Office of Enterprise Assessments
Assessment of the Pantex Plant
Gravel Gerties Aging Management

July 2018

Office of Nuclear Safety and Environmental Assessments
Office of Environment, Safety and Health Assessments
Office of Enterprise Assessments
U.S. Department of Energy

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Acronyms

ASME	American Society of Mechanical Engineers
CFR	Code of Federal Regulations
CM	Configuration Management
CNS	Consolidated Nuclear Security, LLC
CRAD	Criteria and Review Approach Document
DIS	Design Information Summary
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
EA	Office of Enterprise Assessments
GG	Gravel Gertie
HE	High Explosive
ISI	In-Service Inspection
M&O	Management and Operating
NNSA	National Nuclear Security Administration
OFI	Opportunity for Improvement
PM	Preventive Maintenance
Pu	Plutonium
SCID	Safety Control Information Database
SE	System Engineer
TSR	Technical Safety Requirement

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EXECUTIVE SUMMARY

The U.S. Department of Energy Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of the Pantex Plant assembly cell building structures with a focus on the material condition of the portion titled the "Gravel Gertie" (GG). The roof on top of the concrete cylindrical structure (round room) comprised of gravel and supported by a crisscrossing grid of large bridge cables is defined as the GG.

This EA independent assessment evaluated the adequacy of GG aging management because the structures range in age from 40 to 61 years. In addition, the assessment evaluated the adequacy of the cell building documented safety analysis in identifying functional requirements and performance criteria for the GG, the accuracy of GG configuration management documentation and maintenance, the implementation of in-service inspection requirements, and the Consolidated Nuclear Security, LLC (CNS) assigned system engineer's performance in ensuring that the GG continues to fulfill safety basis expectations.

With one exception, CNS is effectively maintaining the material condition of the GGs, and the buildings structures should support many more years of assembly cell operations. The exception involves the lack of monitoring for cable deterioration outside the ring beam. Also, the system engineer assigned responsibility for the GG is effectively performing their duties. In addition, EA identified a few deficiencies, including use of a draft analysis to support approval of a Documented Safety Analysis change, irretrievability of some design basis documentation, and timely completion of surveillances and in-service inspections.

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1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted a safety system management assessment with a focus on the aging management of the Pantex Plant assembly cell buildings confinement feature called the "Gravel Gertie" (GG). The purpose of this EA assessment was to evaluate the implementation of safety system management requirements by the site contractor, Consolidated Nuclear Security, LLC (CNS), to adequately maintain the GG material condition and monitor any deterioration of the GG structures, which range in age from 40 to 61 years. This assessment also evaluated the GG configuration for consistency with the design basis requirements assumed in the safety basis documentation. EA performed this assessment at the Pantex Plant from April 9 to 19, 2018.

2.0 SCOPE

As specified in the *Plan for the Office of Enterprise Assessments Assessment of Aging Management of Cell Building Structures at the Pantex Plant – March 2018*, this assessment evaluated the adequacy of the assembly cells' documented safety analysis (DSA) functional requirements and performance criteria for the GG, the maintaining of configuration management (CM) documentation, the implementation of in-service inspection (ISI) requirements, and the CNS-assigned system engineer's (SE's) performance.

3.0 BACKGROUND

The National Nuclear Security Administration (NNSA) Production Office's current Management and Operating (M&O) contractor is CNS. However, some actions addressed in this report are attributed to former M&O contractors. Based on evolving nuclear explosive designs in the early 1950s, the Atomic Energy Commission pursued a new facility design to conduct nuclear explosive assembly and disassembly activities. The design incorporated a confinement feature to significantly reduce the potential for radioactive material release in the event of an accidental conventional high explosive (HE) detonation during nuclear explosive activities. The facility design was tested at the Nevada Test Site (now the Nevada Nuclear Security Site) in the 1950s and 1980s, and assembly cell buildings were constructed at the Pantex Plant. Three groups of assembly cell structures were built at the Pantex Plant, including Building 12-44 Cells 1-6 in the mid 1950s, Building 12-85 and 96 in the early 1980s, and Building 12-98 Cells 1-4 in the mid 1980s.

