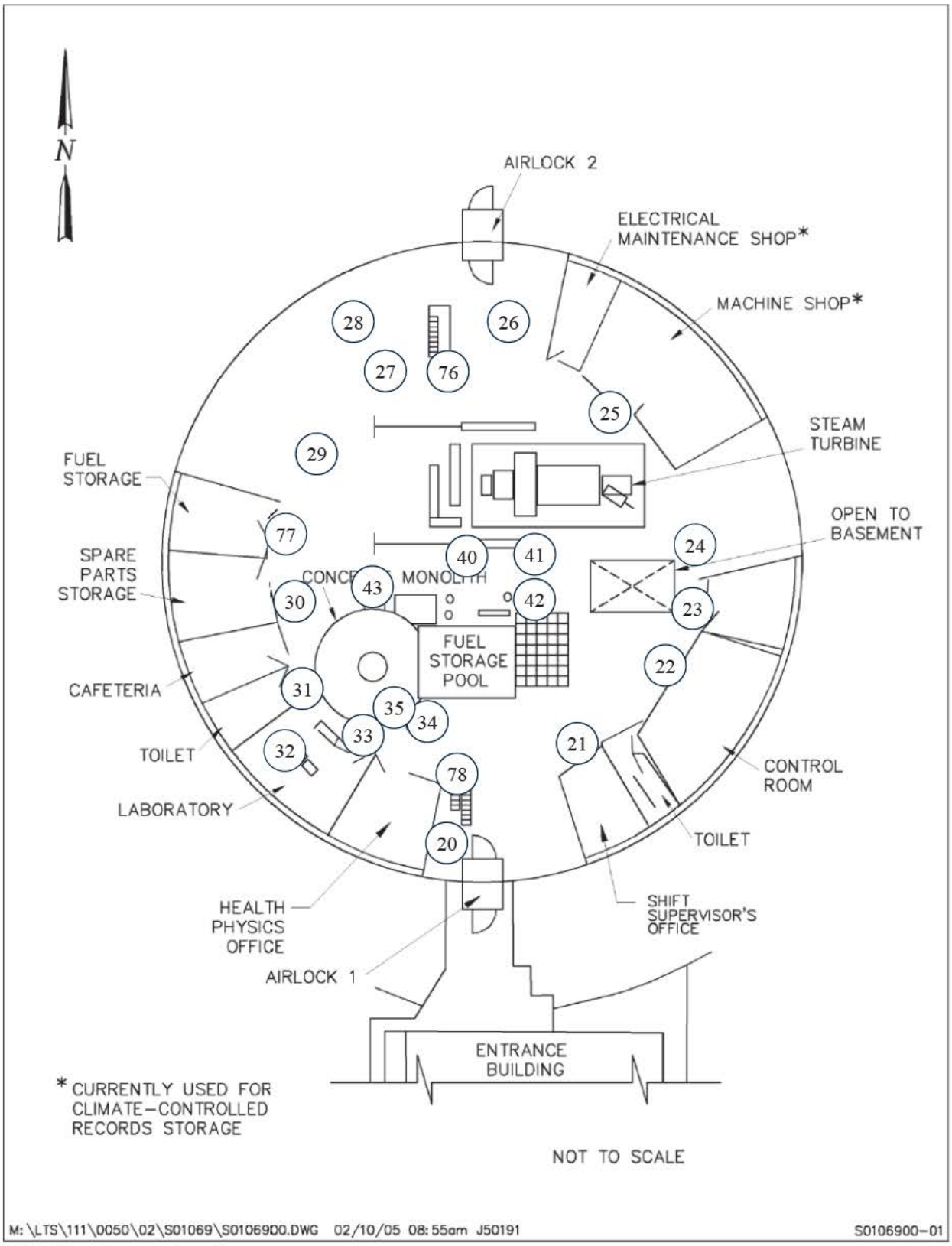
43-10-1 = 1

Remarks:

