May 14, 1998

MEMORANDUM TO: John W. Hickey, Chief
Low-Level Waste and Decommissioning
Projects Branch, DWM

FROM: Michael J. Bell, Acting Chief
Performance Assessment and
HLW Integration Branch, DWM

SUBJECT: REQUEST FOR REVIEW OF "IDENTIFICATION OF RECEPTORS AND EXPOSURE PATHWAYS USED IN THE PERFORMANCE ASSESSMENTS FOR THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE COMPLETION OF THE WEST VALLEY DEMONSTRATION PROJECT AND CLOSURE OR LONG-TERM MANAGEMENT OF THE WESTERN NEW YORK NUCLEAR SERVICE CENTER"

This is in response to your March 20, 1998 memorandum, requesting that Performance Assessment and HLW Integration (PAHL) Branch review of SAIC's document entitled "*Identification of Receptors and Exposure Pathways for the Draft Environmental Impact Statement (DEIS) for Completion of the West Valley Demonstration Project (WVDP) and Closure or Long-Term Management of the Western New York Nuclear Service Center.*" We have completed our review and our comments are enclosed.

As you know, Identification and analysis of receptors and exposure pathways are significant aspects of the overall dose impact assessment. Currently, there are no specific decommissioning criteria for WVDP for my staff to use in assessing the performance objectives of SAIC's dose impact analysis. Nevertheless, for the purpose of this review, PAHL staff assumed that LLW performance objectives in 10 CFR 61, Subpart C, and the license termination criteria in 10 CFR 20, Subpart E, may apply to certain options proposed in the WVDP DEIS. Based on this assumption, my staff compared SAIC's approach and methodology with those typically employed in meeting LLW performance objectives and NRC's radiological criteria for license termination. Therefore, staff comments are only applicable to onsite disposal options or decommissioning situations comparable to those in §61 Subpart C or §20 Subpart E respectively.

Enclosure: As stated

Contact: Boby Abu Eid, PAHL/DWM
(301) 415-6700

98-161
110
NMXT

DISTRIBUTION: Central File NMSS r/f w/att PAHL r/f w/att T. Johnson J. Parrott

DOCUMENT NAME: S:\DWM\PAHL\BAE\westvaly2.bby

OFC	PAHL		PAHL		PAHL					
NAME	B Abu Eid		KMcConnell		MBell					
DATE	5/14/98		5/14/98		5/14/98		/ /		/ /	

OFFICIAL RECORD COPY

Comments On SAIC Report On "Receptors and Exposure Pathways Analysis for West Valley Draft EIS Performance Assessment"[1]

1. **Source-Term Issue:**

The current analysis did not establish a proper source-term representing the primary source-term of each waste management area (WMA). Rather, leach/transport models were employed to develop a secondary source-term which was subsequently used in the dose impact analysis. Thus, before development of a proper source-term conceptual model, the analysis allowed for radionuclide dilution through leaching, retardation, and transport through the saturated zone. The concentration of radionuclides in the saturated zone (after transport through the aquifer system off WMA) was assumed to represent the unsaturated soil concentration (i.e., the secondary source-term) or the contaminated zone in the RESRAD model. In other words, the secondary source-term rather than the primary source-term was used in the RESRAD dose impact analysis. The report assumed that the source-term is fixed in time and space with an area of 10,000 m^2 and a thickness of 1 m. The basis for this source-term assumption was that water table fluctuation would be within 1 m which allows for development of an unsaturated contaminated zone suitable for farming. The calculation of contaminated zone thickness based on the leach/transport codes was never addressed. In addition, it is not known if contamination of the aquifer below the contaminated zone was considered in the water-dependent pathway analysis. Further, in-situ degradation and mixing of the original (primary) source-term within the soil was not considered as an alternate source-term. To provide a more realistic description of the source term, the current source-term assumptions should be revised to address the original (primary) source-term and the in-situ leaching and degradation of the primary source. Thickness and area of the contaminated zone should also be analyzed based on the primary source in each waste management area and in-situ leaching or degradation within the time frame of the dose impact analysis.

2. **Waste Form/Type and Engineering Barriers Issues:**

The paper did not present technical information regarding the waste form and waste type in each waste management area. The paper also did not discuss assumptions for engineering barriers, containers, concrete vaults, and other structures like LLW liners. Waste form information regarding radionuclide inventory, physicochemical properties, and waste type

---

[1] Currently, there are no specific decommissioning criteria for the WVDP for PAHL staff to use in assessing the performance objectives of SAIC's dose impact analysis. For the purpose of this review, PAHL staff assumed that LLW performance objectives in 10 CFR 61, Subpart C, and the license termination criteria in 10 CFR 20, Subpart E, may apply to certain options proposed in the WVDP' DEIS. Based on this assumption, PAHL staff compared SAIC's approach and methodology with those typically employed in meeting LLW performance objectives and NRC's radiological criteria for license termination. Therefore, staff comments are only applicable to onsite disposal or decommissioning situations comparable to those in §61 Subpart C or §20 Subpart E respectively.

