November 21, 2014

Mr. Scott Schierman
Senior Health, Safety and
Environment Specialist
Uranium One Americas, Inc.
907 N Poplar, Suite 260
Casper, WY 82601

SUBJECT: SAFETY EVALUATION REPORT, REVIEW AND VERIFICATION OF THE RESULTS FROM THE TESTING OF THE FIRST LOT OF REDRIED HONEYMOON YELLOWCAKE, AUTHORIZATION FOR SHIPMENT, URANIUM ONE, USA, INC., WILLOW CREEK PROJECT, CAMPBELL AND JOHNSON COUNTIES, WYOMING, MATERIALS LICENSE SUA-1341 (TAC NO. L00748)

Dear Mr. Schierman:

The U.S. Nuclear Regulatory Commission (NRC) Materials License SUA-1341, License Condition (LC) 10.22, requires Uranium One USA, Inc., (Uranium One) to provide specific information to the NRC related to the re-drying of Honeymoon, Australia Project (Honeymoon) yellowcake for NRC review and verification before the Honeymoon yellowcake may be shipped from Uranium One's Willow Creek Project. By letter dated November 14, 2014, Uranium One submitted information to the NRC pertaining to the first lot of Honeymoon yellowcake redried at the Willow Creek Project pursuant to the requirements of NRC Materials License SUA-1341, LC 10.22 (Agencywide Documents Access and Management System (ADAMS) accession # ML14321A250). Uranium One revised the November 14, 2014, submission by letter dated November 17, 2014 (ML14323A571).

The NRC staff has reviewed the information provided by Uranium One. This letter transmits NRC's review and verification that the requirements of LC 10.22 have been met and that shipments of redried Honeymoon yellowcake from the Willow Creek Project may commence.

The NRC staff's review is documented in the enclosed Safety Evaluation Report (SER) (Enclosure). The SER documents the NRC staff's conclusion that there is sufficient information to support the reasonable assurance finding that the Lot 1 shipment of redried Honeymoon yellowcake from the Willow Creek Project is protective of public health, safety and the environment. Furthermore, the NRC staff has reasonable assurance that any additional Honeymoon yellowcake lots redried in a similar manner resulting in similar redried yellowcake physical (e.g., green in color) and chemical (i.e., determined to be U_3O_8) properties as Lot 1 will be protective of public health, safety, and the environment.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's ADAMS. ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

If you have any questions regarding this action, please contact me at 301-415-7777, or by e-mail at Ron.Linton@nrc.gov.

Sincerely,

/RA/

Ron C. Linton
Project Manager/Hydrogeologist
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Docket No.: 040-08502
License No.: SUA-1341

Enclosure: Safety Evaluation Report

cc: Luke McMahan, PG. (WDEQ)
Miles Bennett (WDEQ)

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SAFETY EVALUATION REPORT
REVIEW AND VERIFICATION OF THE RESULTS FROM THE TESTING OF THE FIRST LOT OF REDRIED HONEYMOON YELLOWCAKE, AUTHORIZATION FOR SHIPMENT, URANIUM ONE, USA, INC., WILLOW CREEK PROJECT, CAMPBELL AND JOHNSON COUNTIES, WYOMING, MATERIALS LICENSE SUA-1341

DATE:	November 21, 2014
DOCKET:	04008502
LICENSE NO.:	SUA -1341
LICENSEE:	Uranium One USA, Inc.
SITE:	Willow Creek Project, Irigaray Facility
PROJECT MANAGER:	Ron Linton
TECHNICAL REVIEWER:	Ronald A. Burrows
SUBJECT:	Uranium One, USA, Inc., Willow Creek Project, Request to Commence Shipments of Redried Honeymoon Australia Yellowcake from the Willow Creek Project