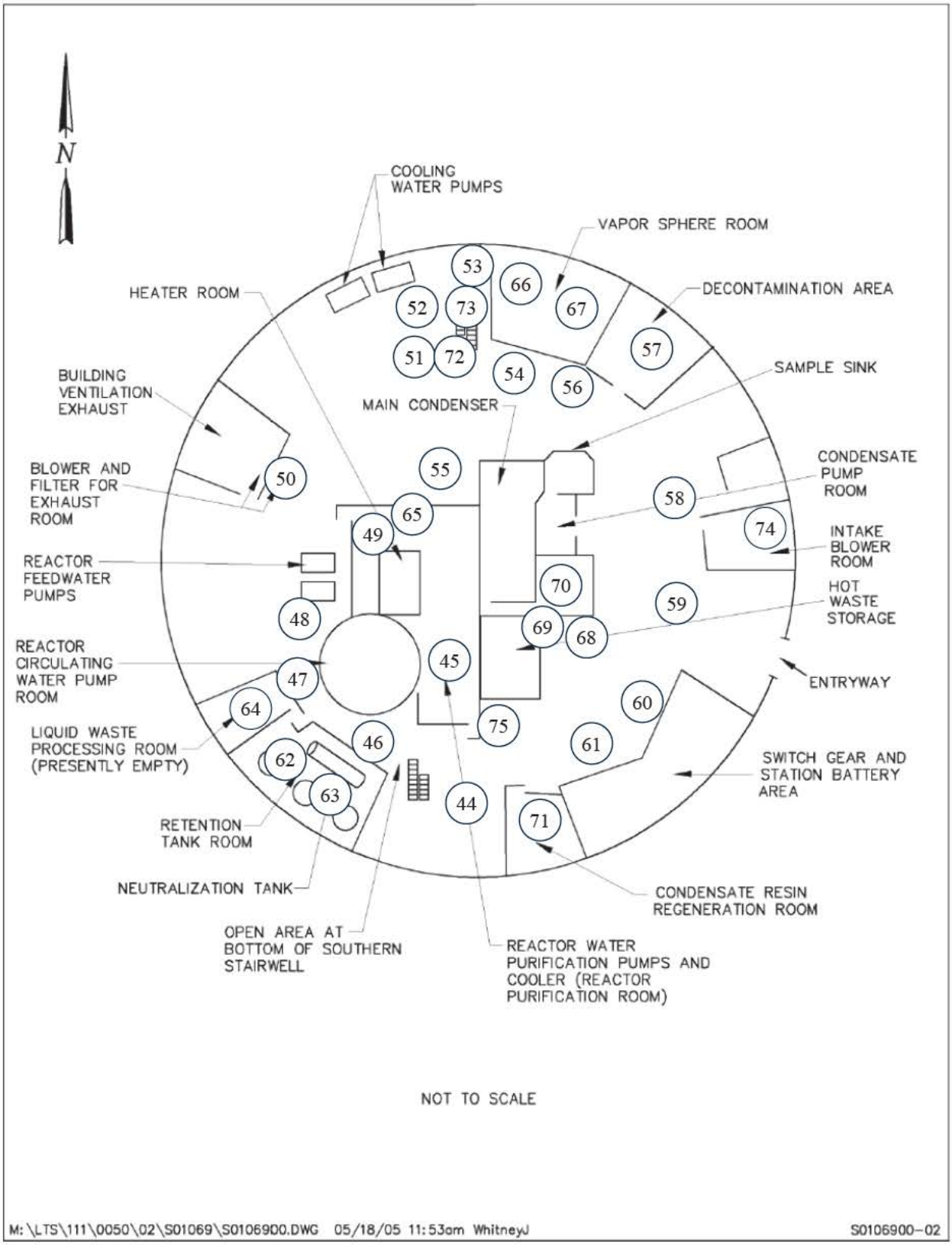
*See attachment 1 for survey location maps and attachment 2 for instrument reading results table.

