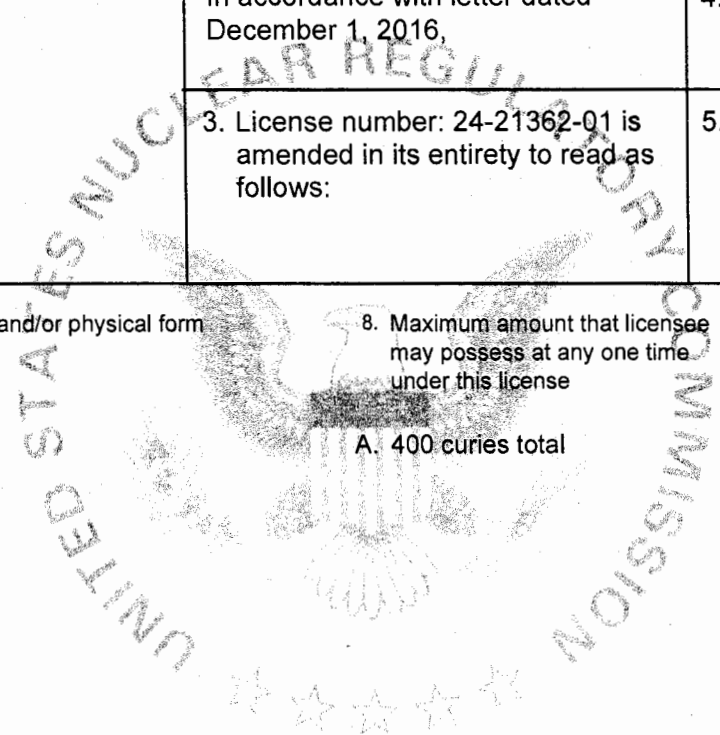


**MATERIALS LICENSE**

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 37, 39, 40, 70 and 71, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

<p>Licensee</p> <p>1. American Radiolabeled Chemicals</p>	<p>In accordance with letter dated December 1, 2016,</p>	<p>4. Expiration Date: September 30, 2018</p>	
<p>2. 101 Arc Drive St. Louis, MO 63146</p>	<p>3. License number: 24-21362-01 is amended in its entirety to read as follows:</p>	<p>5. Docket No.: 030-20567 Reference No.:</p>	
<p>6. Byproduct, source, and/or special nuclear material</p> <p>A. Carbon-14</p>	<p>7. Chemical and/or physical form</p> <p>A. Any</p>	<p>8. Maximum amount that licensee may possess at any one time under this license</p> <p>A. 400 curies total</p>	<p>9. Authorized use</p> <p>A. For possession, use, and processing incident to manufacture and synthesis of radiolabeled chemicals for distribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State. Possession incident to outdoor site construction and site beautification activities involving movement of site soils, radiological site characterization, collection and analysis of water and soil samples containing residual contamination. Possession incident to distribution of labeled compounds in accordance with NRC license Number 24-21362-02E.</p>



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SUPPLEMENTARY SHEET**

License Number  
24-21362-01

Docket or Reference Number  
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Amendment No. 56

