

2010 Inspection and Status Report for the Former Boiling Nuclear Superheater (BONUS) Reactor Facility, Rincón, Puerto Rico

Summary

The Former Boiling Nuclear Superheater (BONUS) Reactor Facility, located on the west coast of Puerto Rico in the town of Rincón, was inspected on June 24, 2010. During the inspection radiation technicians from the Idaho National Laboratory (INL) safely packaged and shipped two legacy radioactive sources to INL for disposition.

The BONUS facility consists of the containment building, which houses the entombed reactor system, and outside support facilities. The Puerto Rico Electric Power Authority (PREPA) uses the decommissioned BONUS facility as a history museum. It is opened to the public for scheduled tours.

There are limited and discrete areas within the museum building that have fixed residual radioactive contamination. These areas are isolated, shielded, and posted to protect visitors and workers from exposures to unacceptable levels of contamination. DOE conducted an environmental assessment and concluded that there was no unacceptable risk to human health or the environment from the fixed radioactive-contaminated areas. DOE remains responsible for the entombed radioactive materials at the BONUS facility.

The inspection included confirming the integrity of the entombed reactor system, the containment building, site security, general site housekeeping, and condition of the surrounding land

The integrity of the entombed reactor is in good condition and there is no requirement for a follow up inspection at this time. Several maintenance items involving the containment dome, site security, and general housekeeping were identified during the inspection, specifically:

- The outer surface of the containment dome should be painted within the next three years.
- The rubber seal/gasket at the base of the containment dome should be repaired and/or replaced. Staining inside the containment dome indicates water is leaking in through the damaged seal area.
- The site security fence should be repaired and/or replaced as soon as possible. In many areas the barbed wire is missing, holes large enough for people to pass through are cut into the fence, and vegetation is encroaching upon the fence in many areas.
- The freight door on the east side of the containment dome should be opened. The seal around the door should be inspected (replaced if deemed appropriate). Metal flashing at the base of the door should be replaced to eliminate large holes that have corroded through the flashing.
- Peeling paint in the basement of the containment dome should be checked for lead content.
- PREPA should provide DOE with the contingency plans that will be used to address future flooding of the facility by another hurricane.

1.0 Introduction

This report presents the findings of the U.S. department of Energy (DOE) inspection of the decommissioned Boiling Nuclear Superheater (BONUS) Reactor Facility, in Rincón, Puerto Rico, on Thursday June 24, 2010. The BONUS Decommissioned Reactor Site consists of a containment building that houses the entombed reactor system and outside support facilities.

M. Miller (Inspector) and K. Broberg (Assistant Inspector) both with S.M. Stoller Corporation, the DOE Office of Legacy Management (LM) Contractor at Grand Junction, Colorado, conducted the inspection. A. Reyes with the Puerto Rico Electrical Power Authority (PREPA) served as escort at the facility.

In addition to the site inspection, personnel from the Idaho National Laboratory (D. Rowley and T. LaPage) packaged and shipped two remaining radioactive sources to the Idaho National Laboratory (INL).

The 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 Grand Junction, Colorado, May 2005), and procedures established by DOE for site inspections. The purposes of the inspection were to confirm the integrity of the entombed reactor and the building in which the entombed reactor is located, status site security, assess general housekeeping of the site, and look for changes in the surrounding area that might impact the long term sustainability of the facility.

Prior to beginning the inspection, personnel reviewed and signed the Plan of the Day/Week and the Job Safety Analysis for the site inspection and source disposition at the BONUS Decommissioned Reactor Site (expiration December 31, 2010).

2.0 Sources Disposition

Two legacy radioactive sources (Cs-137 and Sr-90) were safely packaged and shipped from the BONUS facility to the INL (PL-1). Due to the low radioactivity of the sources, the shipment was not regulated. The radiation survey showed that radiation was <0.1 mr/hr at contact (less than background) when shipped and upon arrival at INL. The sources were shipped in a small drum (PL-2) on Monday June 28th. They arrived in Idaho on Tuesday June 29th and are currently being stored in the INL source storage facility. Uses for the sources have yet to be determined.

3.0 Inspection Results

Features discussed in this report are shown on the attached drawing. Photographs to support specific observations are identified in the text and on the drawing by photograph location (PL) numbers.

