

2018 Annual Inspection and Status Report for the Hallam, Nebraska, Decommissioned Reactor Site

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U.S. DEPARTMENT OF
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Appendix A Site Drawing

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Summary

The former Hallam Nuclear Power Facility (now the Hallam, Nebraska, Decommissioned Reactor Site) was inspected on April 4, 2018. The Intermediate Heat Exchanger Building was found to be in good condition, as were the grass-covered entombment mound and groundwater monitoring wells. It was noted however, the outer casing of the monitoring wells will need to be repainted due to weathering and rusting at the lower portion of the casing. No cause for a follow-up inspection was identified.

In advance of the 2018 site inspection, the U.S. Department of Energy Office of Legacy Management (LM) was requested by the Sheldon Power Station to allow a Canadian tour group to shadow the site inspection to gain an understanding of long-term stewardship initiatives for a U.S. decommissioned reactor facility. Before the field inspection, LM and its Legacy Management Support contractor, Navarro Research and Engineering, Inc., provided an educational briefing to the tour group on the role LM plays in fulfilling its mission of stewardship.

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1.0 Introduction

This report presents the findings of the annual U.S. Department of Energy (DOE) Office of Legacy Management (LM) April 4, 2018, inspection of the Hallam, Nebraska, Decommissioned Reactor Site. Features discussed in this report are shown in Appendix A. Photographs to support specific observations are identified in the text and on the drawing by photograph location (PL) numbers.

Navarro Research and Engineering, Inc., (Navarro), (the DOE Legacy Management Support contractor) conducted the inspection. The DOE site manager, representatives from the Nebraska Department of Health and Human Services (Nebraska DHHS), and representatives of the Canadian Nuclear Laboratories near Winnipeg, Manitoba, Canada accompanied the inspection. A representative of the Nebraska Public Power District (NPPD) escorted the inspection team (PL-1).

The inspection was conducted in accordance with the *Long-Term Surveillance Plan for the Decommissioned Hallam Nuclear Power Facility, Hallam, Nebraska* (DOE 2017) and DOE procedures for site inspections. The inspection was conducted to confirm the integrity of the Intermediate Heat Exchanger (IHX) Building and the grass cover on the foundation of the former reactor building, examine the condition of DOE monitoring wells, and discuss any changing conditions at the Sheldon Power Station (referred to as “Sheldon Station” hereafter) with owner representatives.

2.0 Inspection Results

The Hallam site has the following features:

- IHX cells, entombed in a waterproofed, above-grade, concrete building (the IHX Building).
- A massive, below-grade, reinforced concrete structure (once the reactor foundation now covered with a waterproof membrane, soil, and grass, collectively called “the grass-covered mound”). Fixed radioactive materials remain at three principal locations inside this structure.
- Nineteen groundwater monitoring wells (OBS-1A, OBS-1B, OBS-2A, OBS-2B, OBS-2B2, OBS-2C2, OBS-3A, OBS-3B, OBS-4A, OBS-4B, OBS-4C, OBS-5A, OBS-5B, OBS-7B, OBS-6A, OBS-6B, OBS-7C, OBS-8B, and OBS-8C).

The IHX Building, the below-grade concrete structure, and the groundwater monitoring wells are at Sheldon Station, an active coal-fired power plant owned and operated by NPPD.

2.1 IHX Building

The IHX Building is a massive, 40-foot-wide × 80-foot-long concrete sarcophagus at the north end of the former Hallam Nuclear Power Facility. The south side of the building is two stories (about 25–30 feet high) with a slightly crowned roof, and the north side of the building is one story with a roof that is sloped to drain. Inspectors viewed the roof of the IHX Building from the roof of Sheldon Station to the north.

The roof of the IHX Building was replaced in 2007. The entire roof is capped with a layer of rock material that protects the underlying roofing fabric. Inspectors noted in 2008 that roof rock was missing in the northwest and southwest corners of the crowned roof, exposing the underlying fabric. Strong winds are believed to be the cause of the missing stones. Paver stones were placed in all corners of the roof in 2009 to correct the problem. The roof was in good condition during the 2018 inspection. No bare spots were observed (PL-2).

