LMS/BON/51711

2025 Inspection and Status Report for the Boiling Nuclear Superheater (BONUS) Decommissioned Reactor Site, Rincón, Puerto Rico

August 2025

U.S. DEPARTMENT OF ENERGY | Legacy Management

This document has been designed for online viewing.

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Abbreviations

BONUS	Boiling Nuclear Superheater
DOE	U.S. Department of Energy
LM	Office of Legacy Management
LMS	Legacy Management Support
LTS&M Plan	Long-Term Surveillance and Maintenance Plan
PL	photograph location
PREPA	Puerto Rico Electric Power Authority

Executive Summary

The Boiling Nuclear Superheater (BONUS) Decommissioned Reactor Site, on the west coast of Puerto Rico near the town of Rincón, was inspected on May 13 and 14, 2025. The inspection included checking the integrity of the entombed reactor system and the containment building, assessing site security and general housekeeping, and checking the condition of the surrounding land. The annual radiological survey was also conducted during the same period as the site inspection. The 2025 radiological survey results are covered under a separate report.

The integrity of the entombed reactor system was in excellent condition during this year's inspection. No cause for a follow-up inspection was identified. Puerto Rico Electric Power Authority personnel continue to do an excellent job responding to maintenance items and recommendations from previous site inspections and working through the added demands placed on the island and the operation of the BONUS facility due to fiscal restraints.

The condition of the exterior of the site continues to improve; however, the site perimeter fence is compromised in several areas as evidenced by graffiti on one of the outbuildings.

1.0 Introduction

This report presents the findings from the U.S. Department of Energy (DOE) Office of Legacy Management (LM) inspection of the Boiling Nuclear Superheater (BONUS) Decommissioned Reactor Site near Rincón, Puerto Rico, on May 13 and 14, 2025.

RSI EnTech, LLC (RSI), the Legacy Management Support (LMS) contractor, and specifically the LMS site lead and an LMS assistant inspector, conducted the site inspection. Effective in 2024, the responsibility to conduct the annual radiological survey was transferred from the Puerto Rico Electric Power Authority (PREPA) to LM. The 2025 radiological survey was conducted during the same period as the site inspection. The 2025 radiological survey results are presented in a separate report.

While the site inspection was taking place, a separate LMS team simultaneously conducted the routine annual radiological survey of the entombment area. In the past, this radiological survey was coordinated by PREPA and conducted using a separate subcontractor from Oak Ridge, Tennessee. DOE now has responsibility for coordinating and conducting the annual radiological survey. PREPA personnel served as escorts at the BONUS site.

The 2025 site inspection was conducted in accordance with the *Long-Term Surveillance and Maintenance Plan for the Boiling Nuclear Superheater (BONUS) Reactor Facility, Rincón, Puerto Rico* (DOE 2024), also referred to as the BONUS Long-Term Surveillance and Maintenance Plan (LTS&M Plan), and with procedures established by the LMS team for site inspections. The primary purpose for the inspection was to confirm the integrity of the entombed reactor and the building that contains the entombed reactor. Additional objectives included assessing site security, the general housekeeping of the site, and any changes in the surrounding area that might adversely impact the long-term sustainability of the facility.

Section 4.3 of the BONUS LTS&M Plan prescribes the LM site inspection requirements, which are described in the table below.

Inspection Requirement	BONUS LTS&M Plan Section	Status
Contact PREPA	4.3	PREPA was contacted in advance of the visit.
Contact the mayor of Rincón	4.3	The mayor was contacted in advance of the visit.
Prepare and follow an inspection checklist	4.3.1	The checklist was prepared in advance of the visit.

As part of the pre-job briefing in advance of the inspection, personnel reviewed and signed the job safety analysis for the site inspection at the BONUS site.

The BONUS facility consists of the containment building (which houses the entombed reactor system) and separate support buildings. PREPA uses the decommissioned BONUS facility as a museum that is open to the public for scheduled tours. Before the 2017 hurricane, approximately five to six tours were conducted each year. Museum tours were suspended while the site was without power. Currently, site tours are limited due to availability of PREPA personnel.

