



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION I  
2100 RENAISSANCE BLVD., SUITE 100  
KING OF PRUSSIA, PA 19406-2713

December 19, 2014

Docket No. 05000238

License No. NS-1

Erhard W. Koehler  
Senior Technical Advisor, N.S. Savannah  
U.S. Department of Transportation  
Maritime Administration (MAR-640.2)  
1200 New Jersey Avenue, SE W25-209/212  
Washington, DC 20590-0001

SUBJECT: NRC INSPECTION REPORT NO. 05000238/2014001, U.S. DEPARTMENT OF  
TRANSPORTATION, N.S. SAVANNAH, BALTIMORE, MARYLAND

Dear Mr. Koehler:

On December 11, 2014, Mark Roberts of this office conducted a safety inspection at the Nuclear Ship (N.S.) Savannah berthed in Baltimore, Maryland. The safety inspection reviewed programs and activities associated with the N.S. Savannah while the vessel is in a long-term safe storage status. The enclosed inspection report documents the inspection results, which were discussed with you at the conclusion of the inspection on December 16, 2014. Based on the results of this inspection, no findings of safety significance were identified.

In accordance with 10 CFR Part 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of the NRC's document system (ADAMS). ADAMS is accessible from the NRC Web Site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

The NRC's Safety Culture Policy Statement became effective in June 2011. While a policy statement and not a regulation, it sets forth the agency's *expectations* for individuals and organizations to establish and maintain a positive safety culture. You can access the policy statement and supporting material that may benefit your organization on NRC's safety culture Web site at <http://www.nrc.gov/about-nrc/safety-culture.html>. We strongly encourage you to review this material and adapt it to your particular needs in order to develop and maintain a positive safety culture as you engage in NRC-regulated activities.

E. Koehler

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No response to this letter is required. If you have any questions, please contact Mark Roberts of my staff at [Mark.Roberts@nrc.gov](mailto:Mark.Roberts@nrc.gov) or (610) 337-5094.

Sincerely,

*/RA/*

Marc S. Ferdas, Chief  
Decommissioning and Technical  
Support Branch  
Division of Nuclear Materials Safety

Enclosure:  
Inspection Report No. 05000238/2014001

cc w/enclosure:  
Art Paynter, QA Manager  
John Osborne, Licensing and Compliance Manager  
State of Maryland

E. Koehler

2

No response to this letter is required. If you have any questions, please contact Mark Roberts of my staff at Mark.Roberts@nrc.gov or (610) 337-5094.

Sincerely,

**/RA/**

Marc S. Ferdas, Chief  
Decommissioning and Technical  
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Enclosure:  
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cc w/enclosure:  
Art Paynter, QA Manager  
John Osborne, Licensing and Compliance Manager  
State of Maryland

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U.S. NUCLEAR REGULATORY COMMISSION  
REGION I

INSPECTION REPORT

Docket No. 05000238

License No. NS-1

Inspection No. 05000238/2014001

Licensee: U.S. Department of Transportation  
Maritime Administration  
Washington, DC 20590

Facility: N.S. Savannah

Location: Canton Marine Terminal  
Pier 13  
4601 Newgate Avenue  
Baltimore, MD 21224

Inspection Dates: December 11 and 16 (exit), 2014

Inspector: Mark C. Roberts, Senior Health Physicist  
Decommissioning and Technical Support Branch  
Division of Nuclear Materials Safety  
Region I

Approved By: Marc S. Ferdas, Chief  
Decommissioning and Technical Support Branch  
Division of Nuclear Materials Safety  
Region I

Enclosure

## **EXECUTIVE SUMMARY**

U.S. Department of Transportation  
N.S. Savannah  
NRC Inspection Report No. 05000238/2014001

A routine announced safety inspection was conducted on December 11, 2014, by a Region I inspector of the Nuclear Ship (N.S.) Savannah, currently berthed at a marine terminal in Baltimore, Maryland. NRC oversight of the decommissioning project is managed by staff from the NRC's Reactor Decommissioning Branch, Division of Decommissioning, Uranium Recovery, & Waste Programs (DUWP), Office of Nuclear Material Safety and Safeguards (NMSS) with inspection support from the NRC Region I office.

The N.S. Savannah is classified as a research and test reactor. The program for overseeing the decommissioning of research and test reactors is described in Inspection Manual Chapter (IMC) 2545, "Research and Test Reactor Inspection Program." The inspection included a review of the programs and activities associated with the N.S. Savannah while the vessel is in a long-term protective storage status. The inspection consisted of observations and tours by the inspector, interviews with N.S. Savannah personnel, and a review of procedures and records. There are currently no ongoing decommissioning activities being conducted on the N.S. Savannah. Based on the results of this inspection, no findings of safety significance were identified.