Damage of unknown origin in one spot on the metal roof edge on the building's south side was discovered in 2017. The roof gutter system remains serviceable. No action is required to address the damage at this time. If significant water drains from the roof and down the south wall through the damaged metal edge during a heavy rain, the metal edge will need to be repaired so the base of the building is not undermined. Inspectors will continue to monitor the damage for signs that this might be occurring.

In 2009, soil and gravel were placed around the base of the IHX Building in a shallow, narrow depression in the ground surface that trapped water against the base of the building. With the depression filled, water now drains away from the building base. The perimeter slope around the IHX Building was in good condition during the inspection.

Water stains (noted in previous inspections) remain visible on the outer walls of the IHX Building (PL-3 and PL-4). No corrective action is recommended at this time to address the stains. Inspections of these areas will continue each year to determine whether staining is impacting the protectiveness of the building.

Several surface cracks were observed this year on the walls of the IHX Building that do not appear to compromise the structure (PL-5 through PL-8). No corrective action is recommended at this time to address the cracks. They will be inspected each year to determine whether they are impacting the protectiveness of the building.

2.2 Buried Concrete Structure (Former Reactor Foundation)

The old reactor foundation is buried beneath a waterproof membrane covered by soil and grass. The buried structure appears as a low, flat-topped, grass-covered mound, 1.4 acres in area, immediately south of the IHX Building (PL-9 and PL-10). Inspectors verified that erosion is not developing on the mound, and the sprinkler system is operating adequately to maintain the grass cover. Mound grass was well-established and in good condition.

At the time of the inspection, the sprinkler system had not been turned on for the 2018 year because seasonal rain was sufficient to keep the turf healthy. Plant personnel stated that last year the sprinkler system worked well when watering was required.

A land survey of the mound area at the Hallam facility was conducted in 2016, and survey pins were installed in 2017 to better define the area of the grass-covered mound that pertains to DOE long-term care and maintenance (PL-11).

2.3 Groundwater Monitoring Wells

There are 19 monitoring wells onsite. During the inspection, all 19 monitoring wells were inspected and found to be properly secured.

Four of the 19 monitoring wells have a flush-mount design and are locked using a special tool. The other 15 wells require a padlock. All 15 padlocked wells received a new lock in 2013, except for well OBS-3B. The hasp on well OBS-3B was too small for the shank of the new lock. A new smaller shank lock was installed in 2016. The outer casing of the monitoring wells will need to be repainted due to weathering and rusting at the lower portion of the casing the next time they are sampled. The wells will be sampled again in 2021.

The concrete Jersey barrier on the east side of the OBS-2 well pad protects the well pad from power plant operations. In past years, movement of this barrier was a concern, because the barrier was routinely nudged west, closer to the well pad (PL-12). The barrier position was found to be acceptable this year.

The OBS-4 well pad is located on the edge of a parking lot. Recent changes to the parking lot allow cars to come closer to the well pad than they did previously. DOE plans to install bollards around the OBS-4 well pad during the next sampling event in 2021 to provide added protection. DOE has requested that the Sheldon Power Plant place Jersey traffic barriers around the pad until the bollards can be installed.

2.4 Groundwater Monitoring Results

A surveillance and monitoring program was initiated in 1970 by the Nebraska Department of Health (NDH) and was funded by the U.S. Atomic Energy Commission. It included the analysis of samples from deep production wells (groundwater from the regional aquifer at depths greater than 180 feet) at the Sheldon Power Station. NDH was concerned in 1990 about the possibility of shallow groundwater coming in contact with the buried radiological materials along the buried walls of the reactor. Subsequently, DOE and NDH agreed to further characterize hydrologic conditions and establish a monitoring program in the shallow, perched groundwater zones. The current monitoring program focuses on the shallow, perched groundwater.

DOE monitors groundwater as a best management practice in response to a request from Nebraska DHHS. In 2006, DOE recommended discontinuing groundwater monitoring because analytical results since 1970 demonstrate there has been no impact to shallow, perched groundwater and no current or anticipated unacceptable risk to human health and the environment. The State of Nebraska did not concur with the recommendation to stop monitoring but did agree to a reduction in sampling and analysis from once a year to once every 2 years—a schedule that began in 2008.