The assembly cell structure provides the confinement feature to minimize radioactive material release in the event of an accidental HE detonation. One unique feature of the assembly cell structure which was specifically designed to support the confinement function is the GG. The GG consists of a steel reinforced concrete cylindrical structure (round room) that carries the load of a suspended roof comprised of a thick bed of various sizes of gravel held in place and supported by a crisscrossing grid of large diameter bridge cables (normally referred to as catenary cables) laced through the walls of the round room. The function of the GG is exercised upon an accidental HE detonation, which causes upward movement of the gravel roof, thereby allowing high pressure combustion gas venting and aerosolized radioactive material capture by the gravel falling down into the round room. The results of the GG tests at the Nevada Test Site were used to establish a minimum HE quantity to fully exercise the GG of approximately 106 pounds and a confinement filtration efficiency of approximately 99.6 %.

If more than 106 pounds of HE accidently detonates, the GG functions as designed. If less than 106 pounds accidently detonates, not enough energy is released to raise the gravel a sufficient height to dislocate the gravel support structure, fully vent and filter the gases, and fall back into the round room. Under these accident conditions the round room and adjacent rooms internal volume becomes pressurized. The pressure in the assembly cell will gradually return to atmospheric pressure through minor building leakage and cooling of the unfiltered detonation gases. The assembly cell depressurization will take significantly longer compared to the time frame assumed for a full actuation of the GG. Therefore, based on the design of the GG, an accidental detonation of HE amounts less than 106 pounds could potentially result in higher consequences at the site boundary.

4.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*. EA implements the independent oversight program through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. Organizations and programs within DOE use varying terms to document specific assessment results. In this report, EA uses the terms "deficiencies, findings, and opportunities for improvement (OFIs)" as defined in DOE Order 227.1A. In accordance with DOE Order 227.1A, DOE line management and/or contractor organizations must develop and implement corrective action plans for the deficiencies identified as findings. Other important deficiencies not meeting the criteria for a finding are also highlighted in the report and summarized in Appendix C. These deficiencies should be addressed consistent with site-specific issues management procedures.

As identified in the assessment plan, this assessment considered requirements related to the adequacy of approved safety basis documentation, adequacy of CM documentation supporting design basis, implementation of safety basis in-service inspection (ISI) requirements, and implementation of cognizant system engineering responsibilities by the management and operating (M&O) contractor.

EA used specific criteria from the following sections of CRAD 31-15, *Safety Systems Management Review*, for this assessment:

SS.1: Engineering design documents and analyses are technically adequate and implement the requirements of the DSA such that adequate protection of the public, the workers, and the environment from the facility hazards is demonstrated. (DOE-STD-3009-1994 CN-3 and 10 CFR 830.122)

SS.3: CM programs and processes are adequate to ensure that safety systems continue to meet safety basis requirements and that changes are properly controlled.

SS.5: Surveillance and testing activities are properly performed in accordance with technical safety requirements (TSRs) for surveillance and specific administrative controls.

SS.7: Cognizant SE program implementation is effective in ensuring that safety systems can reliably perform as intended.

EA examined key documents, such as engineering analyses, drawings, system descriptions, work packages, procedures, manuals, policies, training and qualification records. EA also conducted interviews with personnel responsible for developing and executing the associated programs. Since no ISI activities were scheduled during the assessment, a field walkthrough demonstration of the ISI procedure steps was conducted by CNS. Also, photographic results of the most recent ISI activities were reviewed, and significant portions of assembly cell building facilities were walked down with a focus on the GG. The members of the EA assessment team, the Quality Review Board, and EA management responsible for this assessment are listed in Appendix A. A detailed list of the documents reviewed, personnel interviewed, and observations made during this assessment, relevant to the findings and conclusions of this report, is provided in Appendix B.

EA has not conducted a recent assessment of the GG. Therefore, there were no items for follow-up during this assessment.

5.0 RESULTS

5.1 Safety Basis Documentation

This section discusses EA's assessment of DSA documentation to determine whether it adequately describes the GG portion of the confinement system, provides a system evaluation, and identifies functional requirements to ensure that the safety system can fulfill the safety functions credited in the DSA accident analysis.