## **REPORT DETAILS**

### **1.0 Background**

The N.S. Savannah is the property of the U. S. Department of Transportation (DOT), Maritime Administration (MARAD). The N.S. Savannah was designed, constructed, and operated as a joint research and development project of MARAD and the Atomic Energy Commission. The ship operated from 1961 until it was removed from service in 1970. In 1971, the ship was defueled and various dismantling activities were conducted through 1976 to remove much of the radioactive material from the ship and to isolate radiologically contaminated systems. These activities included removing ion exchange systems and resins and most of the water from the primary, secondary, and auxiliary systems. A "Possession Only" license was issued in May 1976. The N.S. Savannah is a registered National Historic Landmark. In May 2008, the ship was towed from Norfolk, Virginia to its present location in Baltimore, Maryland. The program for overseeing the decommissioning of research and test reactors is described in IMC 2545.

### **2.0 Long-term Safe Storage Status Review**

#### **a. Inspection Scope (Inspection Procedure 69002)**

The inspector reviewed the following items, which are required to be reported to the NRC in annual reports per technical specifications: (1) the status of the facility, (2) results of radiation surveys and monitoring station dosimeter readings, (3) results of environmental sample analyses, (4) results of quarterly intrusion alarm system checks, (5) radioactive material releases and shipments of radioactive waste, (6) a description of the principal maintenance performed on the vessel, (7) unauthorized entry into radiation control areas by visitors or employees, (8) degradation of any boundaries that contain the radioactive materials aboard the vessel, and (9) results of occupational exposures. The inspection consisted of observations and tours by the inspector, interviews with N.S. Savannah personnel, and a review of procedures and records.

The inspector also reviewed Radiation Work Permits (RWPs), results from intrusion, fire, and flood detection system surveillance testing, and documentation of the applicability of the NRC's implementation of regulations for the physical protection of certain quantities of radioactive material (10 CFR Part 37), and procedures and protocols implemented by the N.S. Savannah staff for public access to the vessel. The inspector discussed the protocols used by the N.S. Savannah's nuclear operations staff to respond to emergency events and reviewed the status of emergency response equipment maintained by MARAD.

#### **b. Observations and Findings**

The inspector confirmed that the ship remains in its protective storage condition in Baltimore Harbor with a retention crew during regular working hours and regular attendance by the MARAD nuclear operations staff. In March 2013, MARAD awarded a contract to TOTE Services, that integrates radiation protection and emergency response, custodial care of the vessel, and nuclear professional support services. Key nuclear

professionals have been retained under the new contract arrangement to maintain continuity of operations. Routine maintenance, surveillance tests, and environmental and radiological monitoring in support of technical specification requirements continue under the new contract. Radiation Services Organization (RSO), Inc. of Laurel, Maryland is subcontracted to provide radiation protection and emergency response services. Staff from the DOT's Volpe National Transportation Systems Center provides technical, environmental, and marine support services for the project.

The fire detection system provides local visible and audio warning alarms and notification to a remote monitoring system that alerts a local fire department and N.S. Savannah personnel. The flood and intrusion detection systems also provide remote notification and appropriate response personnel are notified of alarms. Periodic alarm system checks are performed and documented in accordance with the N.S. Savannah's surveillance testing procedures. The inspector noted that work is underway on upgrading these systems. Emergency equipment, which includes personal protective equipment and radiation survey meters, is maintained in inventoried kits by N.S. Savannah personnel.

The inspector reviewed radiological environmental monitoring programs and the results from surveys in the radiologically and non-radiologically controlled areas of the N.S. Savannah. Thermoluminescent dosimeters are placed in 46 locations in non-radiologically controlled areas and exchanged semi-annually. The inspector confirmed that the results from these measurements were indistinguishable from background radiation levels. In accordance with the vessel's technical specifications, sediment and water samples are collected in the vicinity of the ship and analyzed for gamma-emitting radionuclides that could be attributable to any potential releases from the ship. Sample results were consistent with expected background radiological conditions. Radiological surveys are conducted at least annually in accordance with the vessel's technical specifications in both radiologically and non-radiologically controlled areas. Survey results in the non-radiologically controlled areas were indistinguishable from background radiation levels. Survey results in the radiologically controlled areas were consistent with previous annual survey results. The inspector noted that areas were properly posted and access to all radiological areas were protected by locked doors.

