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TECHNICAL EVALUATION REPORT OF US ECOLOGY IDAHO'S PROPOSED METHODOLOGY SUPPORTING ALTERNATE WASTE DISPOSAL PROCEDURES IN ACCORDANCE WITH 10 CFR 20.2002

INTRODUCTION

US Ecology Idaho, Inc. (USEI) operates a Resource Conservation and Recovery Act (RCRA) Subtitle C disposal facility located in Grand View, Idaho. USEI is permitted by Idaho's Department of Environmental Quality (IDEQ) and is not a U.S. Nuclear Regulatory Commission (NRC) licensee. An NRC licensee or applicant for an NRC license seeking to dispose of licensed material at USEI must request approval from the NRC (or Agreement State). In addition to approving the licensee's disposal request, the NRC must also exempt USEI from NRC licensing requirements (i.e., the NRC would issue an exemption under 10 CFR 30.11, 10 CFR 40.14, or 10 CFR 70.17) in order for USEI to accept the material. Upon approval of both a licensee's disposal request and the USEI exemption the licensee would then be permitted to dispose of the subject licensed material at USEI.

In 2013, USEI proposed the use of a site-specific dose assessment (SSDA) methodology for calculating doses to support licensee's disposal requests and USEI exemption requests for the transfer and disposal of licensed materials at USEI. On August 24, 2015, NRC staff approved the use of the USEI SSDA methodology and corresponding technical basis document (TBD), designated as Version 1, (ML15125A364 [cover letter] and ML15125A466 [public version of TER]). In a letter dated August 4, 2017 (ML17230A221), USEI requested that the NRC staff review and approve an updated version, Version 3, of the SSDA methodology and corresponding TBD. According to USEI, these updates refine the calculations performed when evaluating future licensee disposal requests and corresponding USEI exemption requests and address some minor technical errors found in the evaluation process since the approval of Version 1.¹

The NRC staff has prepared a technical evaluation report (TER) to document the NRC staff's technical review of the Version 3 SSDA methodology and associated TBD. In performing this technical review, the NRC staff evaluated the technical basis and assumptions incorporated into the USEI calculations. NRC staff also used the updated SSDA methodology to evaluate two previously approved USEI requests and compared the findings. This document is the publicly-available version of the TER; a version of the TER that contains proprietary information is not publicly available in accordance with 10 CFR 2.390(a)(4). This publicly-available version describes, on a more general level, the basis on which the NRC staff reviewed USEI's proposed Version 3 SSDA methodology and supporting TBD and summarizes the staff's findings. Specific details related to the calculations used in the Version 3 SSDA methodology are not explained in this document.

PURPOSE

¹ Version 2 of the SSDA addressed grammatical and other non-technical issues. It was never sent to the NRC for review and no technical evaluations were performed using Version 2.

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The SSDA methodology is intended to streamline both the preparation of, and the NRC staff's subsequent review of, the disposal and exemption request review process by establishing bounding, risk-based performance criteria. The SSDA methodology combines the information required by NRC regulations, including project-specific information (e.g., radionuclides of concern, number of trucks transporting waste, etc.), with site-specific parameter values associated with the USEI site and the dose assessment models commonly used when considering these types of requests.

USEI is now seeking NRC staff approval of its updated SSDA methodology (Version 3). Version 3 refines the calculations performed when evaluating doses associated with the transport and disposal of licensed material at USEI. Version 3 also corrects minor errors that were discovered since the approval of Version 1. During its review of Version 3, the NRC staff considered these corrections, updates, and modifications while confirming that these changes do not impact the overall functionality of the SSDA.

EVALUATION OF UPDATES AND REVISIONS

In Version 3, USEI made numerous updates and revisions to the SSDA methodology to refine the calculations performed when evaluating doses associated with both the transport of licensed material to USEI and the disposal of that licensed material at the site. Version 3 also corrects errors that were discovered within the Version 1 calculations. The NRC staff reviewed Version 3 and has found that the changes and updates provide a more accurate description of the potential doses received by those individuals involved in the transport and disposal processes related to current USEI operations. NRC staff also evaluated a previously approved 2016 request to transport and dispose of water containing radioactive material at USEI (ML17082A581) as well as a 2009 disposal request that was used as an analysis for the evaluation of the Version 1 SSDA methodology (ML110110283). The data from these two previously approved requests were evaluated using the Version 3 SSDA methodology to ensure that the Version 3 changes did not undermine the functionality of the previously approved Version 1 SSDA methodology.

Truck Drivers and Shipping Containers

The Version 3 SSDA methodology provides additional details related to the packaging and shipping processes used to transport radioactive waste to USEI. These additional details enable the SSDA to consider the doses related to the shipment of radioactive material as bulk material in dump trucks or in specific container types on the back of trailers. The Version 3 SSDA methodology also evaluates doses related to the shipment of contaminated water via tanker trucks (Version 1 of the SSDA only considered whether the material was shipped as bulk material or within a general container and did not consider the shipment of contaminated water). Driver doses are calculated using the Microshield computer code with the driver set at a fixed distance from the waste. A shielding thickness is included to account for the type of container used and the thickness of the truck cab walls. The Version 3 SSDA methodology accounts for the variations in distances and thicknesses based on the mode of transportation and the type of container used (or if the material is shipped as bulk material). These calculations are

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dependent on the inputs to the SSSA. Table 1 provides a comparison of the truck driver distances and the shielding thicknesses considered for various shipment types.