3.1 Containment Building and Entombed Reactor System

The Containment Dome houses the entombed reactor system (PL-3). The outer painted surface of the southeast side of the domed building is starting to peel and looks weathered (PL-4). It is recommended that the outer surface of the containment dome be painted within the next three years.

Around the base of the containment dome is a rubber seal/gasket that serves to direct water away from the base of the outer curved surface of the dome. The dome has a diameter of approximately 160 feet, and a corresponding circumference of approximately 502.4 feet. The rubber seal was in bad shape. Around the southwest quadrant of the dome, the rubber seal was cracked and ripped (PL-5, PL-6, and PL-7). The seal was in much worse shape around the southeast and northeast quadrants of the dome. In long stretches, it was missing altogether (PL-8 and PL-9) leaving the concrete exposed.

The flashing near the administrative offices at the base of the dome was bent out away from the dome creating a large void for water to enter the building (PL-10). Inspectors found evidence for fresh water leaks due to this void down the inside basement wall of the domed building near the retention tank room (PL-11). Recent water staining was also present on the basement floor beneath the wall stain (PL-12). It is recommended that the seal/gasket and flashing around the base of the containment dome be repaired and/or replaced to prevent further water from entering the building, which could over time compromise the integrity of the entombed reactor.

PREPA opens up portions of the containment building to the public as a museum. Inspectors found peeling paint on painted surfaces in the basement (PL-13). Given the age of the facility, it is possible that the peeling paint could contain lead. It is recommended that the peeling paint be tested for lead.

The basement of the containment building flooded in September 1998 during Hurricane Georges (LTSP, 2005) due to plugged storm drains and leaking door seals. It took several months to remove the water and allow the basement to dry out. The storm drains, which had debris from original construction, were unplugged and the rubber door seals around the basement doors were replaced (after being in place for more than 28 years).

A few inches of concrete have been added to the basement floor of the containment building since Hurricane Georges to provide shielding for some isolated and discrete areas of fixed radioactive contamination on the basement floor. Floor drains in the basement floor were filled in with concrete (PL-14), raising the question of how will water drain from the facility should it flood again. It is recommended that PREPA provide DOE with the plans that will be followed to address future flooding events at the facility.

The freight door on the east side of the containment building, leading to the basement (PL-15), was sealed shut with scale (PL-16). Metal flashing in front of the freight door had large holes in it due to corrosion of the metal (PL-17). These large holes would allow water to enter the basement of the containment dome should the entry way to the freight door flood (PL-18) as it did during Hurricane Georges in 1998. Because the door seal around the freight door is encrusted with scale it appears that the door has not been opened and inspected in a long time. It is recommended that the corroded flashing around the freight door be repaired, and the door be opened and the door seal cleaned, inspected, and replaced if deemed appropriate.

3.2 Site Security

Site security consists of a manned guard shack, a motor operated entrance gate (24 feet wide), and a security fence that encloses an area of approximately 5 acres (6 foot high chain link fence topped with three strands of barbed wire).

During the inspection, the guard shack was found to be manned. Inspectors signed the required log sheet at the site security shack upon arrival. Once inside the facility fence it was noted that the entrance gate was closed.

Inspectors walked the length of the security fence and found it to be in poor condition. The barbed wire along much of the top of the fence was damaged (PL-19). Several large holes were cut in the fence large enough for people to pass through (PL-20). In several areas the fence was overgrown with vegetation (PL-21).

It is recommended that the site security fence be repaired and or replaced as soon as possible.

3.3 General Housekeeping

Inspectors noted a small pile of trash near the auditorium building (PL-22) as well as many site features that are abandoned in place such that they can be considered as eyesore (PL-23). It is recommended that PREPA personnel remove the pile of trash near the auditorium.

3.4 Surrounding Area

The retaining wall on the west side of the facility, near the beach was broken due to a close growing palm tree (PL-24). The area surrounding the retaining wall and perimeter fence was overgrown with vegetation. It is recommended that PREPA address the retaining wall at the same time they address the perimeter fence, and make repairs to the wall as deemed appropriate. Paths were recently cleared through the vegetation around the facility, and work clearing additional paths was underway during the inspection (PL-25).

4.0 Recommendations

1. The outer painted surface of the containment building is starting to peel and looks weathered (page 2).

Recommendation: It is recommended that the outer surface of the containment building be painted within the next three years.