DOE retains responsibility for the entombed radioactive materials that remain at the BONUS facility. In 2003, DOE conducted an Environmental Assessment and concluded that there was no unacceptable risk to human health or the environment from fixed radioactive contaminated areas. This conclusion was published in the *Finding of No Significant Impact for Authorizing the Puerto Rico Electric Power Authority (PREPA) to Allow Public Access to the Boiling Nuclear Superheat (BONUS) Reactor Building, Rincón, Puerto Rico* (DOE 2003). However, there are limited and discrete areas within the museum building that have fixed residual radioactive contamination, and these areas are isolated, shielded, and posted to protect visitors and workers. Radiation surveys of the facility are conducted quarterly by PREPA staff and, up until this year, annually by a third-party subcontractor. Effective in 2024, the responsibility for coordinating and conducting the annual radiological survey was transferred from PREPA to LM. The most recent annual radiological survey was conducted in May 2025 concurrent with the annual site inspection. Results of the annual radiological survey conducted this year will be reported in a standalone report.

2.0 Inspection Results

Features discussed in this report are shown on the attached site drawings (Appendix A). Photographs to support specific observations are identified in the text and on the site drawings by photograph location (PL) numbers. Inspection items, issues, actions, observations, and recommendations for 2025 are provided in Table 1 and discussed below.

Effective in 2024, with the assistance of the LMS Environmental and Geospatial Data Management department, a Mobile Mapping Applications Program was used to collect and archive geospatial data from the site.

Table 1. 2025 Inspection Items, Issues, Actions, Observations, and Recommendations

No.	Item	Issue	Action	2025 Inspection Observations and Recommendations
1	Access	Site security and access accountability.	Inspectors need to sign in on the required log sheet at the security gate upon arrival.	Inspectors signed the required log sheet at the security gate upon arrival for each day at the site.
2	Specific site surveillance features	In addition to the information in this row, see site-specific surveillance features listed below in this table.	Inspect the following: • Roads and parking area • Entrance gate • Access through the security gate • Security fence • Retaining wall along beach	• The roads and parking area within the fence area remain in good condition. • The entrance gate remains in good condition and was closed upon arrival. • A 24/7 security posture is in place at the main entrance. • Security fencing along the perimeter of the site remains damaged and new areas of fence have been cut out for entry. • The retaining wall along the beach still requires attention; it is heavily damaged.
3	Enclosed domed building—entombed concrete monolith and monolith penetrations	Structural defects or degradation can result in loss of containment or radioactive materials.	Inspect for possible indications of structural problems, such as cracking, staining, and spalling.	No structural defects were visually observed during the 2025 inspection.
4	Enclosed domed building—external piping systems	Systems were flushed during decommissioning. Incidental contamination remains, which might be released if systems corrode or otherwise fail.	Inspect for possible indications of deterioration, such as peeling and blistering paint, staining, and flaking.	The dome paint remains damaged due to past hurricanes. The seal of the dome is adequate. However, where rainwater ponds on the seal. The rubber is deteriorating and will eventually become ineffective.

Table 1. 2025 Inspection Items, Issues, Actions, Observations, and Recommendations (continued)

No.	Item	Issue	Action	2025 Inspection Observations and Recommendations
5	Enclosed domed building—basement	Some areas contain radiological contamination in excess of DOE standards; the general public is not allowed access to contaminated areas.	Note the condition of access control barricades.	Radiological controls remain in place and are marked with appropriate signage.
		In November 2018, PREPA conducted a radiation survey that discovered removable contamination at the base of a condensation pump in the Condensate Pump Room of the basement. The contamination consisted of approximately two handfuls of rust debris stained with oil. It is believed that the contamination is somehow related to the 2017 storm events. Contamination was fixed in place with an epoxy material.	Observe the posting as a contamination area (rope and signage). Inspect the fixed contamination in the Condensate Pump Room.	Radiological area posting is proper. The encapsulated material remains in good condition and no additional debris was observed.
		Asbestos pipe insulation exists throughout the basement, but PREPA asbestos-certified personnel have inventoried the pipe installation and stabilized it in place. In accordance with the BONUS LTS&M Plan, asbestos inspections are performed quarterly, and air sampling is performed annually by PREPA staff or contractors. Vinyl floor tiles in two interior rooms (lab and control room) are suspect ACM given their age and dimensions. The corners of many of the tiles are beginning to curl due to age. The ”mastic” glue used at the time the floor tiles were installed may also contain ACM. These areas are currently isolated from foot traffic.	Visually assess piping where available. Discuss current findings from quarterly asbestos inspections and annual air samplings with PREPA personnel.	Visual assessment confirmed that asbestos pipe insulation continues to be managed properly (non-friable condition). A visual check of ACM encapsulation confirmed it is in good standing. Per PREPA staff, they are no longer conducting asbestos inspections nor are they conducting annual air sampling. The suspect ACM floor tiles that are damaged remain in two locations on the main floor. LM recommends further investigation.
6	Enclosed domed building—basement flooding	Water accumulating in the basement might mobilize and redistribute surface contamination. The basement flooded in 1998 due to Hurricane Georges. After that flood, stormwater drains were unplugged, and the rubber door seals were replaced.	Inspect rubber door seals and stormwater drains.	Rubber seals on exterior doors appear to be adequate but are aging. Storm drains were in good condition.