* 1 minute background verification counts were performed on the Ludlum 3030 after smear numbers 20, 40, and 60. Verification counts were appropriate and showed no instrument contamination during smear counting.

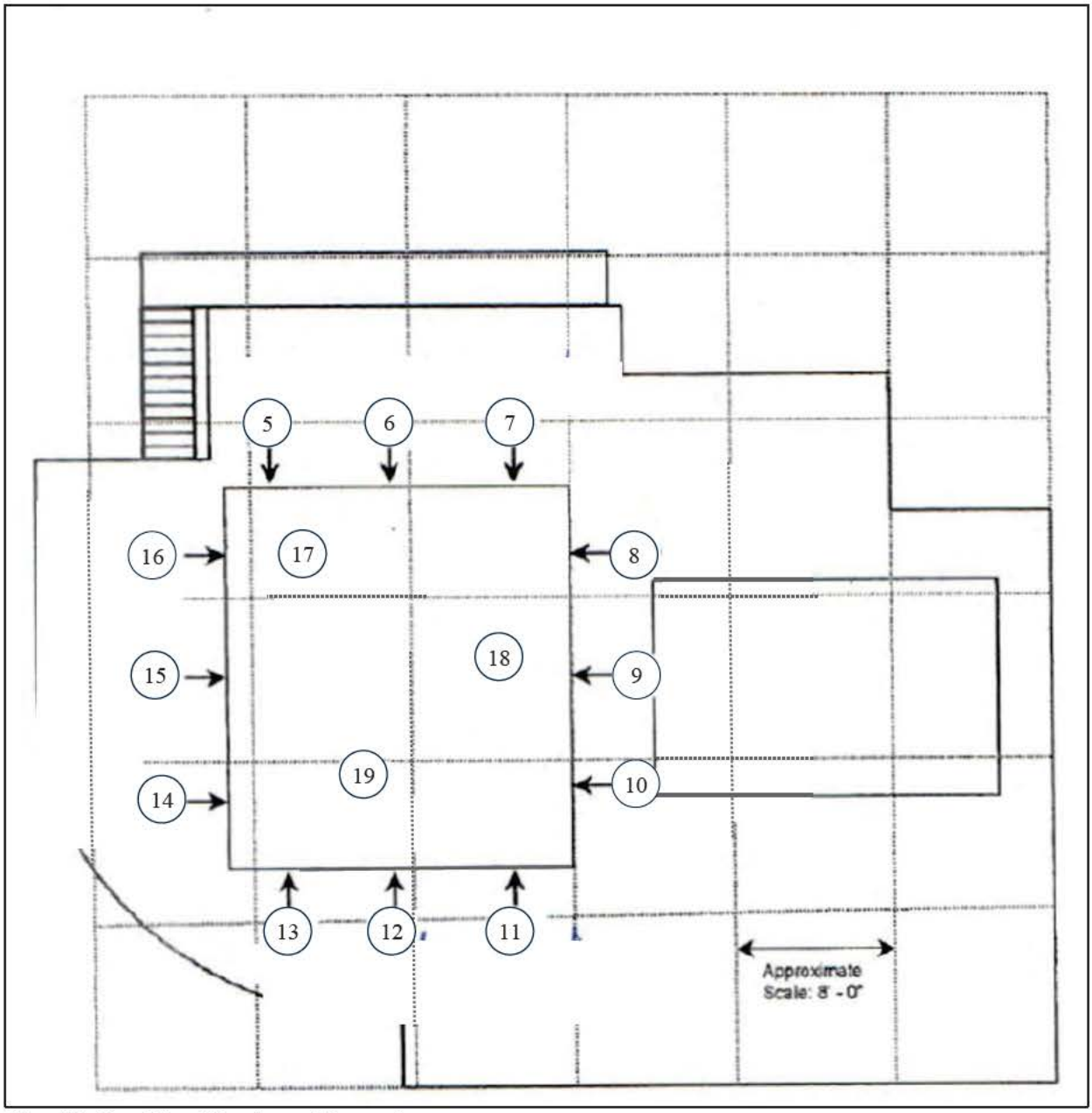
Radiological Survey Number: 250522-001
May 13-14, 2025
RCT initials: JB and LO