6. Byproduct, source,  
and/or special nuclear  
material

B. Calcium-45

C. Chlorine-36

7. Chemical and/or physical form

B. Any

C. Any

8. Maximum amount that licensee  
may possess at any one time  
under this license

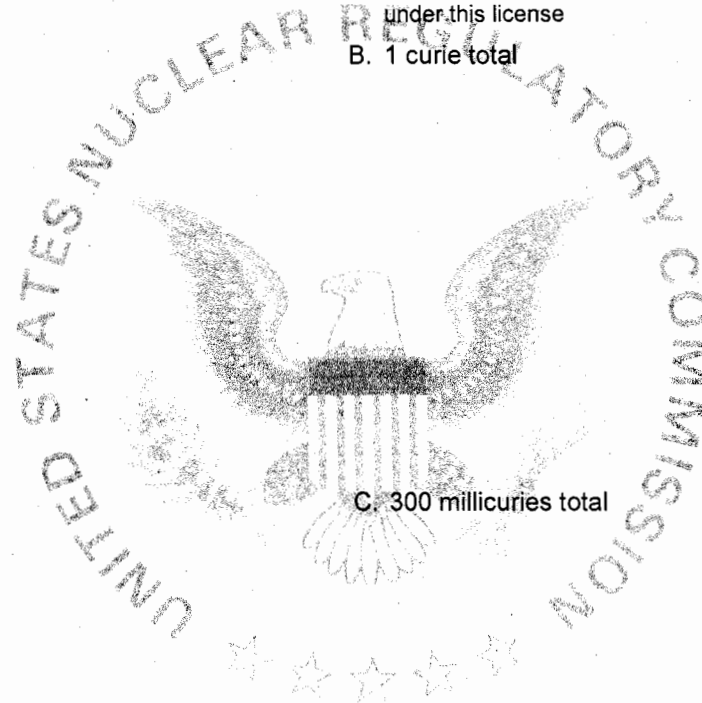
B. 1 curie total

C. 300 millicuries total

9. Authorized use

B. For possession, use, and processing incident to manufacture and synthesis of radiolabeled chemicals for distribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State. Possession incident to outdoor site construction and site beautification activities involving movement of site soils, radiological site characterization, collection and analysis of water and soil samples containing residual contamination.

C. For possession, use, and processing incident to manufacture and synthesis of radiolabeled chemicals for distribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State. Possession incident to outdoor site construction and site beautification activities involving movement of site soils, radiological site characterization, collection and analysis of water and soil samples containing residual contamination.



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6. Byproduct, source, and/or special nuclear material

D. Chromium-51

E. Hydrogen-3

7. Chemical and/or physical form

D. Any

E. Any

8. Maximum amount that licensee may possess at any one time under this license

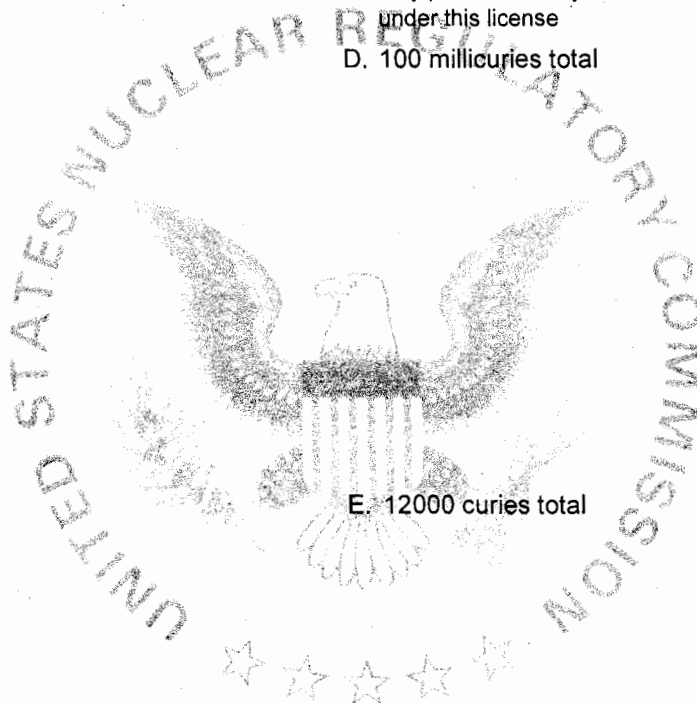
D. 100 millicuries total

E. 12000 curies total

9. Authorized use

D. For possession, use, and processing incident to manufacture and synthesis of radiolabeled chemicals for distribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State. Possession incident to outdoor site construction and site beautification activities involving movement of site soils, radiological site characterization, collection and analysis of water and soil samples containing residual contamination.