Table 1. 2025 Inspection Items, Issues, Actions, Observations, and Recommendations (continued)

No.	Item	Issue	Action	2025 Inspection Observations and Recommendations
7	Enclosed domed building—main floor	Some areas contain radiological contamination in excess of DOE standards; the general public is not allowed access to contaminated areas.	Note the condition of access control barricades, ceramic floor tile, and lead blocks; note general housekeeping. Check to see if access to stairways leading to the basement level is being effectively maintained and controlled to keep out the public.	Some lead blocks had been moved to be used as doorstops. Lead blocks are for shielding and should not be relocated for use as doorstops. Fire extinguisher inspection tags were checked and they are in good standing. Access to the basement stairs is behind a locked gate to prevent unauthorized access. The opening in Airlock 2 has been caulked.
8	Enclosed domed building—mezzanine	Some areas contain radiological contamination in excess of DOE standards; the general public is not allowed access to contaminated areas.	Note the condition of access control to the mezzanine; note general housekeeping.	Several drip pads (a dozen) were observed along the mezzanine and top of the entombment.
9	Enclosed domed building—exterior	Building should appear well maintained. In 2013, the outer surface of the containment dome was repainted. In 2013, the rubber seal at the base of the containment dome was repaired.	Visually inspect the exterior of the building.	Paint damage on the outer surface of the dome from the 2017 hurricane was still observed. The rubber seal is functional, although the ends are no longer attached to the building. It is recommended that PREPA reattach the seal.
10	Surrounding land	New or changing features or activities adjacent to the site can affect site security. The retaining wall located along the west side of the property (along the beach) is heavily damaged and needs to be rebuilt.	Note changes within 0.25 mile (400 meters) of the site.	The security fence continues to be damaged and new openings (cut away) were visually observed for unauthorized entry. The handrails, guardrails, road curbs, and several outbuildings have been painted, which makes the area more appealing. The retaining wall on the west side of the property near the beach remains damaged. It is recommended that PREPA look into restoring the wall. New retaining wall installed in 2024 is in great shape.
11	General site upkeep	The building should appear well maintained.	Observe and evaluate changes in site conditions.	General site conditions continue to be in good standing and things are well maintained. Fresh painting observed on the exterior of some ancillary buildings.

Table 1. 2025 Inspection Items, Issues, Actions, Observations, and Recommendations (continued)

No.	Item	Issue	Action	2025 Inspection Observations and Recommendations
12	Site security	A security guard should be stationed at all times.	Ensure that a security guard is present.	A security guard was present, and PREPA reported that a 24/7 security posture remains enforced. However, the perimeter fence is compromised in several areas as evidenced by an outbuilding being spraypainted by unauthorized person(s).
13	Erosion	Ensure that hill slopes and the beach adjacent to the site are not actively eroding in a way that could adversely affect the facility.	Evaluate erosional features on the adjacent slopes and beach.	No visual change was observed from previous years' evaluations of erosional features on adjacent slopes and beach. The sea wall at the base of the hill near the beach appears to have fallen down a little more.