2. The flashing near the administrative offices was bent out away from the dome creating a large void for water to enter the base of the dome. Inspectors found evidence of recent water leaks down the inside basement wall of the domed building near the retention tank room. Water staining also was present on the basement floor beneath the wall stain. It appears that the water staining within the facility is a direct cause of the hole that is present due to the bent flashing (page 3).

Recommendation: It is recommended that the gasket/seal and flashing around the base of the containment dome be repaired and/or replaced to prevent further water from entering the building, which could, over time, compromise the integrity of the entombed reactor.

3. Inspectors found peeling paint on painted surfaces in the basement. Given the age of the facility, it is possible that the peeling paint could contain lead (page 3).

Recommendation: It is recommended that the peeling paint be tested for lead.

4. Floor drains in the basement were filled in with concrete making it unclear as to how water will drain from the facility should it flood again (page 3).

Recommendation: It is recommended that PREPA provide DOE with the plans that will be followed to address potential future flooding events at the facility.

5. The freight door on the east side of the containment building, leading to the basement, was sealed shut with scale. Metal flashing in front of the freight door had large holes in it due to corrosion of the metal. These large holes would allow water to enter the basement of the containment dome should the entry way to the freight door flood as it did during Hurricane Georges in 1998. Because the door seal around the freight door is encrusted with scale it appears that the door has not been opened to check the seal in a long time (page 3).

Recommendation: It is recommended that the corroded flashing around the freight door be repaired, and the door be opened, the door seal cleaned, inspected, and replaced if deemed appropriate.

6. The security fence was in poor condition. The barbed wire along much of the top of the fence was damaged. Several holes, large enough for people to pass through, were cut in the fence. In several areas the fence was overgrown with vegetation (page 4).

Recommendation: It is recommended that the site security fence be repaired or replaced as soon as possible.

7. Inspectors noted a small pile of trash near the auditorium building as well as many site features that are abandoned in place such that they can be considered as eyesore (page 4).

Recommendation: It is recommended that PREPA personnel remove the pile of trash near the auditorium.

8. The retaining wall on the west side of the facility near the beach was broken due to a close-growing palm tree. The area surrounding the retaining wall and perimeter fence was overgrown with vegetation (page 5).

Recommendation: It is recommended that PREPA address the retaining wall at the same time they address the perimeter fence, and make repairs to the wall as deemed appropriate.

5.0 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	NA	Old Sr-90 and Cs-137 sources being packaged for shipping to INL.
PL-2	NA	Shipping drum for two sources being packaged for shipping to INL.
PL-3	10	South side of containment dome.
PL-4	315	Southeast side of containment dome. Paint shows signs of weathering.
PL-5	NA	Rubber seal at base of containment dome.
PL-6	NA	Rubber seal at base of containment dome.
PL-7	NA	Rubber seal at base of containment dome.
PL-8	NA	Rubber seal at base of containment dome.
PL-9	NA	Rubber seal at base of containment dome.
PL-10	NA	Rubber seal at base of containment dome.
PL-11	NA	Water staining down the inside wall of the basement of containment dome.
PL-12	NA	Water staining on floor of basement within containment dome.
PL-13	NA	Peeling paint in basement.
PL-14	NA	Drain in floor of basement filled in with concrete.
PL-15	270	Freight door on the east side off the containment dome.
PL-16	270	Seal around freight door on east side of the containment dome.
PL-17	270	Base of freight door on east side of containment dome is rusted through.
PL-18	270	Freight door on east side of containment dome.
PL-19	360	Perimeter fence.
PL-20	360	Large hole cut in perimeter fence.
PL-21	315	Vegetation on perimeter fence.
PL-22	NA	Pile of trash outside of auditorium.
PL-23	NA	Open electric box near guard shack.
PL-24	20	Retaining wall, west side of property.
PL-25	90	Construction activity taking place around facility grounds. Paths being cleared of vegetation.



BON 6/2010. PL-1. Old Sr-90 and Cs-137 sources being packaged for shipping to INL.



BON 6/2010. PL-2. Shipping drum for two sources being packaged for shipping to INL.



BON 6/2010. PL-3. South side of containment dome.



BON 6/2010. PL-4. Southeast side of containment dome. Paint shows signs of weathering.



BON 6/2010. PL-5. Rubber seal at base of containment dome.



