State of Utah
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Department of
Environmental Quality

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DIVISION OF RADIATION CONTROL
Rusty Lundberg
Director

July 7, 2011

CERTIFIED MAIL
RETURN RECEIPT REQUIRED

Daniel B. Shrum
Senior Vice President, Regulatory Compliance
EnergySolutions, LLC
423 West 300 South, Suite 200
Salt Lake City, Utah 84101

RE: Radioactive Material License (RML) Number UT 2300249: Non-Conforming Waste Disposal Notice of Violation/Notice of Proposed Civil Penalty Dated February 24, 2011

Dear Mr. Shrum:

Introduction
EnergySolutions has been using the Electronic Waste Information System (EWIS) computer program to calculate the waste classification of waste shipments being sent to the Low-Level Radioactive Waste Disposal Facility in Clive, Utah. In a meeting between EnergySolutions and the Division of Radiation Control (DRC) held December 7, 2010, EnergySolutions Corporate Radiation Safety Office and the Clive Facility's Director of Health Physics informed the DRC that EnergySolutions noticed a possible problem with the EWIS program back in November, 2009. The DRC received a self-identified letter (CD10-0358) dated December 13, 2010 from EnergySolutions addressing the EWIS waste classification problem and the discovery of 15 shipments consisting of 23 containers that exceeded Class A waste limits after an audit of the EWIS program was completed. These containers were accepted and disposed of at the Clive facility.

On February 24, 2011, the DRC issued a Notice of Violation/Notice of Proposed Imposition of Civil Penalty (NOV/NPICP) to EnergySolutions for the acceptance and disposal of the 23 containers that exceeded Class A criteria. The severity level and the proposed civil penalty were assessed based on the statutory provisions of 19-3-109 Utah Code Annotated (UCA) and the regulatory requirements of R313-14 Utah Administrative Code (UAC).

On April 7, 2011, EnergySolutions responded to the NOV/NPICP. In reviewing EnergySolutions' submittal, which compares removing the waste exceeding Class A criteria with leaving the waste in-place, the DRC considered the dose to radiation workers, the dose to the

general public, the waste characteristics following disposal, and the overall positive or negative effects of removing the waste. In performing a technical review of the submittal, the DRC did not consider financial impacts related to the cost of removing the waste exceeding Class A criteria in its final determination.

Definitions (As defined in UAC R313-12-3)
To aid the public in reviewing the information in this letter, the following definitions are provided:

ALARA: As Low As Reasonably Achievable: means making every reasonable effort to maintain exposures to radiation as far below the dose limits as is practical, consistent with the purpose for which the licensed or registered activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed or registered sources of radiation in the public interest.

CFR: means Code of Federal Regulations.

Dose: is a generic term that means absorbed dose, dose equivalent, effective dose equivalent, committed dose equivalent, committed effective dose equivalent, or total effective dose equivalent. For purposes of these rules, "radiation dose" is an equivalent term.

Dose equivalent (H_T): means the product of the absorbed dose in tissue, quality factor, and other necessary modifying factors at the location of interest. The units of dose equivalent are the sievert (Sv) and rem.

Dose limits: means the permissible upper bounds of radiation doses established in accordance with these rules. For purpose of these rules, "limits" is an equivalent term.

Public dose: means the dose received by a member of the public from exposure to radiation or to radioactive materials released by a licensee, or to any other source of radiation under the control of a licensee or registrant. Public dose does not include occupational dose or doses received from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with Rule R313-32, or from voluntary participation in medical research programs.

Radiation: means alpha particles, beta particles, gamma rays, x-rays, neutrons, high speed electrons, high speed protons, and other particles capable of producing ions. For purposes of these rules, ionizing radiation is an equivalent term. Radiation, as used in these rules, does not include non-ionizing radiation, like radiowaves or microwaves, visible, infrared, or ultraviolet light.

Rem: means the special unit of any of the quantities expressed as dose equivalent. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor. One rem equals 0.01 sievert (Sv).

DRC Dose Evaluation
The following are the dose limits for radiation workers and the public as defined by 10 CFR:

- The Radiation Worker dose limit: 5,000 mrem/year
- The Public dose limit: 100 mrem/year

EnergySolutions self-imposed dose limit for an employee is 2,500 mrem/year, as documented in EnergySolutions Clive Facility's Radiation Protection Manual Rev. 5 Section 2.1.5.

The DRC determined:

- The formulas used by EnergySolutions to develop their dose estimates were appropriate;
- The computer program MicroShield® is an appropriate program to use;
- The assumptions that EnergySolutions used to develop the dose estimates were appropriate; therefore,
- The dose estimates for Radiation Workers and the Public are appropriate.

Dose Evaluation Matrix

Options	Dose to Radiation Worker (mrem*/person)	Dose to Public (mrem* /year)	Net Dose (Worker** + Public) (mrem*/year)
Remove Waste	194	1.2	131.9
Waste Stays in Place	0	0	0

* Note mrem = 0.001 rem
** Dose to Radiation Worker was converted to mrem/year by multiplying the Dose to radiation worker in mrem/person by 2/3. Based on the estimated time to complete is 1.6 years.

Although removing the waste will not exceed the regulatory dose limits for the radiation worker or the public, leaving the Class A-exceeding waste in place conforms with ALARA.

DRC Clive Facility Performance Evaluation
The DRC determined:

- The formulas used by EnergySolutions to develop their infiltration estimates were appropriate;
- The assumptions that EnergySolutions used to develop the infiltration estimates were appropriate; therefore,
- The infiltration estimates are appropriate.