Abbreviation:
ACM = asbestos-containing material

2.1 Containment Building and Entombed Reactor System

The containment building houses the entombed reactor system. The dome of the containment building has a diameter of approximately 160 feet and a circumference of approximately 502 feet. The entombed reactor system within the containment dome was found to be in excellent condition, and its integrity was confirmed. No indications of structural problems, such as cracking, staining, or spalling, were identified on the entombed concrete monolith and monolith penetrations. External piping systems showed no signs of deterioration, such as peeling and blistering paint, staining, and flaking.

Access control barricades in the basement, on the main floor, and on the mezzanine were in place and in good order. The basement was very clean and there was no water present on the basement floor.

During the 2024 inspection, inspectors observed an opening in the side of Airlock 2 with what appeared to be an electric cord running through it. This opening was found to be properly sealed during this year's inspection (PL-1).

The outer surface of the dome was reconditioned and painted in 2013. Paint in a few areas of the dome was damaged during the 2017 hurricanes and needs to be repainted (PL-2).

A rubber seal is installed around the base of the containment dome to keep water from seeping into the building. In 2010, the seal was observed to be cracked, ripped, and missing in some spots. Evidence of water seepage was observed in a few spots along the top of the basement wall inside the containment dome, which indicated that the seal was leaking in those areas. PREPA installed a secondary rubber seal over the damaged primary seal to carry water away from the underlying damaged seal. During the inspection, it was observed that water can collect on top of the seal and then evaporate. Observations of the seal noted that this process results in surface flaking of the rubber seal. Repeated cycles of this water collection and evaporation process may weaken the integrity of the seal over time. Should this continue, a fix may be needed in the future to correct this situation. In some areas, the secondary seal has become separated from the dome

structure (PL-3). The rubber seal should be reattached to the dome. No evidence of recent water seepage was observed along the top of the basement wall in the containment building during this year's inspection, which indicates that the secondary seal is still currently functioning properly.

In November 2018, PREPA conducted a radiation survey and discovered removable contamination in the basement at the base of a condensation pump in the Condensate Pump Room. The contamination consisted of approximately two handfuls of rust debris stained with oil. It is believed that the presence of the rust material is likely connected to the two hurricane storm events in 2017. The rust debris has been safely encapsulated (sealed) in an epoxy material, which was observed to be intact and undisturbed (PL-4). No additional debris was observed.

Bird nests that were observed in the Airlock 1 during the 2024 inspection were on longer present. In addition, inspectors observed several drip pads (a dozen) along the mezzanine and top of the entombment.

Lead blocks are provided for shielding. Inspectors noted that some of the lead blocks had been moved and were being used as doorstops. Lead blocks should not be moved. Any lead block that has been moved should be returned to its original location.

2.2 Site Security

Site security consists of a guard shack that is staffed around the clock, a motor-operated entrance gate (24 feet wide), and a security fence (i.e., a 6-foot-high chain-link fence topped with three strands of barbed wire) that encloses approximately 5 acres.

Upon arrival, the security guard was present, and the gate was closed and locked. The on-duty security guard allowed the inspection team to enter the grounds. The perimeter security fence was found to be in poor condition and compromised in several areas as evidenced by recent graffiti found on an outbuilding (PL-5 and PL-6). The top rail of the perimeter fence was bent or damaged in many areas. Barbed wire was missing along most of the fence (PL-7). It is recommended that the fence be further repaired if funding becomes available.

2.3 Support Facilities

Support facilities (auditorium, patio area, and training center) are on the west side of the property. The support buildings have no effect on the integrity of the containment building entombment but were inspected to get a better understanding of their present condition and potential future use.

The auditorium was in good condition and was being used by PREPA. It consists of a stage area with seating for approximately 100. The patio area is just outside of the auditorium. It was in good condition and was also being used by PREPA on an as-needed basis. The training center was not being used. For safety reasons, the inspection team did not go inside the training center.

The new retaining wall with security fence atop was installed just west of the support facilities in 2024. It was found to be in great condition (PL-8).

2.4 General Housekeeping

General housekeeping around the site was excellent. Areas between buildings and along the fence line were free of trash. Except for vegetation damage from the 2017 hurricanes, the landscaping was well maintained.

Ventilation and humidity levels within the containment building continue to be a challenge. Many of the excellent museum displays were showing wear due to poor ventilation and humidity. Many of the exhibits are in danger of being permanently damaged if conditions are not improved.