E. For possession, use, and processing incident to manufacture and synthesis of radiolabeled chemicals for distribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State. Possession incident to outdoor site construction and site beautification activities involving movement of site soils, radiological site characterization, collection and analysis of water and soil samples containing residual contamination. Possession incident to distribution of labeled compounds in accordance with NRC license Number 24-21362-02E.



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24-21362-01

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6. Byproduct, source,  
and/or special nuclear  
material

F. Iodine-125

G. Phosphorus-32

7. Chemical and/or physical form

F. Any

G. Any

8. Maximum amount that licensee  
may possess at any one time  
under this license

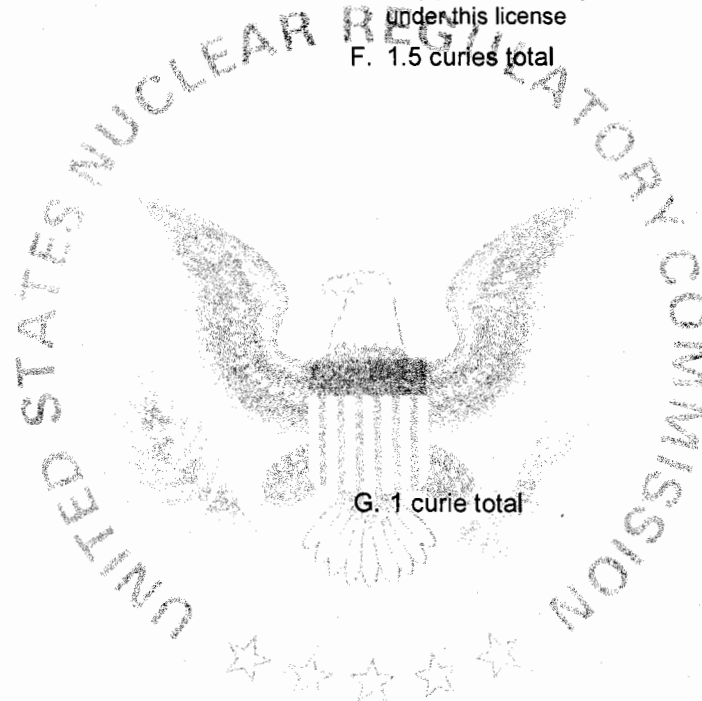
F. 1.5 curies total

G. 1 curie total

9. Authorized use

F. For possession, use, and processing incident to manufacture and synthesis of radiolabeled chemicals for distribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State. Possession incident to outdoor site construction and site beautification activities involving movement of site soils, radiological site characterization, collection and analysis of water and soil samples containing residual contamination.

G. For possession, use, and processing incident to manufacture and synthesis of radiolabeled chemicals for distribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State. Possession incident to outdoor site construction and site beautification activities involving movement of site soils, radiological site characterization, collection and analysis of water and soil samples containing residual contamination.



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6. Byproduct, source, and/or special nuclear material

H. Phosphorus-33

7. Chemical and/or physical form

H. Any

8. Maximum amount that licensee may possess at any one time under this license

H. 1 curie total

9. Authorized use

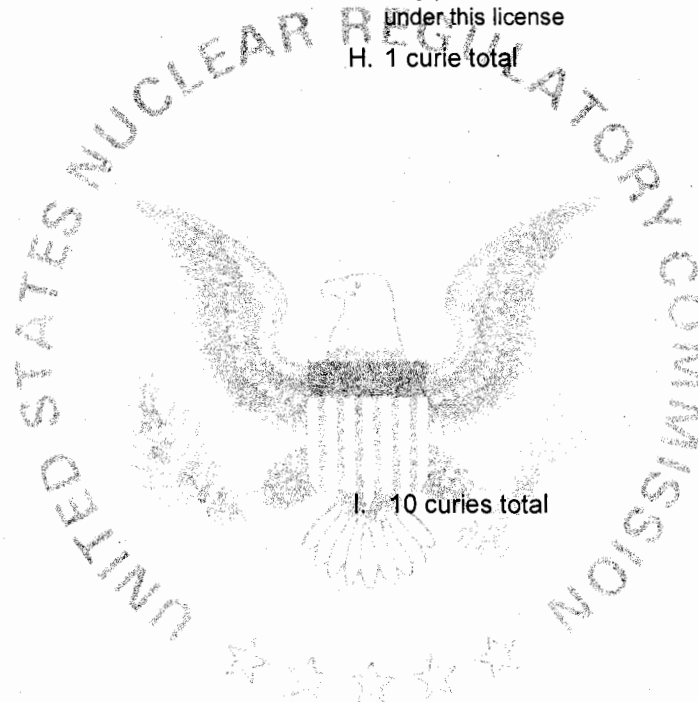
H. For possession, use, and processing incident to manufacture and synthesis of radiolabeled chemicals for distribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State. Possession incident to outdoor site construction and site beautification activities involving movement of site soils, radiological site characterization, collection and analysis of water and soil samples containing residual contamination.