The Clive facility's existing performance assessment demonstrates compliance with the facility's RML and Groundwater Discharge Permit because it is based on the condition that the waste does not exceed Class A limits following disposal in the embankment. Consequently, a performance assessment evaluation depends on whether the waste that exceeded Class A criteria when it arrived still exceeds Class A criteria following placement in the disposal lifts. For purposes of this type of evaluation, the Class A classification is determined by the concentration of each

isotope (in units of nCi/g or Ci/m^3) in a given volume of waste. The concentration value of each isotope is then compared to Table 1 and Table 2 of UAC R313-15-1009 to determine its classification. These concentrations are determined through sampling and laboratory analysis. Handheld instrumentation, in its different varieties (i.e., scintillators, gas flow proportional, sodium iodide, ion chamber, Geiger-Muller detectors, etc.) is not designed to detect radioactivity in units of concentration. Such instrumentation detects radioactivity in units of dose rate or surface contamination and cannot be used to determine low-level radioactive waste classification (A, B or C).

DRC Observation: While calculating radioactive concentrations in each container to confirm if it exceeded Class A criteria, it was determined that 18 of the 23 containers did exceed the Class A limit based on the Sum of the Fractions Rule. The Sum of the Fractions Rule is stated in UAC R313-15-1009(1)(g) as follows:

> The sum of the fractions rule for mixtures of radionuclides. For determining classification for waste that contains a mixture of radionuclides, it is necessary to determine the sum of fractions by dividing each radionuclide's concentration by the appropriate limit and adding the resulting values. The appropriate limits shall all be taken from the same column of the same table. The sum of the fractions for the column shall be less than 1.0 if the waste class is to be determined by that column.

In applying the "sum of the fractions rule," to each shipping container, 18 of the 23 containers were determined to exceed Class A limits. The remaining 5 containers exceeded Class A criteria based on a single isotope.

DRC Observation: As documented on EnergySolutions' Lift Approval Forms and observed during DRC on-site inspections, waste is not always disposed in the container in which it arrives. Specifically, a container is emptied and spread out within the disposal embankment in lifts, covered with soil, and compacted using heavy equipment. It is very common that wastes from several different generators are placed in the same lift. EnergySolutions tracks which lift that the contents of each container were placed, but does not track the specific location within the lift the contents were placed. Soils used to cover the waste are either clean fill, contaminated soil or covered in CLSM (low strength concrete). The lifts in question range in size from 6,667 sq. ft. to 69,708 sq. ft. Therefore, because the contents of multiple containers are mixed together in the same lift, it is impossible to distinguish the contents of an individual container.

This observation confirms EnergySolutions' statement in the first paragraph of section 2.2 of the April 7, 2011 submittal, "Once received and processed, Class A containers are placed into a lift area with other lower activity wastes, native soils, and other CLSM fill materials. Because of this, none of the errant containers remain in an isolated, concentrated unit within the disposal cell. Instead, the Waste Removal Management Plan assumes removal of the entire disposal lift in which the errant containers were placed."

The DRC requested EnergySolutions also perform and submit a sum of fractions calculation on all of the lifts that will have to be removed to demonstrate if the waste produced from excavating these lifts is Class A or not. EnergySolutions provided these calculations and they show that the

lifts are within Class A limits. The DRC reviewed these calculations and has determined that they were done correctly. Therefore, the waste exceeding Class A criteria has been effectively mixed with the other contents in each lift and the disposal embankment remains in compliance with the required performance objectives, as confirmed by the existing performance assessment.

DRC Overall Net Effect Evaluation

DRC Scenario: Due to the fact that the entire lift, not just a container, would be removed and returned to the original generators, the waste would be considered Class A waste. Upon receipt of the returned waste, the generator/shipper would subsequently characterize and profile the waste as Class A waste and likely reship the waste to the Clive facility as Class A waste and in turn placed in the same embankment from which it was removed. Therefore, the overall net effect in removing the waste is unchanged.

Conclusion

In summary:

- Removing the waste that exceeded Class A limits results in a higher dose estimate to radiation workers and the general public than if the waste is left in place. These dose limits do not exceed regulatory dose limits. Using the ALARA philosophy as a criterion, there is no health or environmental benefit to removing the waste.

- Once the waste that exceeded Class A limits was placed on the disposal lifts it became blended with all of the other waste and soils in the lifts. Calculations have shown that the lifts meet Class A criteria. Leaving the waste in place does not compromise the performance assessment evaluation of the facility that was completed during the last license renewal.

- Removing the waste and returning it to the involved generators with the subsequent likelihood that it would be reshipped to the Clive facility as a Class A waste is counter productive and increases the risk to the public and environment due to the added shipments.

- For informational purposes, the cost estimate submitted by EnergySolutions for removing the waste is $1,916,507 and would take 1.6 years to complete. The DRC did not consider financial impacts related to the cost of removing the waste exceeding Class A criteria in its final determination.

There is no added benefit to public health, the environment, or the State of Utah to remove the waste that exceeded Class A criteria from the EnergySolutions Clive Facility. The DRC agrees with the recommendation of EnergySolutions to leave the waste that exceeded Class A waste criteria in the Clive Facility's disposal embankment. The DRC accepts the corrective actions for both violations and will evaluate the effectiveness of the corrective actions in future inspections of and notifications from EnergySolutions.

Therefore, the DRC requests that an enforcement conference, as per R313-14-15(5)(b), be scheduled to discuss details of an Environmental Project and final closure for this NOV.

Dated at Salt Lake City, Utah
This 7th day of July, 2011

UTAH RADIATION CONTROL BOARD

Rusty Lundberg

Rusty Lundberg, Executive Secretary

RL/RJ:rj

Cc: Sean McCandless, Director of Compliance and Permitting