2.5 Surrounding Area

Storm drains leading from the site were found to be clear and free of debris. The beach west of the facility is readily utilized by the public. A construction project was underway to enlarge the parking area next to the lighthouse along the public road leading to the site entrance (PL-9). A demonstration camp was also established on the road leading to the site to protest the construction of a new bike path in the area (PL-10).

3.0 Recommendations

The following recommendations are made for the site:

- A few small areas of the dome should be repainted to help protect the dome from corrosion.
- Remaining hurricane damage to the perimeter fence should be repaired. Existing openings should be patched until the fence can be replaced. PREPA should consider replacing the fence when funding becomes available.
- Inspectors observed several drip pads (a dozen) along the mezzanine and top of the entombment. If the pads are for absorbing oil from the overhead crane, it is recommended that PREPA address this by removing the oil.
- Lead blocks are provided for shielding. Inspectors noted that some of the lead blocks had been moved and were being used as doorstops. Lead blocks should not be moved. Any lead blocks that have been moved should be returned to their original location.
- The retaining wall along the beach remains heavily damaged. It is recommended that PREPA consider repairing the retaining wall when funding becomes available.
- There are suspect asbestos-containing material floor tiles that are damaged in two locations on the main floor. LM recommends further investigation.
- The ends of the rubber seal around the base of the dome, although functional, are no longer attached to the dome. It is recommended that PREPA reattach the end of the seals to the dome.

4.0 Photographs

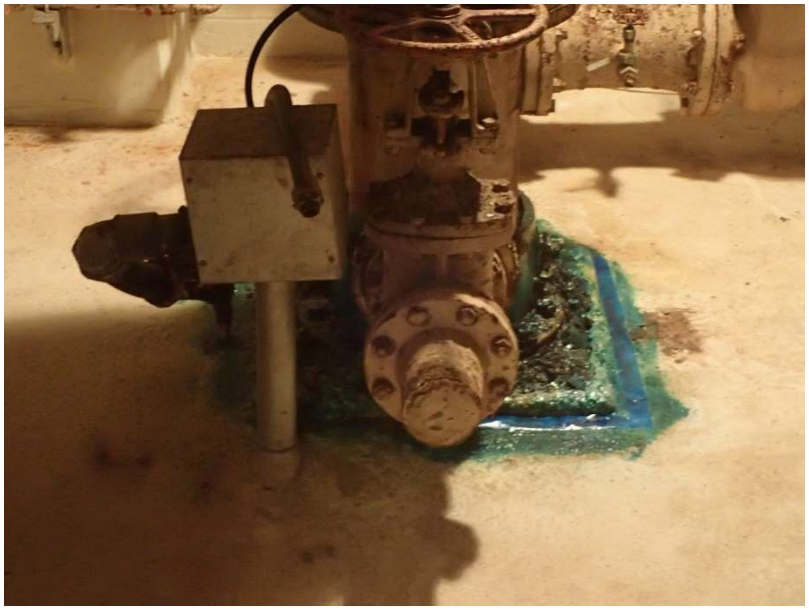
PL Number	Azimuth	Photograph Description
PL-1	—	Hole in Airlock 2 Sealed
PL-2	360	Paint on Dome Damaged
PL-3	—	Seal Along Base of Dome
PL-4	—	Encapsulated Material
PL-5	180	Hole in Fence near Old Zeolite Treatment Plant
PL-6	180	Dated Graffiti on Outside Wall of Old Zeolite Treatment Plant
PL-7	225	Barbed Wire Missing
PL-8	225	New Retaining Wall and Fence
PL-9	20	Construction in Front of Lghthouse
PL-10	—	Protest Signs

Note:
— = Photograph taken vertically from above.

PL-1. Hole in Airlock 2 Sealed

PL-2. Paint on Dome Damaged

PL-3. Seal Along Base of Dome



PL-4. Encapsulated Material

PL-5. Hole in Fence near Old Zeolite Treatment Plant

PL-6. Dated Graffiti on Outside Wall of Old Zeolite Treatment Plant

PL-7. Barbed Wire Missing

PL-8. New Retaining Wall and Fence

PL-9. Construction in Front of Lighthouse

PL-10. Protest Signs

5.0 References

DOE (U.S. Department of Energy), 2003. *Finding of No Significant Impact for Authorizing the Puerto Rico Electric Power Authority (PREPA) to Allow Public Access to the Boiling Nuclear Superheat (BONUS) Reactor Building, Rincón, Puerto Rico,* FONSI DOE/EA-1394, Oak Ridge Operations Office, January.