BON 6/2010. PL-6. Rubber seal at base of containment dome.



BON 6/2010. PL-7. Rubber seal at base of containment dome.



BON 6/2010. PL-8. Rubber seal at base of containment dome.



BON 6/2010. PL-9. Rubber seal at base of containment dome.



BON 6/2010. PL-10. Rubber seal at base of containment dome.



BON 6/2010. PL-11. Water staining down the inside wall of the basement of containment dome.



BON 6/2010. PL-12. Water staining on floor of basement within containment dome.



BON 6/2010. PL-13. Peeling paint in basement.



BON 6/2010. PL-14. Drain in floor of basement filled in with concrete.



BON 6/2010. PL-15. Freight door on the east side off the containment dome.



BON 6/2010. PL-16. Seal around freight door on east side of the containment dome.



BON 6/2010. PL-17. Base of freight door on east side of containment dome is rusted through.



BON 6/2010. PL-18. Freight door on east side of containment dome.



BON 6/2010. PL-19. Perimeter fence.



BON 6/2010. PL-20. Large hole cut in perimeter fence.



BON 6/2010. PL-21. Vegetation on perimeter fence.



BON 6/2010. PL-22. Pile of trash outside of auditorium.



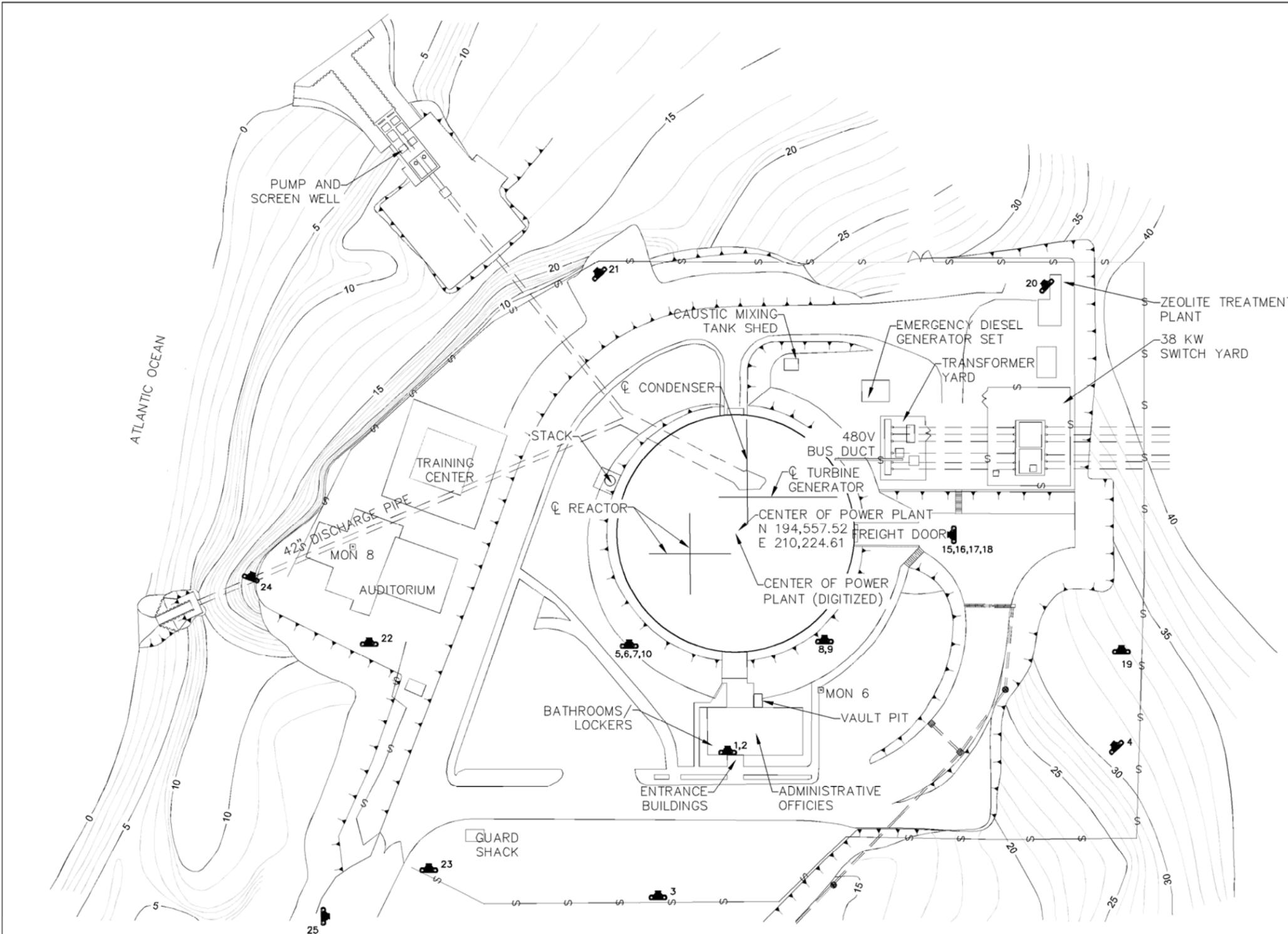
BON 6/2010. PL-23. Open electric box near guard shack.