BACKGROUND

Uranium One USA, Inc. (Uranium One or licensee) requested verification from the U.S. Nuclear Regulatory Commission (NRC) to authorize the commencement of shipping yellowcake originating from the Honeymoon, Australia Project (Honeymoon) uranium recovery project that was shipped to, and redried at the Uranium One, Willow Creek Project, Irigaray Central Processing Facility. A description of the origin of this yellowcake, the purpose for redrying, and the drying process can be found in NRC's approval of Amendment 3 to Uranium One's Materials License SUA-1341 (Agencywide Documents Access and Management System (ADAMS) accession # ML14212A154). Pertinent to this review, Amendment 3 contained a new license condition (LC), LC 10.22, that requires Uranium One to provide the NRC with specific testing information related to the redried Honeymoon yellowcake. As discussed in NRC's Safety Evaluation Report (SER) for Amendment 3 (ML14212A154), this testing information was required to provide a technical foundation for ensuring the redried Honeymoon yellowcake is chemically stable for shipping offsite and thus does not present an increased potential for radiological accidents. In addition, LC 10.22 requires Uranium One to receive written verification from the NRC prior to shipping the redried Honeymoon yellowcake offsite.

In correspondence dated November 14, 2014 (ML14321A250), and revised by correspondence dated November 17, 2014, (ML14323A571), Uranium One provided the NRC with the testing data on the redried Honeymoon yellowcake as required by LC 10.22 and requested verification

that this redried yellowcake could be shipped offsite. The November 14, 2014, and November 17, 2014, correspondence together are considered "the submittal" for purposes of this review. The purpose of this evaluation is limited to the NRC staff reviewing Uranium One's testing data of the redried Honeymoon yellowcake and determining if shipping this yellowcake offsite will be protective of public health, safety, and the environment. The regulatory review of Uranium One's drying process and other aspects of redrying the Honeymoon yellowcake was reviewed and approved in NRC's SER for Amendment 3 (ML14212A154).

REGULATORY REQUIREMENTS

The NRC staff observes that there are no regulatory requirements for the chemical composition of yellowcake produced by in situ recovery facilities such as Uranium One's Willow Creek Project. However, it has been demonstrated that under certain circumstances, a drum(s) of yellowcake may become pressurized causing an unexpected ejection of a portion of the drum contents and a subsequent uptake of yellowcake to those in the vicinity of the drum. In its SER for Amendment 3 (ML14212A154), the NRC staff described several of these pressurization events that occurred from yellowcake produced at Uranium One's Willow Creek Project.

The NRC staff reviewed Uranium One's testing data on the redried Honeymoon yellowcake against the requirements in LC 10.22 and the guidance in NRC Information Notice 1999-03, Rev. 1 (ML14028A175) to provide reasonable assurance that drums of the redried Honeymoon yellowcake would not become pressurized. Although not requirements, the guidance in this information notice provides the NRC staff's and industry's current knowledge of the causes for pressurized yellowcake drums.

TECHNICAL EVALUATION

In accordance with LC 10.22, the licensee provided, in its submittal, the physical parameters (e.g., temperature profile, drying time) of its yellowcake dryer as well as physical and chemical properties of it first lot of redried Honeymoon yellowcake. According to the licensee, it currently has 2.5 lots of redried Honeymoon yellowcake ready for offsite shipment.

Residual Organics

The licensee provided the results of their in-house testing of residual organic material. For a discussion on the origin of residual organic material in the Honeymoon yellowcake, refer to the NRC staff's discussion in the SER for Amendment 3 (ML14212A154). After adjusting their dryer feed rate and dryer temperature, the licensee's tests for residual organic material indicated that the total organic carbon (TOC) in the redried Honeymoon yellowcake was less than 0.1 percent. A comparison of the TOC test and the test used for determining hexane extractable organics (used, for example, by Cameco's Blind River, Canada, uranium conversion facility) was previously provided by the licensee (ML14113A421).

The results of the licensee's TOC testing meet the requirements of LC 10.22. In addition, based on the licensee's testing, the NRC staff has reasonable assurance that this level of residual organic material content will be acceptable for shipment to uranium conversion facilities. Therefore, the results of the TOC analyses are acceptable.