DOE (U.S. Department of Energy), 2024. *Long-Term Surveillance and Maintenance Plan for the Boiling Nuclear Superheater (BONUS) Reactor Facility, Rincón, Puerto Rico,* LMS/BON/S01091-3.0, Office of Legacy Management, September.

Appendix A

2025 Annual Inspection Site Drawings

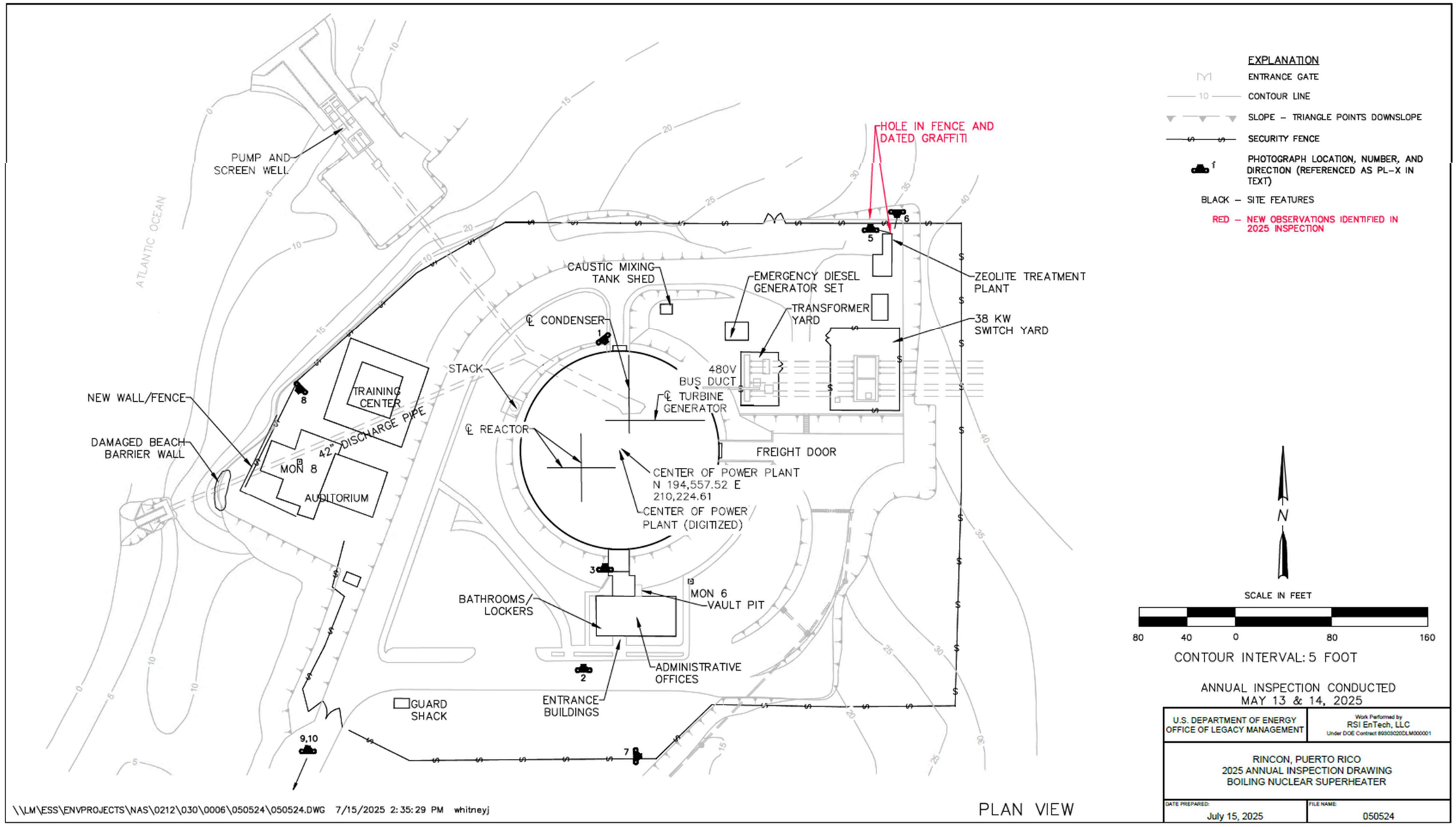


Figure A-1. 2025 Annual Inspection Drawing, Plan View, Rincón, Puerto Rico, BONUS Site