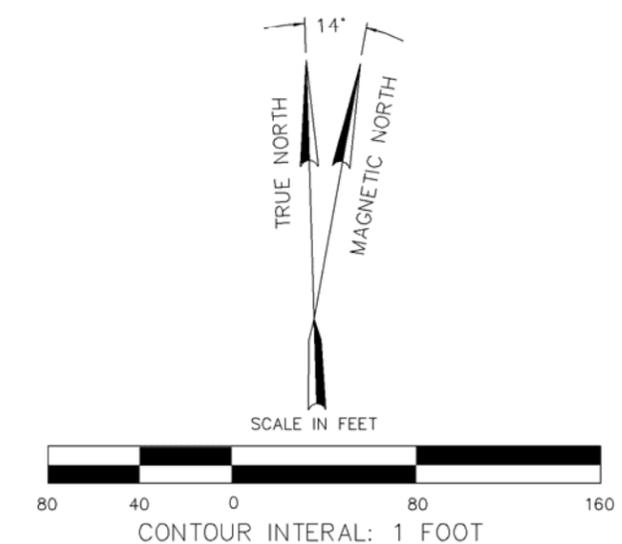
BON 6/2010. PL-24. Retaining wall, west side of property.



BON 6/2010. PL-25. Construction activity taking place around facility grounds. Paths being cleared of vegetation.