Criteria:

- *The approved safety analysis provides descriptions of attributes (i.e., functional requirements and performance criteria) required to support the safety functions identified in the hazard and accident analysis and to support subsequent derivation of TSRs. (DOE-STD-3009-1994 CN3, Chapter 4)*

- *Verification and validation work is complete before approval and implementation of the design. (10 CFR 830.122 Criterion 6)*

Chapter 4 of the DSA for the assembly cells provides the system description and evaluation of the GG and provides the functional requirement and performance criteria for the assembly cells' confinement feature. The DSA system evaluation for the assembly cell structure identified only one functional requirement applicable to the GG, which states, "The facility structure will limit the offsite radiological consequences to less than 25 rem for HE accidents that don't activate the GG."

CNS uses SB-MIS-941154, *Calculation of Offsite Dose Consequences Resulting from Sub Design Basis Explosions*, to justify the facility HE and Plutonium (Pu) limits to maintain consequences less than 25 rem and meet the DSA functional requirement. The calculation indicates that offsite consequences will remain less than 25 rem even if the leakage area of the assembly cell building was increased by 50%. EA's observation of nuclear explosive operations indicates that CNS is complying with HE and Pu limits. Moreover, CNS is using specific administrative controls for each nuclear explosive program to maintain the current HE and Pu operating limits for the assembly cell buildings well below the maximum allowable values supported by the dispersion analysis.

When the Pantex safety analysis report for the assembly cell buildings was prepared in the mid 1990s, the maximum amount of HE assumed to not exercise the GG was 106 pounds. CNS has changed the 106 pounds value and the current assembly cell DSA has a lower HE amount. A Sandia National Laboratories report, *Preliminary Assessment of the Radiological Consequences of an Accident Involving High Explosives and Plutonium in a Pantex Assembly Cell*, September 1996, gives the basis for the lower HE amount. Review of the Sandia report indicates it is still a draft report. Sandia originally prepared its analysis and report to support a Pantex environmental impact statement; however, CNS has used this Sandia report to support conclusions in the DSA. CNS' continued use of a draft engineering analysis is contrary to the expectations of the CNS quality assurance program. (**Deficiency**) Furthermore, lowering the HE amounts assumed in the accident analysis would result in a lower non-bounding offsite dose consequence. This is because the lower HE amounts would result in lower initial gas pressure during pressurization of the assembly cell volume. A lower initial pressure would result in a shorter duration for radioactive material release, and an underpredicition of the amount of radioactive material that could be released to the site boundary under bounding accident conditions.

The as-constructed configuration of the GG differs from the test configuration in both the 1950s and 1980s full-scale tests. The GG test configuration used a bridge cable pattern which extended radially out from a center spider ring to the wall of the round room, and the cables did not have a crisscrossing pattern. The full-scale tests established a GG filter efficiency of approximately 99.6%, which the DSA accident analysis uses in the dispersion analysis. CNS has not considered the difference in the as-constructed versus the as-tested configuration when using the GG filtration efficiency in offsite dose consequences. Currently, CNS limits the HE quantity in the assembly cell to below the value needed to fully exercise the GG, so the 99.6% efficiency is not a factor for determining the potential offsite consequences for an evaluation basis accident. However, if operations return to higher values of HE, the efficiency will become applicable.

Overall, the National Nuclear Security Administration (NNSA) Production Office and CNS have sufficiently described, evaluated, and established an adequate control methodology in the DSA for using the GG. Although CNS improperly used a draft analysis to justify a change in accident analysis assumptions, if current assembly cell HE and Pu quantity restrictions remain in effect, the functional requirement for offsite doses to be less than 25 rem will be met.

5.2 Configuration Management

This section discusses the adequacy of CM documentation supporting implementation of the GG safety basis requirements for the erosion control covers and catenary cable systems. EA reviewed the CNS CM program documents and the GG safety basis documents, procedures, available drawings, and reports, which constitute the design basis for the GG. Furthermore, EA interviewed engineering, maintenance, and operating personnel; observed catenary cable wall penetrations of Building 12-44 Cell 1; and reviewed photographs of catenary cables that were taken to support the ISI results. EA examined exterior assembly cell erosion control covers during walk downs of the outside of the assembly cell buildings.

Criterion:

- *Configuration management is used to develop and maintain consistency among system requirements and performance criteria, documentation, and physical configuration for the SSCs within the scope of the program. (NQA-1, Requirement 3)*

The Pantex CM program adequately establishes and maintains consistency among the design requirements, physical configuration, and documentation including system drawings, engineering analysis, system description document, and ISI procedures. MNL-00054, *System Engineering and Configuration Management Program,* provides a CM control framework consistent with the NNSA-approved CNS quality assurance program, which implements American Society of Mechanical Engineers (ASME) Nuclear Quality Assurance (NQA)-1-2008 and 2009 Addenda, *Quality Assurance Requirements for Nuclear Facility Applications*, Requirement 3, *Design Control*.