Groundwater samples were last collected in June 2016, in accordance with the long-term surveillance plan (DOE 2008). Water levels were measured in 17 monitoring wells, and those wells were sampled for gross alpha, gross beta, tritium, gamma spectrometry, and nickel-63. Results are posted on the LM website (<https://www.lm.doe.gov/land/sites/ne/hallam/hallam.htm>).

Results from the 2016 sampling event were similar to those of previous sampling events. Gross alpha and gross beta are the only parameters that were detected at statistically significant concentrations. The gross alpha and gross beta activity concentrations are consistent with values detected previously and are attributed to naturally occurring radionuclides such as uranium and its decay-chain products in the groundwater.

An updated assessment of the groundwater monitoring effort was issued in 2016 (DOE 2016). The entire body of water quality data continues to demonstrate that there have been no negative impacts to the shallow, perched groundwater from radioactive materials entombed at the site 49 years ago. DOE changed the sampling frequency, effective in 2018, as follows: once every 5 years from 2021 to 2041 and once every 10 years from 2041 to 2071.

In 2006, DOE demonstrated that the gross alpha activities measured at the site can be attributed to naturally occurring radionuclides (e.g., uranium and uranium decay chain products) in the groundwater (DOE 2006). DOE will add the analysis of total uranium (beginning with the next sampling event) so that this relationship can be readily demonstrated for each future sampling event.

3.0 Minor Maintenance Actions

The OBS-4 well pad is located on the edge of a parking lot. Recent changes to the parking lot allow cars to come closer to the well pad than they did previously. DOE plans to install bollards around the OBS-4 well pad during the next sampling event in 2021 to provide added protection. DOE has requested that the Sheldon Power Plant place Jersey traffic barriers around the pad until the bollards can be installed.

4.0 Photographs

Photograph Location Number	Azimuth	Photograph Description
PL-1	45	Canadian group at IHX Building
PL-2	225	IHX roof
PL-3	315	IHX Building—east side
PL-4	90	IHX Building—west side
PL-5	180	IHX Building—surface cracks on north side
PL-6	180	IHX Building—surface cracks on north side
PL-7	180	IHX Building—surface cracks on north side
PL-8	180	IHX Building—surface cracks on north side
PL-9	360	Grass-covered mound and IHX Building—looking north
PL-10	315	Grass-covered mound and IHX Building—looking northwest
PL-11	NA	Survey pins
PL-12	360	Monitoring well OBS-2 well cluster



PL-1. Canadian group at IHX Building



PL-2. IHX roof



PL-3. IHX Building—east side



PL-4. IHX Building—west side



PL-5. IHX Building—surface cracks on north side



PL-6. IHX Building—surface cracks on north side



PL-7. IHX Building—surface cracks on north side



PL-8. IHX Building—surface cracks on north side



PL-9. Grass-covered mound and IHX Building—looking north



PL-10. Grass-covered mound and IHX Building—looking northwest



PL-11. Survey pins



PL-12. Monitoring well OBS-2 well cluster

5.0 References

DOE (U.S. Department of Energy), 2006. *Summary of Ground Water Monitoring Results and Recommendation to Discontinue Monitoring at the Decommissioned Hallam Nuclear Power Facility, Hallam Nebraska*, DOE-LM/1319-2006, Office of Legacy Management, September.

DOE (U.S. Department of Energy), 2008. *Long-Term Surveillance Plan for the Decommissioned Hallam Nuclear Power Facility, Hallam, Nebraska*, LMS/HAL/S03478, Office of Legacy Management, June.

DOE (U.S. Department of Energy), 2016. *Monitoring Assessment Report for the Decommissioned Hallam Nuclear Power Facility*, LMS/HAL/S14752, Office of Legacy Management, December.