Based on a tour of the vessel and discussions with N.S. Savannah staff, there have been no issues identified with the material condition of any of the ship's boundaries that contain radioactive materials. Potential pathways for non-routine radiological releases of radioactive liquids have been capped to prevent inadvertent releases. There is no active decommissioning in progress so there has been no release of radioactive material as effluents or as radioactive waste. Maintenance campaigns have been conducted in the cold chemistry lab, the health physics lab, and the hot chemistry lab to improve the general house-keeping in these areas and identify and consolidate historical records from these areas.

An RWP system is used to access the controlled areas on the ship. Each RWP provided a description of the measures required for access to and egress from the controlled areas and described protective clothing and radiation dosimeter requirements for access. Individuals desiring access to areas that are controlled by an RWP are also

provided with a briefing from the Radiation Safety Officer. The inspector noted that all reported occupational doses were minimal.

Although the N.S. Savannah is not open for general public visitation, the vessel is often available for public visitation for special open house events or in response to specific requests from organizations. Prior to boarding the vessel, visitors are provided with a briefing that covers safety and general information about the ship. During public access events or tours, routine work is suspended and access to certain areas is restricted by ropes or physical barriers per N. S. Savannah procedures. Savannah Technical Staff representatives are positioned in strategic areas to direct visitors. During a walk-down of the public tour route and public access areas, the inspector did not identify any potential safety issues.

c. Conclusions

There are currently no ongoing decommissioning activities being conducted on the NS Savannah. Based on the results of this inspection, no findings of safety significance were identified.

**3.0 Exit Meeting Summary**

On December 16, 2014, the inspector presented the inspection results to Erhard Koehler, Senior Technical Advisor, N.S. Savannah. Mr. Koehler acknowledged the inspection findings. The inspector confirmed that proprietary information was not provided or examined during the inspection.

## **SUPPLEMENTAL INFORMATION**

### **PARTIAL LIST OF PERSONS CONTACTED**

#### Licensee and contractors

C. Bearor, Documentation and Administrative Support Manager, MARAD  
M. Buonopane, Senior Marine Engineer, USDOT, Volpe Center  
H. Evans, Radiation Safety Officer, RSO, Inc.  
E. Koehler, Senior Technical Advisor, MARAD  
J. Osborne, Licensing and Compliance Manager, Savannah Technical Staff  
A. Paynter, Quality Assurance Manager, Savannah Technical Staff  
K. Petho, Environmental Engineer, USDOT, Volpe Center  
R. Sheranko, Business and Risk Manager, Savannah Technical Staff  
C. Zevitas, Senior Environmental Engineer, USDOT, Volpe Center

### **PARTIAL LIST OF DOCUMENTS REVIEWED**

N.S. Savannah Annual Report 2011, STS-149, Rev.0, February 28, 2012  
N.S. Savannah Annual Report 2012, STS-172, Rev.0, February 28, 2013  
N.S. Savannah Annual Report 2013, STS-183, Rev.0, February 28, 2014  
N.S. Savannah Decommissioning Funds Status Report for CY 2013, STS-189, March 31, 2014  
N.S. Savannah Updated Final Safety Analysis Report, STS-004-002 Rev.7, May 1, 2013  
N.S. Savannah – Applicability of 10 CFR Part 37 to NSS, STS – 180, July 17, 2014  
N.S. Savannah – Public Access, STS – 002-007, Rev. 3, September 17, 2013  
Occupational Radiation Exposure Reports  
Environmental Radiation Exposure Reports  
N.S. Savannah, Surveillance, Inspection, and Calibration, STS-004-004, Rev. 11, October 16, 2014  
N.S. Savannah, Annual Structures, Systems and Components Degradation Inspection 2013, STS-186, February 25, 2014  
N.S. Savannah Radiation Work Permits for 2014 (RWPs 14-001, 14-002, 14-004, 14-005, and 14-006)  
Environmental Sample Analysis Reports  
Miscellaneous Surveillance and Alarm Test Results

### **ITEMS OPEN, CLOSED, AND DISCUSSED**

None

## **LIST OF ACRONYMS USED**

CFR	Code of Federal Regulations
DOT	U. S. Department of Transportation
DUWP	Division of Decommissioning, Uranium Recovery, & Waste Programs
IMC	Inspection Manual Chapter
MARAD	U. S. Maritime Administration
NMSS	Office of Nuclear Material Safety and Safeguards
NRC	Nuclear Regulatory Commission
N.S.	Nuclear Ship
RSO	Radiation Services Organization, Inc.
RWP	Radiation Work Permit
STS	Savannah Technical Staff