CNS is developing a software system for all CM program processes and migrating all engineering document and record sources into a new electronic record management system called PDMLink. The CNS System Engineering Department's Safety Control Information Database (SCID), which interfaces with PDMLink, OPTIX, and other commercial software applications, provides adequate access to CM documentation.

CNS has formally assigned the SE as the TSR Control Owner for the GG, per CM Process Document 02.03.12.01, *Process for Authorization Basis Control Owner Configuration Management*, to implement safety basis requirements. The assigned SE demonstrated adequate access to SCID to obtain the latest approved catenary cable and erosion control cover documents, including a limited number of drawings, reports documenting upgraded seismic analyses, and ISI procedures, which define the design basis and approved configuration. However, some design calculations and some construction drawings for the assembly cells could not be retrieved.

EA reviewed the available design basis documents, construction specifications, and design calculations for the facilities. CNS was unable to retrieve:

- The design calculations for the 12-98 assembly cells.
- Concrete design strength and size and spacing of reinforcing steel in Building 12-44 assembly cells.
- Engineering analysis that establishes the purpose and design details for the cable clamps at some of the cable intersections of the catenary system in the assembly cells.
- Confirmation of similar catenary cable system construction for all the assembly cells (e.g., were the zinc wedges installed in the exterior pipe sleeves in all the Building 12-44 cells).

DOE Order 420.1C, *Facility Safety*, specifies criteria for mitigating natural phenomena hazards and requires reviews of natural phenomena hazards to be performed at least every 10 years. The last 10-year update identified by NPO, "*Literature and Requirements Review for Seismic Hazard Evaluation of the Pantex Site*", was performed in 2008. CNS is currently developing a cost estimate to perform the 10 year update. Relevant reports summarizing the current seismic design show that all assembly cells, false ceilings, and attachments meet seismic performance criteria as stipulated in the safety basis documentation. However, the seismic evaluation of Building 12-44 Cells 2 – 6 was based on a comparison with the 12-85, 12-96, and 12-98 assembly cells due to the absence of original design calculation and construction drawings. The lack of design basis documents (design calculations and as-built drawings) precludes verification of the assumptions in the seismic analysis credited in the DSA. In addition to the design calculations and construction drawings, CNS is also missing a concrete strength study and rebar installation details for the Building 12-44 cells, and the cable clamp design basis for all the assembly cells. **(Deficiency)**

CNS appropriately developed Design Information Summary (DIS)-013, *Facility Blast Structure System (BSS, STR) For NE [nuclear explosive] Cells Design Information Summary [DIS], BLDGS: 12-44, 12-85, 12-96, and 12-98*, for the GG. The DIS is analogous to a system design description document. The DIS-013 document is the central coordination link for the implementing documents for the design basis and the safety basis. DIS-013 provides basic GG design information, addressing functional requirements, design drawings, engineering evaluations, and ISI procedures. Overall, the DIS provides useful information on the assembly cell structure. However, CNS has identified some deficiencies in DIS-013, and EA identified the following additional minor inaccuracies:

- DIS-013, Section 4.2.1, items 2, 3, 4, 5, 6, 7, 12, 15, and 16 inaccurately address functional requirements and Section 4.2.7 *ALARA* [As-Low-As Reasonably-Achievable] indicates "N/A", yet ALARA is the basis for omitting ISIs of the 12-44 Cell 8, catenary cable system.

- DIS-013 is missing discussions on important institutional knowledge of system attributes, such as:
    - The use of zinc wedges depicted in Drawing D12-C-98-S11, *Catenary Section, Elevation, Detail and Table* and addressed on page 15 of DRD-002, *Title III Bid*. The drawings and construction specification for the Building 12-98 assembly cells indicate that these wedges were inserted in the exterior of each cable sleeve penetration.
    - Historical problems with the erosion control cover degradation and water infiltration prior to effective resolution employing a Teranap® membrane in the late 1990s.
    - Inability to inspect cables outside the ring beam for moisture intrusion, which poses the greatest likelihood of catenary cable system degradation.
    - Significant differences between the as-built catenary cable system configuration and the as-tested cable configuration as depicted in ESD-182, *SAND84-0618, TTC-0431, Gravel Gertie Confinement Verification Program – Final Report*, pages 136-137. These differences may have a significant impact if Pantex raises the current assembly cell HE limits (see Section 5.1, Safety Basis Documentation Adequacy, above).