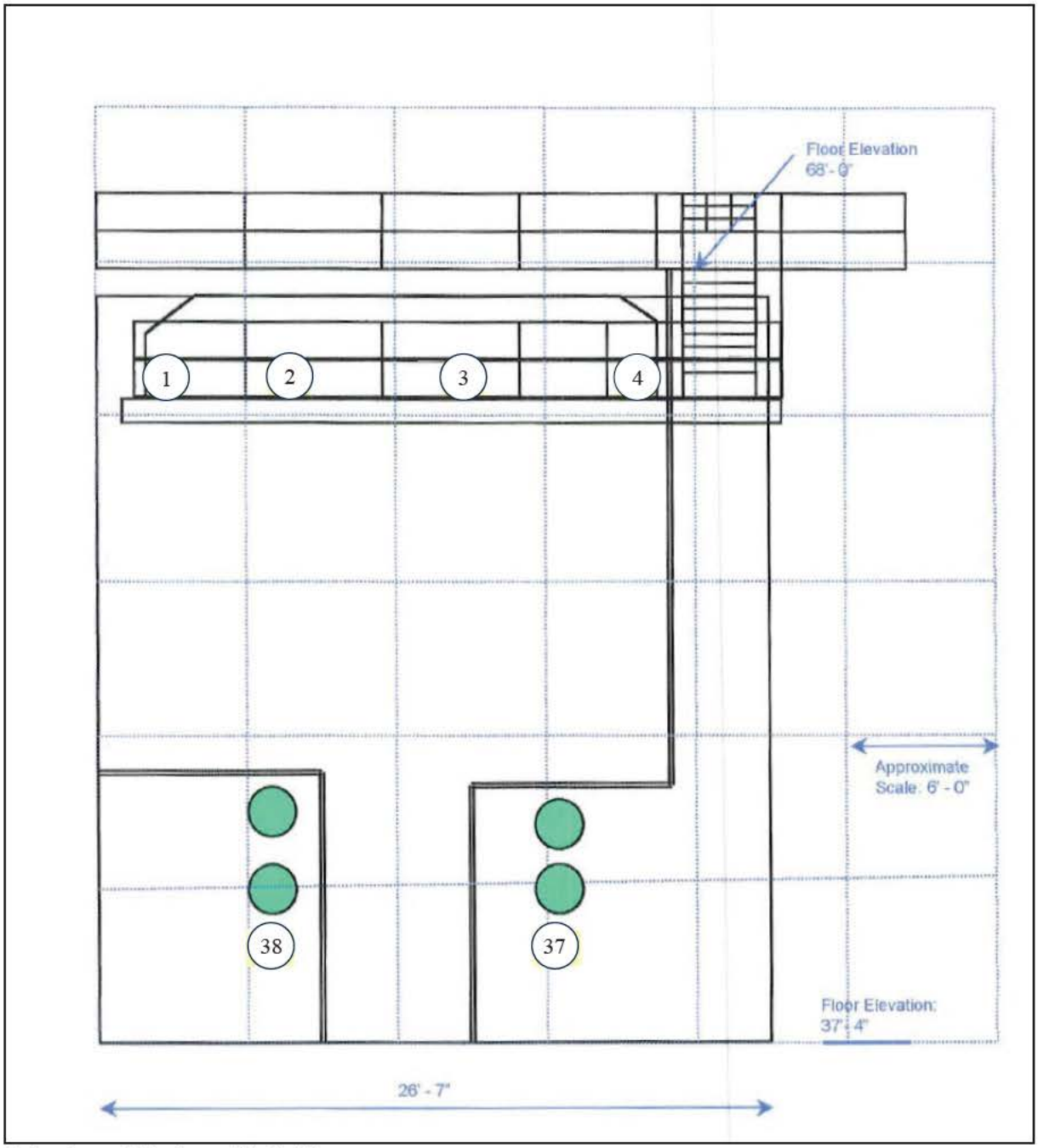
Main Floor Survey Locations



Basement Floor Survey Locations

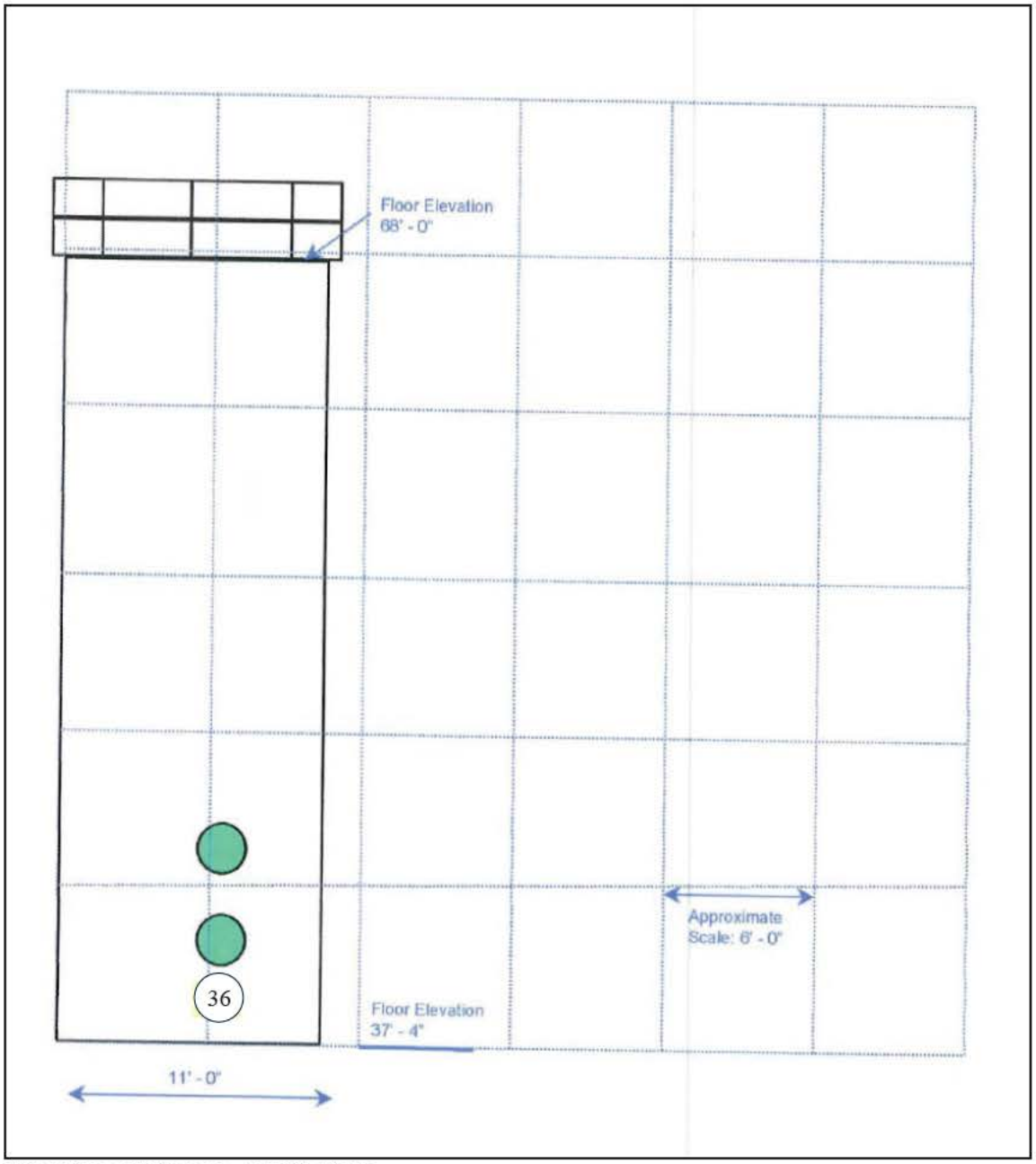


Monolith Top Plug Structure - Mezzanine

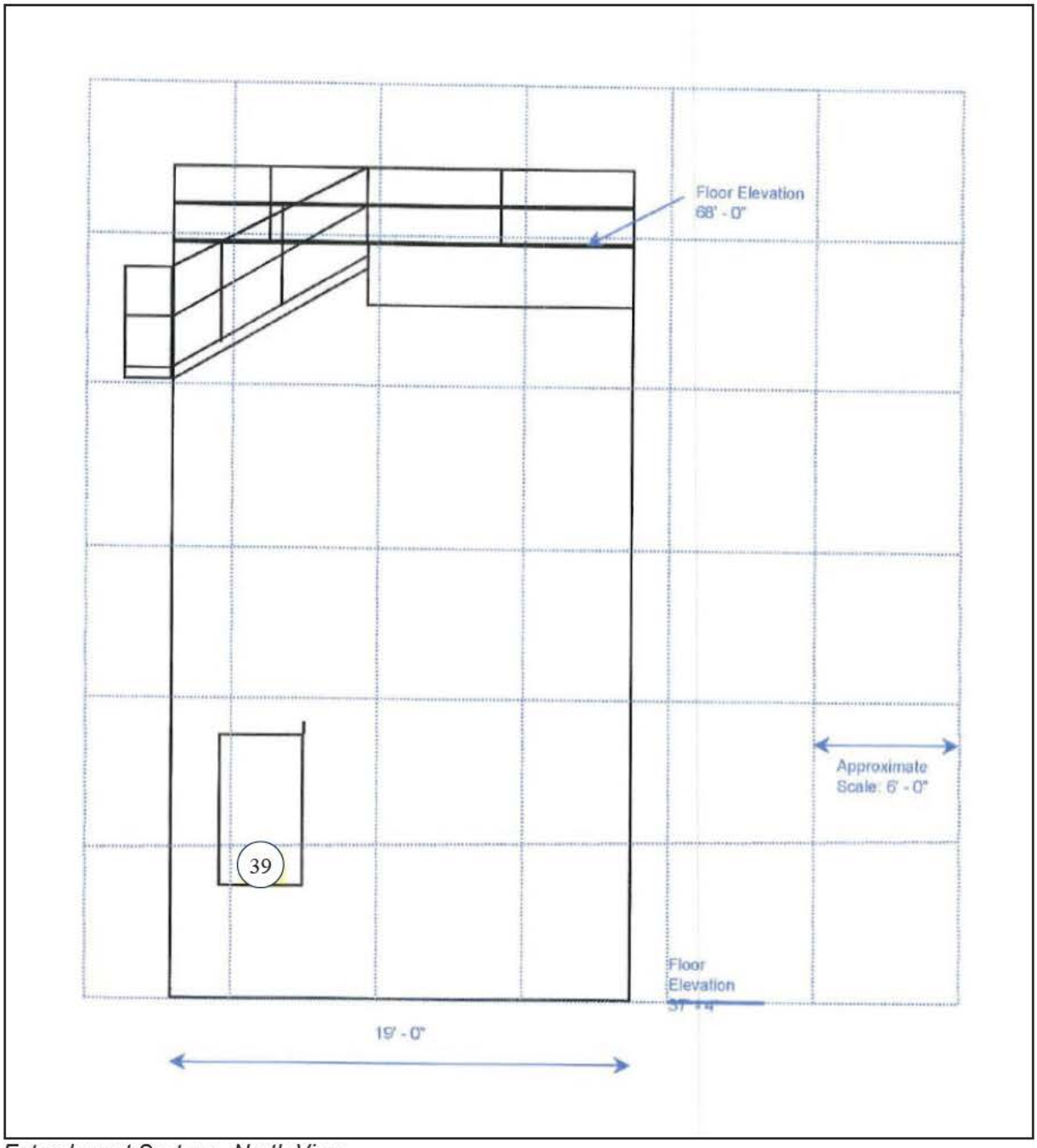


Entombment System - North View

Radiological Survey Number: 250522-001
May 13-14, 2025
RCT initials: JB and LO



Entombment System - South View



Entombment System - North View

Radiological Survey Number: 250522-001

RCT Name: Larry Oeffner/Jeremy Byble **Survey Date:** May 13/14, 2025

Exposure Rate Instrument Info

Survey Instrument Model: Thermo uR meter
Instrument Serial Number: 19288
Calibration Due Date: 9/23/2025
Time of Daily Response Check: 0830/0730