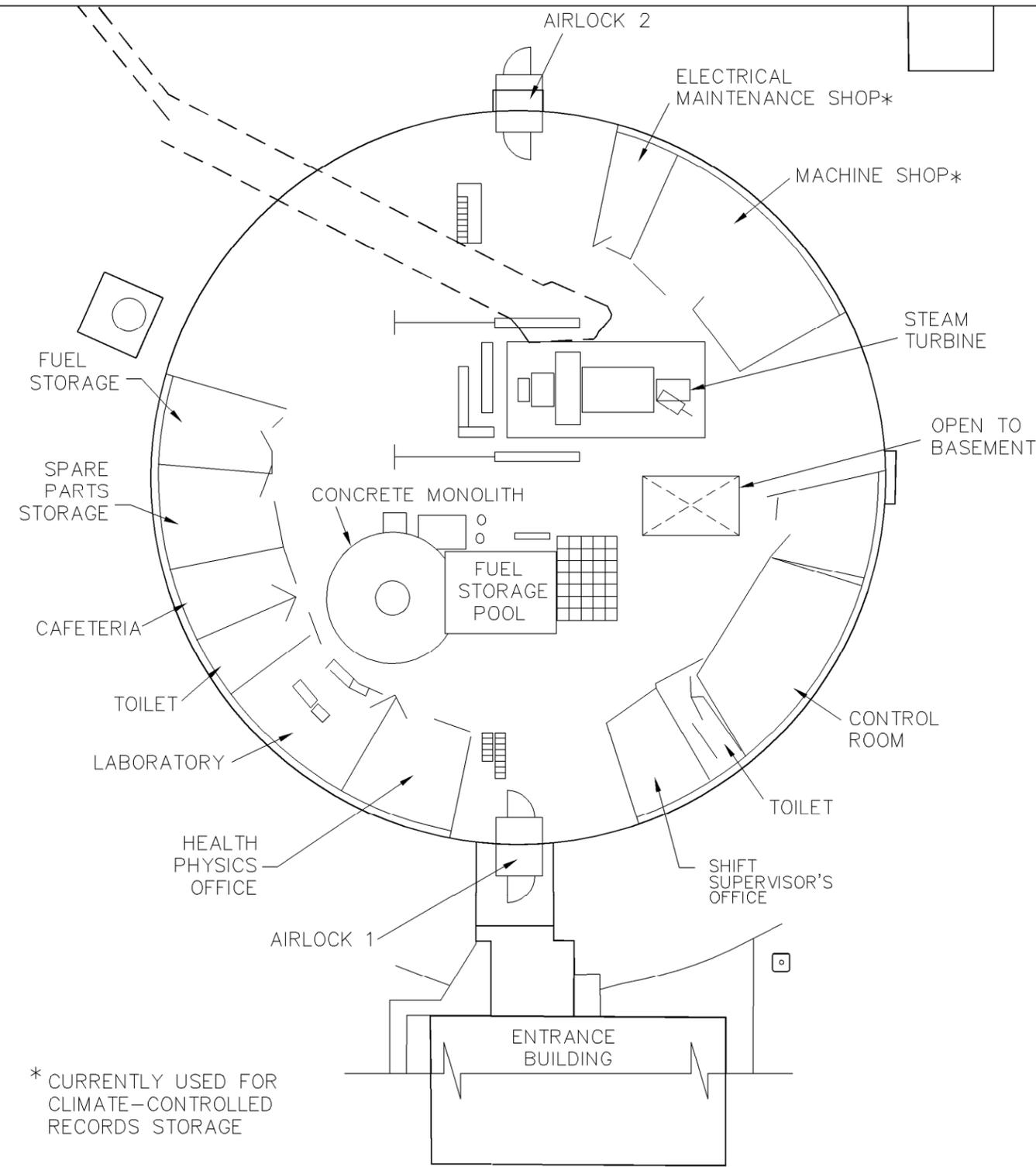


- EXPLANATION**
- ENTRANCE GATE
 - 10 CONTOUR LINE
 - SLOPE - TRIANGLE POINTS DOWNSLOPE
 - SECURITY FENCE
 - PHOTO LOCATION, NUMBER AND ROTATION



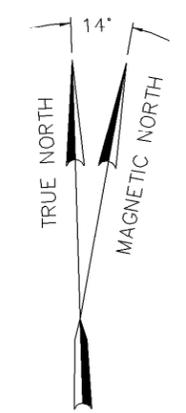
ANNUAL INSPECTION CONDUCTED
JUNE 24, 2010

U.S. DEPARTMENT OF ENERGY GRAND JUNCTION, COLORADO	Work Performed by S.M. Stoller Corporation Under DOE Contract No. DE-AM01-07LM00060
2010 INSPECTION DRAWING RINCON, PUERTO RICO BOILING NUCLEAR SUPER HEATER	
DATE PREPARED: JULY 21, 2010	FILENAME: S0669800