The System Engineering Department has assigned the assembly cell facility structure SE to correct the inadequacies with DIS-013.

CNS has established effective interface control among the Preventive Maintenance (PM), Engineering, and Operations organizations for ISI performance. The PM organization initiates work orders for the assembly cells' catenary cable and erosion control cover ISIs. The CNS Facility Representative verifies completed ISIs and returns the work orders to the PM organization for records retention. This process, as demonstrated by completed ISI work orders, ensures appropriate CNS organizational involvement and performance verifications.

EA observed some of the Building 12-44 Cell 1 catenary cable system physical configuration to verify consistency with facility documentation. EA examined ring beam penetrations near the assembly cell entrance doorway. All observed cables and cable clamps appear to be in good condition and consistent with design documentation. The first approximate 12-inch cable lengths exiting the concrete penetration sleeves exhibit a marked difference in color compared to the remaining cable lengths extending to the center of the GG. The color difference may be due to a higher concentration of applied "Cosmoline," which is a common class of brown wax-like petroleum-based rust inhibitors. Cosmoline is viscous when freshly applied and has a slight fluorescence in appearance, but solidifies over time and when exposed to air. Also, several cable penetrations through the ring beam exhibited a dark brown or black seepage stain on the concrete wall surface below the penetrations. This stain could be iron oxide or Cosmoline residue. CNS has no analysis data to confirm its composition or develop a conclusion on the reason for the stains.

Overall, CNS has implemented the DSA expectations for the GG through the CM program. The SE demonstrated effective access to CM documentation of the design basis information through the CNS System Engineering Department's SCID. The DIS-013 provides basic assembly cell design information, such as functional requirements, design drawings, and engineering evaluations. Interface control for ISI performance is effective among the CNS PM, Engineering, and Operations organizations. However, CNS could not retrieve some design calculations and construction drawings for the assembly cells, preventing verification of some assumptions of the engineering calculations that support the design basis. Also, DIS-013 contains dated and incorrect information.

5.3 In-service Inspections

This section discusses EA's assessment of the ISI program for the Buildings 12-44, 12-85, 12-96, and 12-98 assembly cells. EA reviewed safety basis documentation, inspection procedures, ISI records, and interviewed key personnel knowledgeable of previous and current ISI performance.

Criterion:

- *Requirements relating to test or inspection assure that the necessary operability and quality of safety structures, systems, and components is maintained. (10 CFR 830.122, Criterion 8)*

The TSRs (e.g., RPT-SAR-199801, *Technical Safety Requirements for Pantex Facilities*) specify an annual ISI requirement to visually inspect the GG and the erosion control cover for degraded condition and damage and a 10-year ISI requirement to inspect visible portions of the catenary cables for obvious signs of corrosion or degraded condition. A qualified SE in the Structural Group within the System Engineering Department has been assigned the responsibility for implementing these ISIs. The M&O contractor has conducted the annual structures and erosion control cover ISIs for more than 20 years. In 2007, the M&O contractor initiated a program to perform an ISI of the catenary cable system. The second catenary cable ISI is in progress and is almost complete.

Procedures specifying the requirements for the assembly cells ISI program fulfill the TSR GG ISI requirements, with the exception of one deficiency (described in a subsequent subsection). However, the GG catenary cable system is enclosed behind a false ceiling and requires supplemental lighting for ISIs. The procedure identifies a flashlight "as required." The SE used a flashlight (FULTON Permissible Electric Flashlight UL Model 475H Type N35) for the recent 2017-2018 catenary cable inspections, but the light intensity could not be determined. CNS had not consulted ASME Boiler and Pressure Vessel Code, Section V, Nondestructive Examination, Article 9, Visual Examination, Section T-952, to ensure that visual inspections use a sufficient light source. (See **OFI-CNS-1**.)