Table 1. Summary of truck driver distances and shielding thicknesses for shipping various materials

Material	Driver Distance	Shielding
Bulk soil and debris	0.6 m (2 ft)	0.635 cm (0.25 inch) thick aluminum
IMC shipments	4 m (13.1 ft)	0.635 cm (0.25 inch) thick aluminum
Water	3.3 m (10.8 ft)	.5 cm (0.197 inch) thick steel

In its evaluation of the Version 3 SSSA methodology, the NRC staff compared the doses to truck drivers associated with the different shipment options. The results showed that not only do the doses received depend on the type of package used but that the maximally exposed individual (MEI) (i.e., the worker that receives the largest dose associated with the transportation and disposal process) can vary depending on the type of shipping container used.

Additional Worker Scenarios

The Version 3 SSSA methodology also included additional worker scenarios related to the onsite processing of radioactive waste at USEI, such as.:

- Container Pad Operators who process the shipments of small containers (B-25 boxes, drums, etc.) upon arrival at USEI;
- Treatment Plant Truck Drivers who transport any waste that requires treatment prior to disposal in the landfill; and
- Container Pad Truck Drivers who transport the containerized waste from the container pad to the landfill.

Incorporation of these additional worker scenarios into the list of calculated doses is dependent on the inputs to the SSSA.

Analysis of Water Transport-Related Issues

The Version 3 SSSA methodology added the ability to calculate doses associated with the transportation and disposal of water containing radioactive material. A review of the Version 3 calculations show that selecting water as the waste form impacts the dimensions of the truck used in the Microshield computer code calculations, the amount of time spent transporting and processing the waste, and specific parameters associated with the dose calculations for individuals involved in the transport and disposal process.

The NRC staff used a 2016 request to transport radioactively-contaminated water from the Vermont Yankee power reactor to USEI for disposal (ML17082A581) as a basis to assess the ability of the Version 3 SSSA methodology to calculate doses related to transportation and disposal activities. The 2016 NRC staff review relied upon the Version 1 SSSA methodology with conservative assumptions made to account for the fact that the Version 1 SSSA

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methodology did not include inputs for calculating doses associated with the transport and disposal of contaminated water. As expected, doses calculated using the water transport capabilities incorporated into Version 3 were more realistic than the doses calculated using the Version 1 methodology.

Comparison of Version 3 and Version 1

In Version 3, USEI made numerous changes and updates to the SSDA in order to refine the calculations performed when evaluating doses associated with the transport to and the disposal of licensed material at USEI. USEI also corrected errors that were discovered within the calculations since the issuance of Version 1. To ensure that these changes did not impact the doses calculated by the updated SSDA, the NRC staff evaluated the same 2009 USEI exemption request used as an independent analysis for the evaluation of Version 1 of the SSDA. This 2009 request evaluated the shipment and disposal of low-activity radioactive material from Toronto, Canada to USEI. Information provided in both the initial submittal (ML090860763) and the final SER that supported the NRC staff's approval of the exemption request (ML110110283) were used to evaluate the Version 3 SSDA. A comparison of the doses calculated using Version 1 and Version 3 of the SSDA is provided in Table 2.

Table 2. Comparison of Version 1 and Version 3 doses to workers and members of the public

Exposure Scenario	Version 1	Version 3
	mSv/yr (mrem/yr)	mSv/yr (mrem/yr)
Front-End Dray Truck Driver ¹	3.00E-02 (3.00E+00)	3.00E-02 (3.00E+00)
Truck Surveyors	7.35E-04 (7.35E-02)	7.35E-04 (7.35E-02)
RTF Excavator Operator	2.09E-03 (2.09E-01)	1.13E-03 (1.13E-01)
Treatment Workers	3.72E-04 (3.72E-02)	3.72E-04 (3.72E-02)
Landfill Cell Operators	1.05E-03 (1.05E-01)	1.05E-03 (1.05E-01)
Post-Closure Dose	6.24E-05 (6.24E-03)	1.74E-03 (1.74E-02)
Inadvertent Intruder – Construction Scenario	9.20E-03 (9.20E-01)	9.20E-03 (9.20E-01)
Inadvertent Intruder – Well Driller Scenario	1.15E-03 (1.15E-01)	1.15E-03 (1.15E-01)
Inadvertent Intruder – Driller Occupancy Scenario	2.15E-04 (2.15E-02)	2.15E-04 (2.15E-02)

¹ MEI for both analyses

CONCLUSIONS

The NRC staff performed an extensive review of the Version 3 SSDA methodology as well as the updated TBD to determine whether the updates and revisions would impact the NRC staff's ability to continue using the SSDA methodology for approving the disposal of licensed material at USEI. The review involved evaluating the specific changes and updates included in Version 3 to more accurately define specific doses to individuals associated with the transport of material to and the disposal of material at USEI. Analysis of two previously approved USEI disposal requests, including a 2009 request for the disposal that was used in the evaluation of Version 1 of the SSDA, demonstrated that the Version 3 SSDA methodology's changes and

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updates did not impact the ability to use the SSDA to evaluate the doses received by workers involved in transport and disposal actions at USEI.

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