I. Sulfur-35

I. Any

I. 10 curies total

I. For possession, use, and processing incident to manufacture and synthesis of radiolabeled chemicals for distribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State. Possession incident to outdoor site construction and site beautification activities involving movement of site soils, radiological site characterization, collection and analysis of water and soil samples containing residual contamination.



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6. Byproduct, source,  
and/or special nuclear  
material

7. Chemical and/or physical form

8. Maximum amount that licensee  
may possess at any one time  
under this license

9. Authorized use

J. Iron-59

J. Prepackaged Kits

J. 100 millicuries total

J. For redistribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State.

K. Strontium-85

K. Prepackaged Kits

K. 100 millicuries total

K. For redistribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State.

L. Cobalt-60

L. Prepackaged Kits

L. 100 millicuries total

L. For redistribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State.

M. Iron-55

M. Prepackaged Kits

M. 100 millicuries total

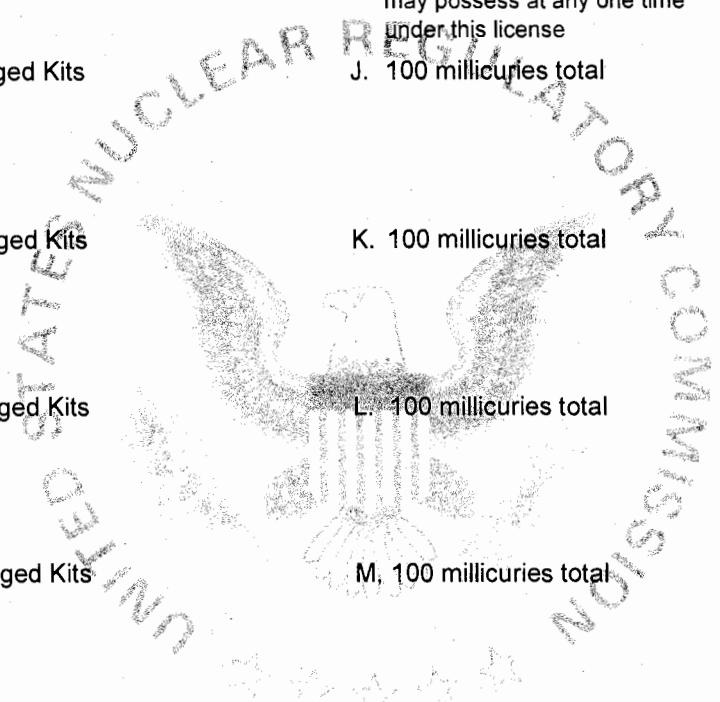
M. For redistribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State.

N. Iron-55

N. Any

N. 10 millicuries total

N. For possession, use, and processing incident to manufacture and synthesis of radiolabeled chemicals for distribution to persons authorized to receive the licensed material under the terms of a specific license issued by the Commission or an Agreement State.