In-service Inspection of Erosion Control Cover

The records of the 2001 inspection of the erosion control covers (fabricated from a product called Gulfseal®) showed the covers were severely degraded. Procedure data sheets document the extent of the degradation, and several photographs show examples of the degradation. Interviews with several personnel disclosed that precipitation water infiltrated to varying degrees into the GG structures until a former M&O contractor installed a new cover fabricated from a material called Teranap® in the early 2000s. Subcontract documentation and annual ISI results indicate that, since 2012, CNS and the former M&O contractors have adequately maintained this cover in accordance with the manufacturer's five-year recoating recommendation.

In-service Inspection of GG Catenary Cable

The design of the GG precludes inspection of the cable runs on the outside of the ring beam. An analysis of Building 12-98 catenary cable seismic response indicates that the cables are only stressed to one-third of their capacity during a seismic event. However, a statement in the analysis indicates this assumption is based on no deterioration of the cables or other adverse conditions associated with the cable splices outside the ring beam.

During the current assessment, CNS was in the process of performing the current 10-year cycle of ISIs. Records of recently completed ISIs indicate improved description of results and detail as compared to the 2008 ISI records. During the 2017-2018 catenary cable ISIs, the SE used a camera (3.6 Megapixel resolution) to take approximately 400 pictures of visible cable penetrations in Building 12-44 Cells 2-6. The camera flash provided sufficient lighting, as the photographs demonstrate. The SE identified some configuration issues through examination of the photos. The SE adequately used the photos and visual inspections to determine the condition of the catenary cable system and ensure that TSR acceptance criteria are met.

The use of photography is an innovative approach to enhancing evaluation and documentation of the condition of the GG. In addition, CNS is piloting the use of a laser 3D scanning tool to document catenary cable component position during ISIs. CNS anticipates comparing subsequent scannings to supplement the visual inspections by comparing cable positions and identify changing conditions. Slight changes in cable position could be an early indicator of potential cable deterioration.

CNS has identified several improvements to the ISI procedure for the GG. The improvements include increasing the catenary cable inspection frequency to five years in response to a recent Defense Nuclear Facilities Safety Board staff visit, based on inspection intervals specified in the American Concrete Institute Code 349.3R-02, *Evaluation of Nuclear Safety-Related Concrete Structures*, and ASME Boiler and Pressure Vessel Code, Section XI, *Rules of In-service Inspection of Nuclear Power Plant Components*. Also, the SE intends to include the use of a camera.

EA Review of recent ISI performance records have identified the following concerns:

- TP-MN-06060 does not provide sufficient instruction to monitor for potential indications of cable deterioration outside the ring beam. **(Deficiency)** A number of the photos from Building 12-44 Cells 2-6 showed a dark stain below the pipe sleeve where the cable penetrates the cell walls. The ISI records did not identify the presence of these stains, and CNS did not indicate any plans to evaluate their cause. The stains could be an indication of water intrusion through the Gunite cap on the ring beam.

- ISIs of each assembly cell's 168 distributed intersecting cable-clamps surrounding the peripheral cable intersections identified some missing cable clamp U-bolts, one missing cable clamp nut, and one loose clamp nut; record entries indicate that the SE concluded these were not structural issues. However, there is no design basis information to support this determination or the safety function provided by the cable clamps.

- A drainage system is installed in the Building 12-85 and 12-96 cells, Building 12-98 Cells 1-4, and Building 12-44 Cell 8. The drainage system consists of a copper collection pan below the suspended catenary cable system, connected to a drain line routed down the wall of the round room. The ISI program does not require an inspection to determine whether water is present in the drainage system. There is no recent evidence that CNS or the former M&O contractors have checked the drainage systems in any of cells to determine whether water is present. Maintenance personnel drained approximately 300 gallons of water from this system in Building 12-98 Cell 3 during the early 2000s. Periodically checking the drainage piping for water would provide early indication of water intrusion into the GG.

- There is no evidence that CNS or the former M&O contractors have formally documented a catenary cable inspection of Building 12-44 Cell 8. The cell is not approved for nuclear explosive operations but does have a DSA and is categorized as a hazard category 2 nuclear facility. The DSA/TSRs do not address the catenary cable system as a design feature. Catastrophic failure of the GG would be viewed as an initiating event for DSA purposes. CNS uses Building 12-44 Cells 2-6 as indicators for the health of the Cell 8 GG. However, given the indications of water on the floor as recent as 2017 in Cell 8, a formally documented inspection of the GG cables may be warranted.