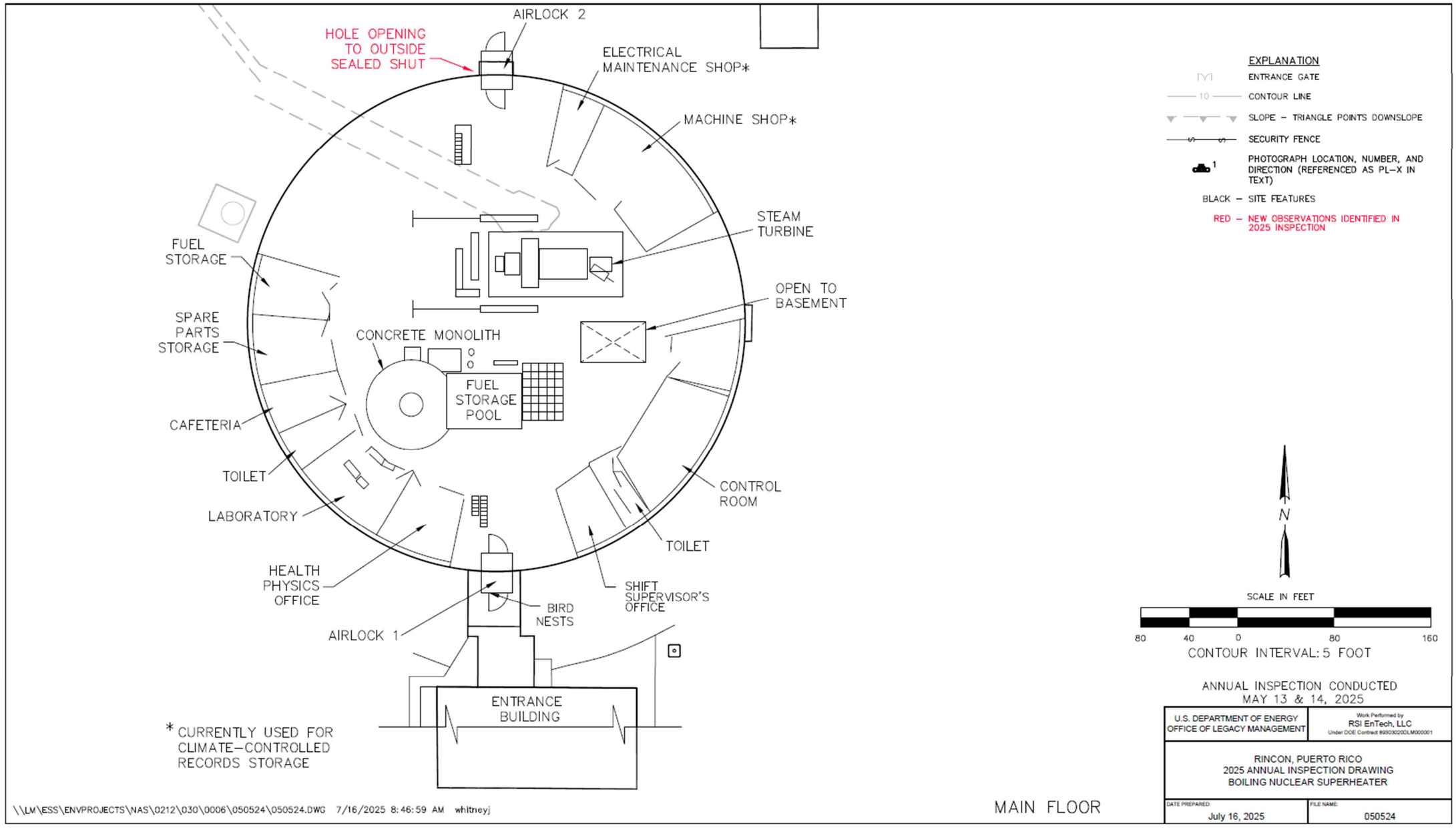


Figure A-2. 2025 Annual Inspection Drawing, Main Floor, Rincón, Puerto Rico, BONUS Site