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6. Byproduct, source,  
and/or special nuclear  
material

O. Iron-59

7. Chemical and/or physical form

O. Any

8. Maximum amount that licensee  
may possess at any one time  
under this license

O. 10 millicuries total

9. Authorized use

O. For possession, use, and processing  
incident to manufacture and synthesis  
of radiolabeled chemicals for  
distribution to persons authorized to  
receive the licensed material under the  
terms of a specific license issued by  
the Commission or an Agreement  
State.

**CONDITIONS**

10. Licensed material may be used or stored at the licensee's facilities located at:

1. 104 ARC Drive, St. Louis, Missouri, 63146
2. 100 ARC Drive, St. Louis, Missouri, 63146

11. A. Licensed material listed in items 6.A. through 6.O. shall be used by, or under the supervision of, Surendra K. Gupta, Ph.D., Kamal Das Ph.D., or Janardhanam Selvasekaran, Ph.D.

B. Licensed material listed in Items 6.F., and 6.J. through 6.M. shall be used by, or under the supervision of, Robert C. Speth, Ph.D.

12. The Radiation Safety Officer (RSO) for this license is Jeffrey S. Vollmer.

13. This license does not authorize commercial distribution of licensed material to persons generally licensed pursuant to 10 CFR Part 31 or to persons exempt from licensing pursuant to 10 CFR 30.18.

14. Licensed material shall not be used in or on human beings except as provided otherwise by specific condition of this license.

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15. The licensee shall not use licensed material in field applications where activity is released except as provided otherwise by specific condition of this license.
16. The licensee shall conduct a physical inventory every 6 months, or at other intervals approved by the U.S. Nuclear Regulatory Commission, to account for all sealed sources and/or devices received and possessed under the license. Records of inventories shall be maintained for 3 years from the date of each inventory, and shall include the radionuclides, quantities, manufacturer's name and model numbers, and the date of the inventory.
17. A. Sealed sources and detector cells shall be tested for leakage and/or contamination at intervals not to exceed the intervals specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or by an Agreement State. In the absence of a registration certificate, sealed sources shall be tested for leakage and/or contamination at intervals not to exceed 6 months, or at such other intervals as specified.
- B. Notwithstanding Paragraph A of this Condition, sealed sources designed to primarily emit alpha particles shall be tested for leakage and/or contamination at intervals not to exceed 3 months.
- C. In the absence of a certificate from a transferor indicating that a leak test has been made within the intervals specified in the certificate of registration issued by the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or by an Agreement State, prior to the transfer, a sealed source received from another person shall not be put into use until tested and the test results received.
- D. Sealed sources need not be tested if they contain only hydrogen 3; or they contain only a radioactive gas; or the half-life of the isotope is 30 days or less; or they contain not more than 100 microcuries of beta- and/or gamma-emitting material or not more than 10 microcuries of alpha-emitting material.
- E. Sealed sources need not be tested if they are in storage and are not being used. However, when they are removed from storage for use or transferred to another person, and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.



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- F. The leak test shall be capable of detecting the presence of 185 becquerels (0.005 microcuries) of radioactive material on the test sample. If the test reveals the presence of 185 becquerels (0.005 microcuries) or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission in accordance with 10 CFR 30.50(c)(2), and the source shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Commission regulations.
- G. Analysis of leak test samples and/or contamination shall be performed by persons specifically licensed by the U.S. Nuclear Regulatory Commission or an Agreement State to perform such services. The licensee is authorized to collect leak test samples but not perform the analysis.
- H. Records of leak test results shall be kept in units of becquerels (microcuries) and shall be maintained for 3 years.
18. Sealed sources containing licensed material shall not be opened or sources removed from source holders by the licensee.
19. The licensee is authorized to hold radioactive material with a physical half-life of less than or equal to 120 days for decay-in-storage before disposal in ordinary trash provided:
- A. Before disposal as ordinary trash, the waste shall be surveyed at the container surface with the appropriate survey instrument set on its most sensitive scale and with no interposed shielding to determine that its radioactivity cannot be distinguished from background. All radiation labels shall be removed or obliterated, except for radiation labels on materials that are within containers and that will be managed as biomedical waste after they have been released from the licensee.
- B. A record of each such disposal permitted under this license condition shall be retained for 3 years. The record must include the date of disposal, the date on which the byproduct material was placed in storage, the radionuclides disposed, the survey instrument used, the background dose rate, the dose rate measured at the surface of each waste container, and the name of the individual who performed the disposal.