Scheduling of In-service Inspections

The PM automated work scheduling process, PeopleSoft, accurately triggers and generates work orders for the annual erosion control cover and 10-year catenary cable ISIs. Of the 12 annual erosion control cover ISI work orders completed over the past three years, CNS performed 10 before the required due date and 2 within a few days after the required due date but still within the grace period (25% or 456 days). CNS used the grace period (a few days to a few months) for all of the catenary cable 10-year ISIs (the ISI of 12-98 Cells 1-4 is still in process). CNS explained that ongoing operations in the assembly cell buildings, other PMs, and ensuring all of the appropriate detection systems are inactivated precluded more timely completion.

CNS engineering, nuclear safety, and maintenance senior managers receive monthly performance metric information that addresses Pantex's credited systems maintenance performance. The metric information currently shows an 86% completion (seven-year rolling average) of all TSR surveillances and ISIs by the due date or within a management-authorized grace period (based on a business decision). In addition, the metric information indicates that CNS had used the grace period approximately 50% of the time during fiscal year 2018. Based on this performance, CNS management started a process improvement initiative in March 2018 to study this performance. This performance appears to be a routine extension of the specified surveillance frequencies and conflicts with the expectations of the Pantex TSR's generic Surveillance Requirement 4.0.2. **(Deficiency)** Furthermore, WI 02.06.03.03.02, *Authorize Work in/on Facility and Facility Systems and Components for Operations, Maintenance, and Subcontractor Activities*, Step 2 instructs the user to "identify when PX-5874 [the authorizing form for entering the grace period] is Required," but does not communicate that the grace period "should not be relied upon as a routine extension" per TSR Surveillance Requirement 4.0.2.

Overall, CNS has implemented inspection activities to ensure the erosion control cover and catenary cable TSR ISIs are appropriately conducted and ensure that the GG can support fulfillment of the functional requirement specified by the DSA. Improvements in the ISI records details from the use of high definition photography and laser 3D scanning will provide an improved basis for complying with the TSRs for design features. The CNS PM automated work scheduling process accurately generates and schedules required ISI work orders for performance by the SE. However, CNS does not incorporate direction in the ISI procedure for inspecting the catenary cable and sleeves for signs of deterioration, does not incorporate an inspection light source standard for conducting visual inspections, does not periodically check the catenary cable drain systems, and has not completed a formal ISI for Building 12-44 Cell 8. Additionally, the plant-wide use of TSR grace periods is excessive.

5.4 System Engineer Program

This section discusses the implementation of the SE program to effectively ensure that safety systems can be reliably performed as intended. EA reviewed CNS training/qualification program processes, the incumbent SE's qualification records, and training-related assessments/surveillances, and it interviewed the incumbent SE and supervisor.

Criterion:

- *The DOE contractor has established a system engineer program to ensure continued operational readiness of systems within the program scope. (NQA-1, Requirement 2, Section 200 and 300)*

CNS has effectively implemented the CNS quality assurance program training requirements, which uses the Systematic Approach to Training methodology. Three separate qualification checklists ("Qual Cards") TSR Control Owner, SE, and Facility Inspector—adequately address required reading, training (internal and external), process mentoring, and oral board reviews.

CNS has selected, trained, and qualified an SE responsible for the TSR design features including the catenary cables and erosion control covers. The official training records indicate that the incumbent has been qualified for two years as a qualified SE and Facility Inspector.

The SE demonstrated an adequate level of knowledge of all applicable CM documentation. The assigned SE is actively engaged in assigned responsibilities as demonstrated through interviews, document reviews, and the recent proficient completion of ISIs. The SE demonstrated a questioning attitude and propensity to exceed base expectations by providing more complete inspection report detail than in years past and by including photo documentation beyond the expectations of reference procedures TP-MN-06060 and TP-MN-04514 to better substantiate the official record.

Overall, the SE for the catenary cables and erosion control covers achieved full qualification two years ago. Interviews and interactions with the SE provide a high level of confidence that the incumbent is well qualified to perform assigned duties. The SE also exhibited favorable performance behaviors, such as a questioning attitude and propensity to exceed base expectations.

