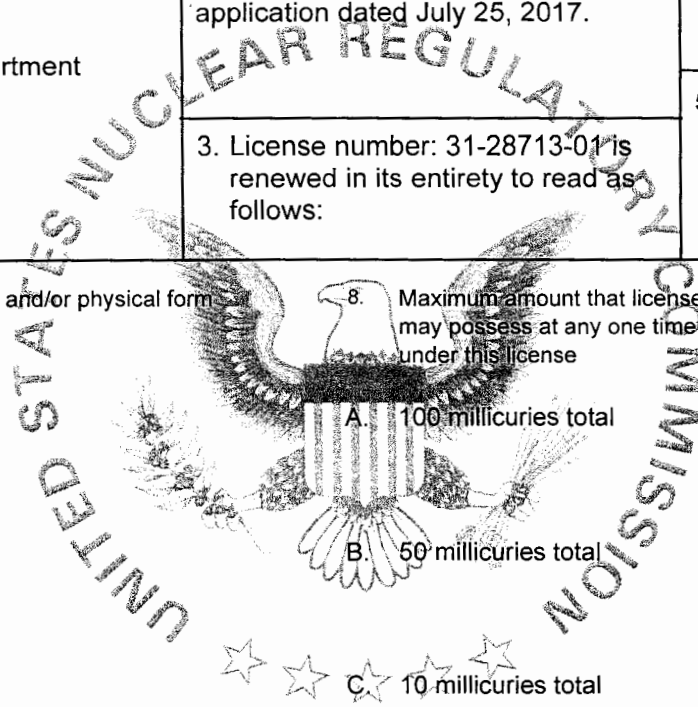


MATERIALS LICENSE

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 style="text-align: center;">Licensee</p> <p>1. Columbia University Environmental Health and Safety Department</p> <p>2. 419 West 119th Street Mail Code 2298 New York, NY 10027</p>		<p>In accordance with the application dated July 25, 2017.</p> <p>3. License number: 31-28713-01 is renewed in its entirety to read as follows:</p>	<p>4. Expiration Date: December 31, 2032</p> <p>5. Docket No.: 030-34376 Reference No.:</p>
<p>6. Byproduct, source, and/or special nuclear material</p> <p>A. Hydrogen-3</p> <p>B. Carbon-14</p> <p>C. Phosphorus-32</p> <p>D. Phosphorus-33</p>	<p>7. Chemical and/or physical form</p> <p>A. Any</p> <p>B. Any</p> <p>C. Any</p> <p>D. Any</p>	<p>8. Maximum amount that licensee may possess at any one time under this license</p> <p>A. 100 millicuries total</p> <p>B. 50 millicuries total</p> <p>C. 10 millicuries total</p> <p>D. 25 millicuries total</p>	<p>9. Authorized use</p> <p>A. For research and development as defined in 10 CFR 30.4; and calibration and checking of the licensee's instruments.</p> <p>B. For research and development as defined in 10 CFR 30.4; and calibration and checking of the licensee's instruments.</p> <p>C. For research and development as defined in 10 CFR 30.4; and calibration and checking of the licensee's instruments.</p> <p>D. For research and development as defined in 10 CFR 30.4; and calibration and checking of the licensee's instruments.</p>



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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
E. Sulfur-35	E. Any	E. 25 millicuries total	E. For research and development as defined in 10 CFR 30.4; and calibration and checking of the licensee's instruments.
F. Protactinium-233	F. Any	F. 1 microcurie total	F. For research and development as defined in 10 CFR 30.4; and calibration and checking of the licensee's instruments.
G. Thorium-229	G. Any	G. 0.002 microcuries total	G. For research and development as defined in 10 CFR 30.4; and calibration and checking of the licensee's instruments.
H. Thorium-230	H. Any	H. 1 microcurie total	H. For research and development as defined in 10 CFR 30.4; and calibration and checking of the licensee's instruments.
I. Cesium-137	I. Sealed Sources (Isotope Products Laboratories, Model 225)	I. 10 millicuries per source and 20 millicuries total	I. For use in a Geotek core logger for density measurements of sediment core samples.

CONDITIONS

10. Licensed material may be used on research vessels at sea in national and international waters and coastal waters located anywhere in the United States where the U.S. Nuclear Regulatory Commission maintains jurisdiction for regulating the use of licensed materials.
11. Licensed material shall only be used by, or under the supervision of, individuals designated, in writing, by the Radiation Safety Committee. The licensee shall maintain records of individuals designated as users for 3 years after the individual's last use of licensed material.

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12. The Radiation Safety Officer (RSO) for this license is Thomas L. Morgan, Ph.D.
13. The licensee shall not use the licensed material in or on humans.
14. The licensee shall not use licensed material in field applications where activity is released except as provided otherwise by specific condition of this license.
15. 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. Tests for leakage and/or contamination, including leak test sample collection and analysis, shall be performed by the licensee or other persons specifically licensed by the U.S. Nuclear Regulatory Commission or an Agreement State to perform such services.
- H. Records of leak test results shall be kept in units of becquerels (microcuries) and shall be maintained for 3 years.
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. 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 July 25, 2017 (ML17214A709)

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Amendment No. 11



FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Date: December 21, 2017

By: *Elizabeth Ullrich*
Elizabeth Ullrich
Region 1