Background Exposure Rate (μR/h): 20 main level / 35 basement level

Surface Contamination Instrument Info

Survey Instrument Model: Ludlum model 26
Instrument Serial Number: PF002650
Calibration Due Date: 9/23/2025
Time of Daily Response Check: 0830/0730

Survey ID	Survey Location	Exposure Result (uR/h)	Removable Contamination (dpm/100cm^2)	Total Contamination (dpm/100cm^2)	Comment
1	Pipe Chase Face #1	20	< Sc	< Sc	Monolith Top
2	Pipe Chase Face #2	26	< Sc	< Sc	Monolith Top
3	Pipe Chase Face #3	25	< Sc	< Sc	Monolith Top
4	Pipe Chase Face #4	20	< Sc	< Sc	Monolith Top
5	Top Plug Face #1 - left	15	< Sc	< Sc	Monolith Top
6	Top Plug Face #1 - center	20	< Sc	< Sc	Monolith Top
7	Top Plug Face #1 - right	20	< Sc	< Sc	Monolith Top
8	Top Plug Face #2 - top	20	< Sc	< Sc	Monolith Top
9	Top Plug Face #2 - center	25	< Sc	< Sc	Monolith Top
10	Top Plug Face #2 - bottom	25	< Sc	379	Monolith Top
11	Top Plug Face #3 - right	25	< Sc	618	Monolith Top
12	Top Plug Face #3 - center	20	< Sc	< Sc	Monolith Top
13	Top Plug Face #3 - left	25	< Sc	< Sc	Monolith Top
14	Top Plug Face #4 - bottom	20	< Sc	< Sc	Monolith Top
15	Top Plug Face #4 - center	25	< Sc	< Sc	Monolith Top
16	Top Plug Face #4 - top	25	< Sc	< Sc	Monolith Top
17	Top Plug Top Surface - upper left	25	< Sc	< Sc	Monolith Top
18	Top Plug Top Surface - center right	30	< Sc	< Sc	Monolith Top
19	Top Plug Top Surface - center bottom	25	< Sc	< Sc	Monolith Top
20	Main Floor Zone 1	30	< Sc	738	Main Level-Public Access
21	Main Floor Zone 2	30	< Sc	< Sc	Main Floor
22	Main Floor Zone 3	30	< Sc	498	Main Floor
23	Main Floor Zone 4	30	< Sc	< Sc	Main Floor
24	Main Floor Zone 5	30	< Sc	857	Main Floor
25	Main Floor-Zone 6	30	< Sc	379	Main Level-Public Access
26	Main Floor-Zone 7	30	< Sc	< Sc	Main Level-Public Access
27	Main Floor-Zone 8	30	< Sc	< Sc	Main Level-Public Access
28	Main Floor-Zone 9	35	< Sc	< Sc	Main Level-Public Access
29	Main Floor-Zone 10	35	< Sc	977	Main Level-Public Access
30	Main Floor-Zone 11	30	< Sc	498	Main Level-Public Access
31	Main Floor-Zone 12	30	< Sc	498	Main Level-Public Access
32	Main Floor-Zone 14	35	< Sc	< Sc	Main Level-Public Access