6.0 FINDINGS

EA did not identify any findings during this assessment. Deficiencies that did not meet the criteria for a finding are listed in Appendix C of this report, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified one OFI to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in appraisal reports, they may also address other conditions observed during the appraisal process. EA offers these OFIs only as recommendations for line management consideration; they do not require formal resolution by management through a corrective action process and are not intended to be prescriptive or mandatory. Rather, they are suggestions that may assist site management in implementing best practices or provide potential solutions to issues identified during the assessment.

Consolidated Nuclear Security, LLC

OFI-CNS-1: Consider adopting an inspection light source standard for light intensity consistent with ASME Boiler and Pressure Vessel Code, Section V, Nondestructive Examination, Article 9, Visual Examination, Section T-952, which requires a minimum light intensity of 1000 lux at a 24-inch inspection distance.

Appendix A
Supplemental Information

Dates of Assessment

Onsite Assessment: April 9-19, 2018

Office of Enterprise Assessments (EA) Management

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Appendix B
Key Documents Reviewed, Interviews, and Observations

Documents Reviewed

- RPT-SAR-199801, *Technical Safety Requirements for Pantex Facilities*, Revision 391, February 9, 2018
- SB-MIS-941154, *Calculation of Offsite Dose Consequences Resulting from Sub Design Basis Explosions, March 31, 2006*
- Sandia Report, *Preliminary Assessment of the Radiological Consequences of an Accident Involving High Explosives and Plutonium in a Pantex Assembly Cell*, Draft, September 1996
- CNS Procedure MNL-00054, *System Engineering and Configuration Management Program*, Issue 32
- DIS-013 [Design Information Summary], *Facility Blast Structure System (BSS, STR) For NE [nuclear explosive] Cells Design Information Summary [DIS], BLDGS: 12044, 12085, 12096, 12098*, December 30, 2013
- CNS Work Instruction 02.03.12.02.05, *Design Information Summaries*, Issue #004
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- B&W Drawing No. D12-96A12, Assembly Cell Erosion Control Cover Detail
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- Records of In-Service Structural Inspections of Assembly Cells, Building 12-98, Cells 1, 2, 3, and 4, for 2016, 2017, and 2018
- Records of In-Service Structural Inspections of the Catenary Cable Systems in Assembly Cells, Building12-44, Cell 2 – 6, Building 12-85, and Building 12-96, completed in 2017
- Records of In-Service Structural Inspections of the Catenary Cable Systems in Assembly Cells, Building12-44, Cell 2 – 6, Building 12-85, Building 12-96, and Building 12-98, Cells 1, 2, 3, &4, completed between April 2007 and May 2008

Interviews

- NPO Safety System Oversight Engineer
- CNS System Engineer (3)
- Core Engineering Senior Specialist
- CNS Facility Engineering Manager, Structures/Mechanical Group
- CNS Building 12-44 Facility Representative
- CNS Configuration Management Manager
- CNS Configuration Management Specialist
- CNS Records Manager
- CNS Information Technology - PDMLink developers (2)
- Core Engineer Advisor
- CNS Preventive Maintenance Planning Section Manager

Observations

- 12-44 Cell 1 Walkdown
- 12-44 Cell 6 Walkdown
- 12-85 Cell Walkdown
- 12-98 Cells Exterior Walkdown

Appendix C
Deficiencies

Deficiencies that did not meet the criteria for a finding are listed below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

- Contrary to the requirements of the CNS quality assurance program, CNS uses a draft analysis to support approval of a change in the DSA. The change revised a DSA assumption on the maximum HE quantity that would not exercise the GG and would result in a non-conservative assumption for initial blast pressure and offsite dose consequences supporting the accident analysis.

- Contrary to the requirements of NQA-1, Requirement 3, subsection 601.5, CNS could not provide controlled copies of some design basis documents (e.g., design calculations, drawings, concrete strength study, cable clamp design basis, zinc wedge use, and rebar installation) for the assembly cells.

- Contrary to the requirements of TSR Design Feature ISI Statement DF.1.2N.ISI.8, which says, “Visually inspect visible portions of the catenary cable for obvious signs of corrosion or degraded conditions,” ISI procedure TP-MN-06060 does not provide sufficient instruction to monitor visible portions of the GG to identify potential indications of cable deterioration outside the ring beam.

- Contrary to the requirements of TSR generic Surveillance Requirement 4.0.2, which specifies that extensions to surveillance frequencies will not be routinely used, CNS used the grace period for approximately 50 percent of surveillances and ISIs during fiscal year 2018.