Drying Parameters

The licensee discussed its process for setting the optimal yellowcake dryer parameters to meet TOC requirements set by uranium conversion facilities, as well as producing a chemically stable yellowcake product that will not cause yellowcake shipping drums to become pressurized. The licensee provided data on the yellowcake dryer hearth temperatures, dryer feed rate, dryer rake speed, and its estimate on the amount of time the yellowcake was in the dryer. The licensee also provided temperature data, including a cooling profile, on the redried Honeymoon yellowcake in shipping drums using a thermocouple placed in the center of the yellowcake shipping drum (ML14323A571).

The information provided by the licensee on the yellowcake dryer and yellowcake temperature profiles for Lot 1 of the redried Honeymoon yellowcake meet the requirements of LC 10.22 and is therefore acceptable.

Honeymoon Yellowcake Physical Description

The licensee described the Honeymoon yellowcake color and consistency before and after redrying. The licensee stated that prior to redrying, the Honeymoon yellowcake was light yellow, almost cream color, with a consistency of fine powder. After redrying, the drummed yellowcake was a dark olive green and also a fine powder (ML14323A571).

The NRC staff observes that changes in color of yellowcake as it is heated at higher temperatures and for longer periods of time is consistent with industry yellowcake drying experience (refer to Figure 7-13 of the Merritt, 1971 reference in NRC Information Notice 1999-03, Rev. 1 (ML14028A175)). In addition, the information provided by the licensee on the color and consistency of the drummed redried Honeymoon yellowcake meet the requirements of LC 10.22 and is therefore acceptable.

Honeymoon Yellowcake Chemistry

The licensee provided X-ray diffraction (XRD) test results from two independent testing facilities for the Honeymoon yellowcake prior to, and after, redrying. Prior to redrying, the XRD tests indicated that the Honeymoon yellowcake was predominantly metastudtite ($UO_4 \cdot 2H_2O$). After redrying the Honeymoon yellowcake, the XRD tests indicated that the material was predominantly (greater than 98 percent for Lot 1, Drums 3 and 9) U_3O_8 (ML14323A571).

The NRC staff observes that the test results provided by the licensee are consistent with previous conclusions presented in NRC Information Notice 1999-03, Rev. 1 (refer to Enclosure 1, Table 1, of ML14028A175). In addition, the information provided by the licensee on the yellowcake chemical analyses meet the requirements of LC 10.22 and is therefore acceptable.

Results of Yellowcake Drum Pressurization Tests

In order to test if the shipping drums containing the redried Honeymoon yellowcake could become pressurized if the thermal decomposition process for the yellowcake was not completed, the licensee secured lids outfitted with pressure gauges on three shipping drums

filled with hot (200, 206, and 213 degrees Fahrenheit) redried Honeymoon yellowcake. The temperatures of the yellowcake used during this testing process were significantly higher than the 90 degrees Fahrenheit temperature used by the licensee for its typical yellowcake drumming operations. After observing these drums for seven days, the licensee reported that no pressure was observed (ML14323A571).

The NRC staff previously concluded that UO_3 and lower oxide forms of uranium (e.g., U_3O_8), which are typically dried at higher temperatures than uranium peroxide products, did not demonstrate the ability to pressurize yellowcake shipping drums (NRC Information Notice 1999-03, Rev. 1 (ML14028A175)). The NRC staff observes that the licensee's pressure test findings are consistent with previous NRC staff conclusions. In addition, the information provided by the licensee on the on-site drum pressurization tests meet the requirements of LC 10.22 and is therefore acceptable.

CONCLUSION

NRC staff has reviewed the redried Honeymoon yellowcake test information against the requirements of LC 10.22 and for consistency with the guidance in NRC Information Notice 1999-03, Rev. 1 (ML14028A175). Based on the information provided in Uranium One's submittals (ML14321A250 and ML14323A571) and the NRC staff's review discussed in this SER, the NRC staff concludes that Lot 1 of the Honeymoon yellowcake redried by Uranium One at its Willow Creek facility is acceptable for shipment offsite and NRC staff has reasonable assurance that public health, safety and the environment will be protected. Furthermore, the NRC staff has reasonable assurance that any additional Honeymoon yellowcake lots redried in a similar manner resulting in similar redried yellowcake physical (e.g., green in color) and chemical (i.e., determined to be U_3O_8) properties as Lot 1 will be protective of public health, safety, and the environment.