* CURRENTLY USED FOR CLIMATE-CONTROLLED RECORDS STORAGE

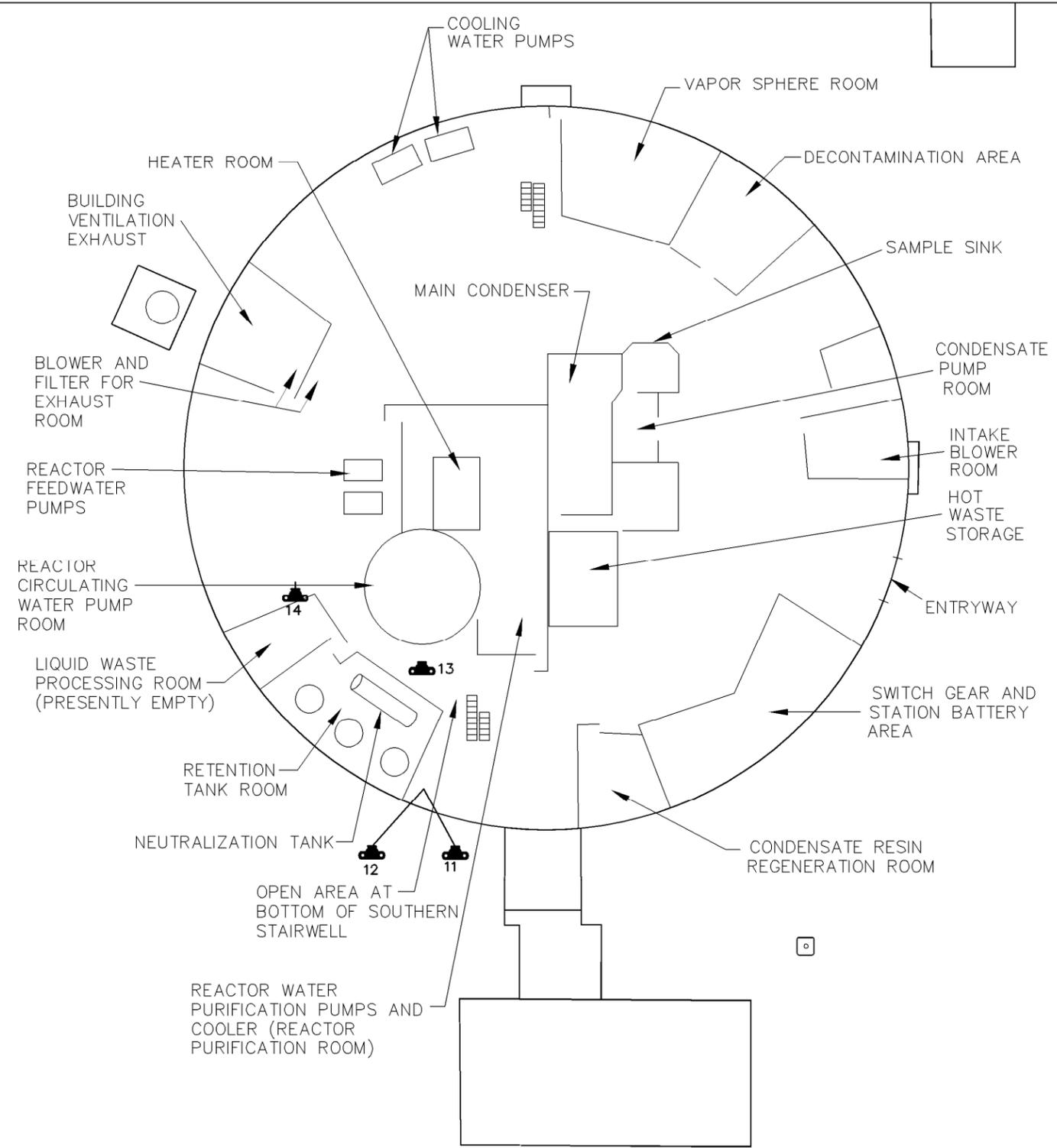
EXPLANATION	
	ENTRANCE GATE
	CONTOUR LINE
	SLOPE - TRIANGLE POINTS DOWNSLOPE
	SECURITY FENCE
	PHOTO LOCATION, NUMBER AND ROTATION



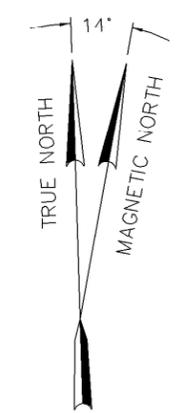
ANNUAL INSPECTION CONDUCTED
JUNE 24, 2010

U.S. DEPARTMENT OF ENERGY GRAND JUNCTION, COLORADO	Work Performed by S.M. Stoller Corporation Under DOE Contract No. DE-AM01-07LM00060
2010 INSPECTION DRAWING RINCON, PUERTO RICO BOILING NUCLEAR SUPER HEATER	
DATE PREPARED: JULY 21, 2010	FILENAME: S0669800

MAIN FLOOR



EXPLANATION	
	ENTRANCE GATE
	CONTOUR LINE
	SLOPE - TRIANGLE POINTS DOWNSLOPE
	SECURITY FENCE
	PHOTO LOCATION, NUMBER AND ROTATION



ANNUAL INSPECTION CONDUCTED
JUNE 24, 2010

U.S. DEPARTMENT OF ENERGY GRAND JUNCTION, COLORADO	Work Performed by S.M. Stoller Corporation Under DOE Contract No. DE-AM01-07LM00060
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2010 INSPECTION DRAWING RINCON, PUERTO RICO BOILING NUCLEAR SUPER HEATER	
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DATE PREPARED: JULY 21, 2010	FILENAME: S0669800
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BASEMENT FLOOR