33	Main Floor-Zone 13	35	< Sc	< Sc	Main Level-Public Access
34	Main Floor Water Column - center bottom	30	< Sc	< Sc	Main Level-Controlled Area
35	Main Floor Water Column - right middle	30	< Sc	< Sc	Main Level-Controlled Area
36	Instrument Thimble #1	32	< Sc	< Sc	Main Level-Controlled Area
37	Instrument Thimble #2	32	< Sc	< Sc	Main Level-Controlled Area
38	Instrument Thimble #3	32	< Sc	< Sc	Main Level-Controlled Area
39	Pipe Chase Ext Hatch	30	< Sc	< Sc	Main Level-Controlled Area
40	Fuel Pool Purifier. Floor #1	40	< Sc	16988	Main Level-Contaminated Area
41	Fuel Pool Purifier. Floor #2	35	< Sc	618	Main Level-Controlled Area
42	Fuel Pool Purifier. Floor #3	35	33	618	Main Level-Controlled Area
43	Fuel Pool Purifier. Floor #4	35	< Sc	< Sc	Main Level-Controlled Area
44	Basement Floor-Zone 1	40	< Sc	< Sc	Basement Level
45	Basement Floor-Zone 2	40	< Sc	< Sc	Basement Level
46	Basement Floor-Zone 3	40	< Sc	< Sc	Basement Level
47	Basement Floor-Zone 4	38	< Sc	< Sc	Basement Level
48	Basement Floor-Zone 5	40	< Sc	< Sc	Basement Level
49	Basement Floor-Zone 6	40	< Sc	< Sc	Basement Level
50	Basement Floor-Zone 7	40	< Sc	< Sc	Basement Level
51	Basement Floor-Zone 8	42	< Sc	< Sc	Basement Level
52	Basement Floor-Zone 9	40	< Sc	< Sc	Basement Level
53	Basement Floor-Zone 10	40	< Sc	< Sc	Basement Level
54	Basement Floor-Zone 11	38	< Sc	< Sc	Basement Level
55	Basement Floor-Zone 12	36	< Sc	< Sc	Basement Level
56	Basement Floor-Zone 13	38	< Sc	< Sc	Basement Level
57	Basement Floor-Zone 14	36	< Sc	< Sc	Basement Level
58	Basement Floor-Zone 15	40	< Sc	379	Basement Level
59	Basement Floor-Zone 16	38	< Sc	< Sc	Basement Level
60	Basement Floor-Zone 17	40	< Sc	< Sc	Basement Level
61	Basement Floor-Zone 18	42	< Sc	< Sc	Basement Level
62	Side of Liq. Waste Ret. Tank #1	42	26	< Sc	Basement Level
63	Side of Liq. Waste Ret. Tank #2	38	< Sc	379	Basement Level
64	Column 4 and 5 inside room	40	< Sc	< Sc	Basement Level
65	F.W. Heater Room (Wall)	40	< Sc	< Sc	Basement Level
66	Vapor Sphere Room - upper left	42	< Sc	< Sc	Basement Level
67	Vapor Sphere Room - center right	38	< Sc	< Sc	Basement Level
68	Water pump room to the right, enter 50A	38	< Sc	< Sc	Basement Level
69	Condenser Room Entry Wall - block	40	< Sc	< Sc	Basement Level
70	Condenser Room Entry Wall - concrete	40	< Sc	379	Basement Level
71	South room with 2 pumps	40	< Sc	< Sc	Basement Level
72	Under stairs near north door. Floor #1	40	< Sc	< Sc	Basement Level
73	Under stairs near north door. Floor #2	40	< Sc	< Sc	Basement Level
74	Inlet air plenum room floor	38	< Sc	< Sc	Basement Level
75	Cond. Mixed bed area floor	40	< Sc	< Sc	Basement Level
76	Floor near north stairwell	42	< Sc	< Sc	Main level - public access
77	Floor outside fuel storage room	40	< Sc	< Sc	Main level - public access
78	Floor near south stairwell	40	< Sc	379	Main level - public access