**MATERIALS LICENSE  
SUPPLEMENTARY SHEET**

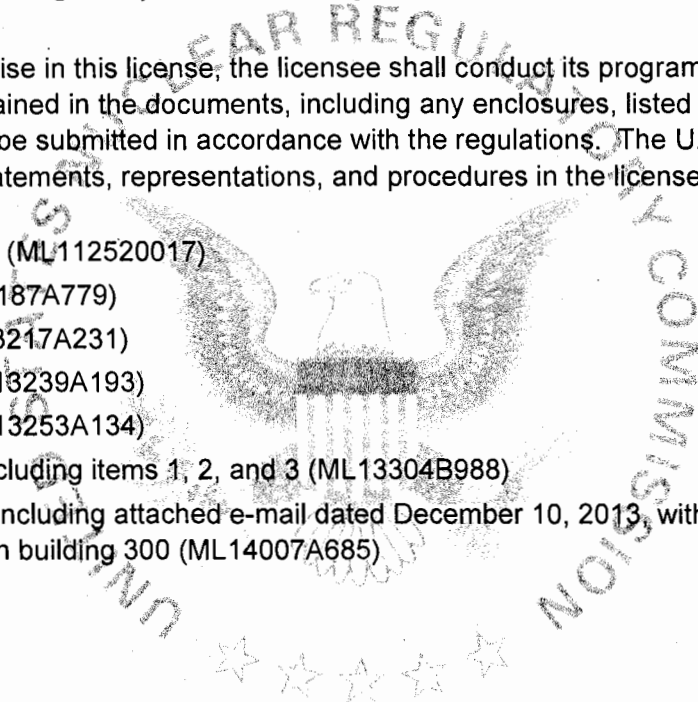
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20. The Radiation Safety Officer shall have the authority to stop any operation which he deems to constitute a threat to health and safety or violates the license or the U.S. Nuclear Regulatory Commission regulations.
21. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents, including any enclosures, listed below. This license condition applies only to those procedures that are required to be submitted in accordance with the regulations. The U.S. Nuclear Regulatory Commission's regulations shall govern unless the statements, representations, and procedures in the licensee's application and correspondence are more restrictive than the regulations.
- A. Application dated August 31, 2011 (ML112520017)
  - B. Letter dated June 29, 2012 (ML12187A779)
  - C. Letter dated August 2, 2013 (ML13217A231)
  - D. Letter dated August 23, 2013 (ML13239A193)
  - E. Letter dated August 27, 2013 (ML13253A134)
  - F. Letter dated October 30, 2013; excluding items 1, 2, and 3 (ML13304B988)
  - G. Letter dated December 31, 2013; including attached e-mail dated December 10, 2013, with regard to the effective radius of the nozzle exit velocity for the effluent stack in building 300 (ML14007A685)
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License Number

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- H. Letter dated December 23, 2013 (ML13364A167)  
I. Letter dated February 3, 2014 (ML14037A171)  
J. Letter dated February 7, 2014 (ML14042A123)  
K. Letter dated July 11, 2014 (ML14195A376)  
L. Letter dated September 30, 2014 (ML14287A663)  
M. Letter dated August 1, 2014 (ML14218A761)  
N. Letter dated November 14, 2014 (ML14322A794)  
O. Letter dated January 15, 2015 (ML15035A362)  
P. Radiation Protection Program received August 27, 2013; revised Item 3.3.4.12 (ML13253A132)  
Q. Letter dated March 10, 2017 (ML17074A038)  
R. Letter dated March 29, 2017 (ML17101A446)  
S. Letter dated April 4, 2017 (ML17101A445)

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Date: April 12, 2017By: Cassandra F. Frazier  
Region 3