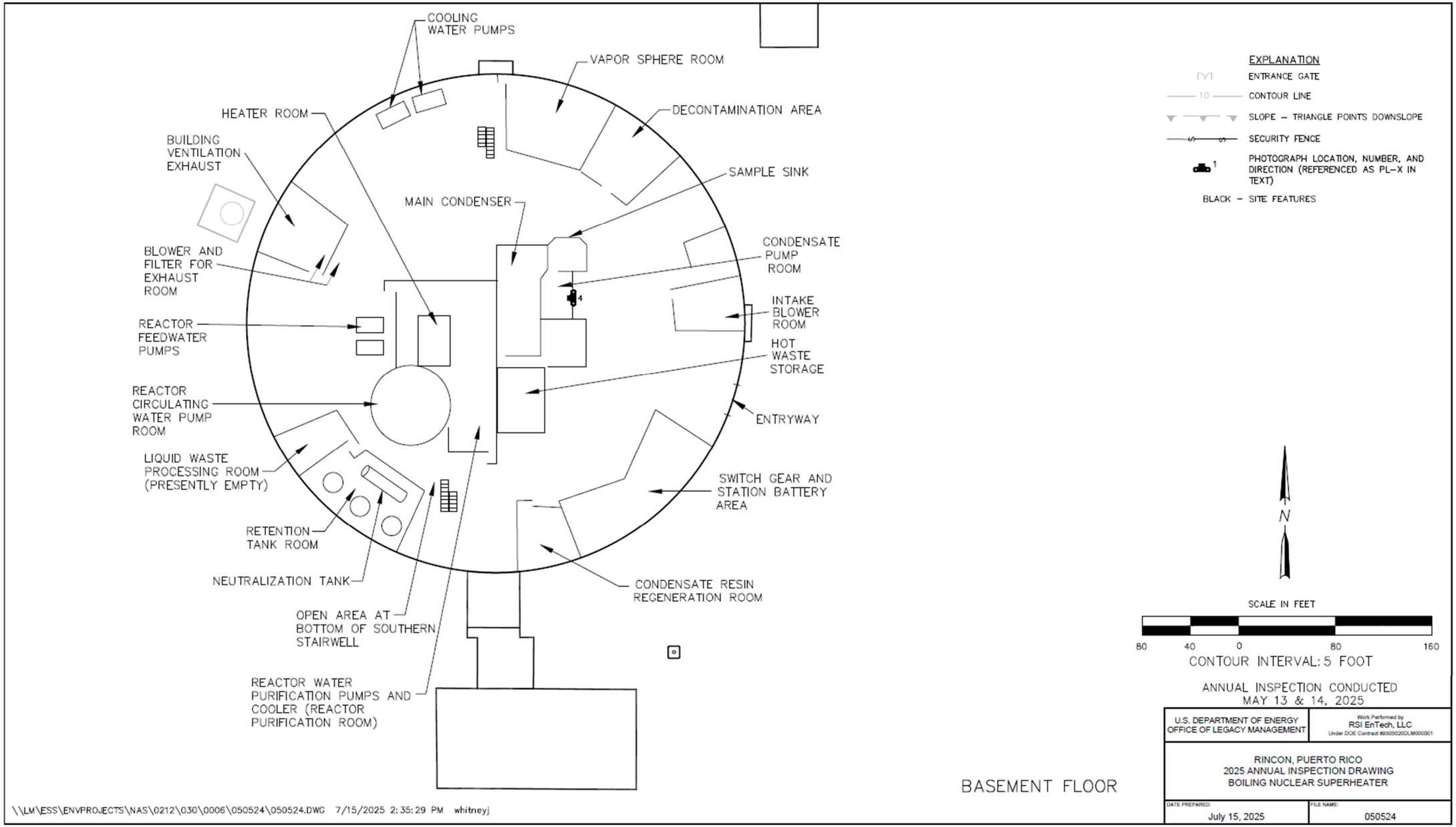


Figure A-3. 2025 Annual Inspection Drawing, Basement Floor, Rincón, Puerto Rico, BONUS Site