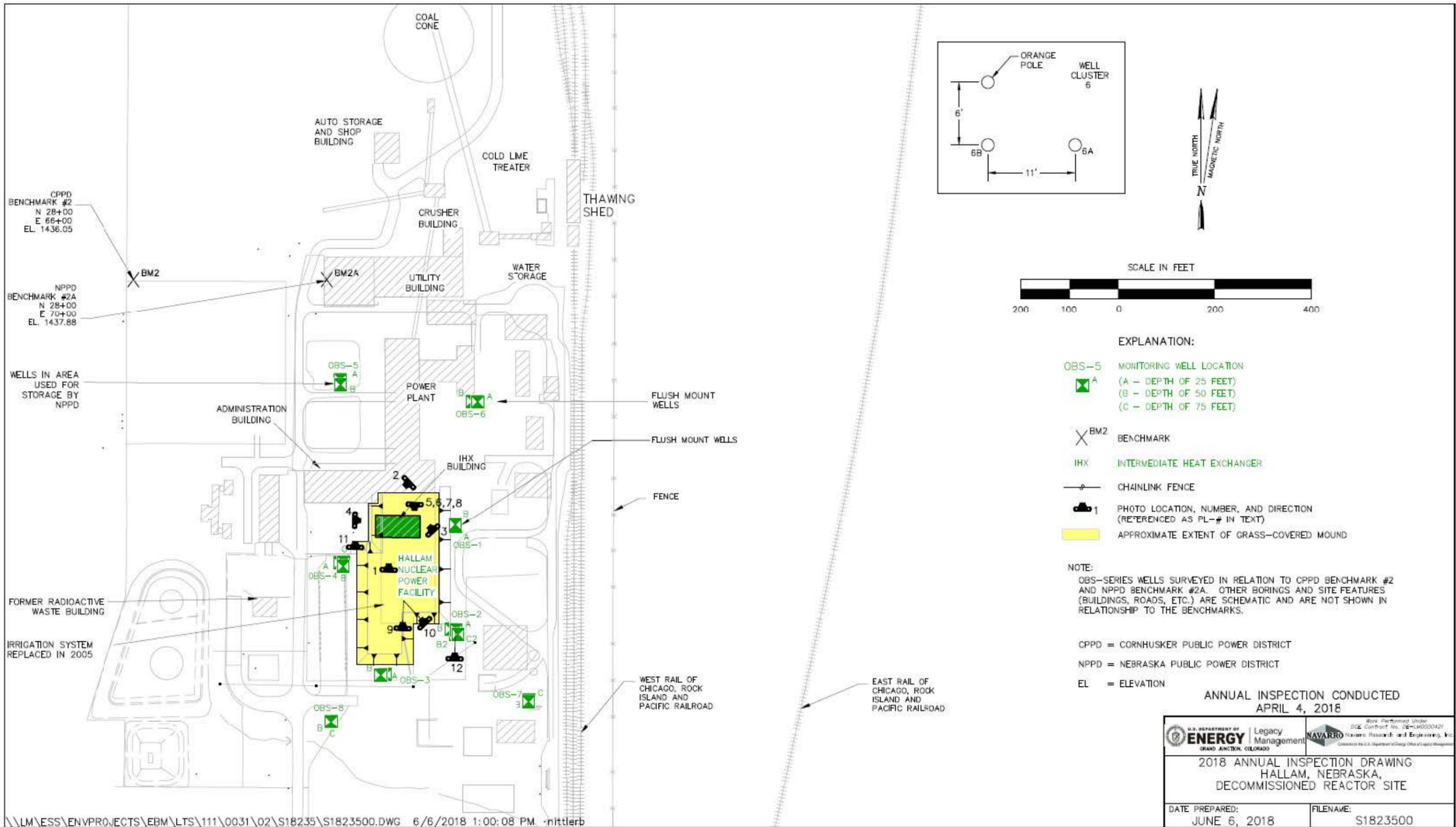
DOE (U.S. Department of Energy), 2017. *Long-Term Surveillance Plan for the Hallam, Nebraska, Decommissioned Reactor Site*, LMS/HAL/S03478, Office of Legacy Management, June.

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Appendix A

Site Drawing

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Site Drawing of Hallam, Nebraska, Decommissioned Reactor Site

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