ATTACHMENT

should be included to allow a meaningful performance assessment analysis (PA) to be performed. For example, the paper should discuss requirements of waste forms for PA of near surface disposal as given in 10 CFR 61.56. The paper should also address LLW structural stability requirements similar to those in 10 CFR 61.56(b). Such information is necessary to define the association of exposure pathways with the primary source-term, with potential releases to environmental media, and with the receptor. Therefore, a meaningful review of exposure pathways cannot be completed without this information.

3. **Waste Classification Issue:**

The dose impact analysis did not address the waste classification (e.g., LLW class A, B. C, or GTCC, or HLW class) issue. It should be noted that NRC's regulations for LLW shallow land disposal are essentially based on safety analyses of waste classes or waste categories (e.g., NUREG-0945). A pre-definition of waste class would be necessary to ensure consistency in the form of disposal and consistency with NRC's regulations. Therefore, to enable proper comparison of approaches used in SAIC paper with NRC's safety analysis, the paper should address waste classification issue.

4. **Receptor Location Issue:**

The onsite receptor was assumed to be within the State licensed boundaries (i.e., within the boundaries of the Western New York Nuclear Service Center (WNYNSC)). However, the paper assumed that an onsite intruder would be located off the boundaries of waste management areas. Thus, although the onsite receptor locations were still within WNYNSC, the onsite intruder was assumed to be located at distances ranging from 150 to 10,000 ft away from the boundaries of contaminated areas. This assumption is inconsistent with dose impact analyses conducted for decommissioning, under 10 CFR Part 20, Subpart E, where the receptor is typically assumed to establish a residence at the center of the contaminated area (NUREG/Cr-5512, NUREG-1549). It is also inconsistent with the onsite intruder-agricultural scenario of 10 CFR Part 61 impact analysis methodology and compliance with the LLW performance objective in Subpart C, §61.42 (i.e., *Protection of Individuals from Inadvertent Intrusion*). Therefore, the resulting dose impacts could be underestimated as compared to dose impacts derived for decommissioning or LLW intruder scenarios. On the other hand, for compliance with §61.41 (i.e., *Protection of the General Population from Releases of Radioactivity*) the selected receptor's locations could be appropriate. Typically, dose impacts in LLW are assessed based on exposure of the average member of the "critical group." which is defined as *"the group of individuals reasonably expected to receive the greatest exposure to radioactive releases from the disposal facility over time, given the circumstances under which the analysis would be carried out."* In LLW performance assessment, the critical group is typically assumed to be a family living off-site on a farm adjacent to the LLW disposal facility. In summary, if the WMA areas were assumed to be decommissioned under unrestricted/restricted releases in accordance with 10 CFR 20.1402/§20.1403, the location of current receptors (i.e., at any location between the two points marked "+" on Buttermilk Creek) may not be appropriate. In addition, as indicated above, the selected receptor location could also be inappropriate to demonstrate compliance with LLW intruder scenario in 10 CFR 61.42. In brief, for demonstration of compliance with 10 CFR 20.1402/§20.1403 and 10 CFR 61.42, SAIC

would need to address the issues of waste form and waste class as the mechanism for protecting intruders which are documented in NRC's safety analysis reports (e.g., NUREG-0945).

5. **Pathway Elimination Issue:**

The dose conversion factors presented in the paper correspond to water-independent pathways. Thus, water dependent-pathways from fish, plant, meat, and milk were eliminated in the current dose impact analysis. The paper lacked information regarding the rational for elimination of groundwater and agricultural pathways for the intruder receptor scenario at waste management areas. The paper should discuss how the water-dependent pathways will be incorporated in the total dose impact analysis.

6. **Assumptions of RESRAD Dose Analysis:**

For conducting RESRAD runs, the paper assumed an unsaturated zone (below the contaminated zone) 1 m thick. The paper also assumed a well location far from the contaminated zone. In addition, as indicated above, water-dependent pathways (except for drinking water pathway) were eliminated from the RESRAD dose analysis. The soil/plant transfer factors and bioaccumulation factors assumed in the current SAIC analysis also appear to be different from recent RESRAD code versions (e.g., RESRAD Version 5.70 or higher). Further, certain physical assumptions used in SAIC's analysis such as mass loading and soil erosion rate may not be sufficiently conservative. Assumption of crop irrigation from contaminated water was also eliminated. Fish consumption was assumed to be from a source far from the contaminated site. The source term used in the analysis was subjected to infiltration, leaching, and retardation twice; first, through infiltration, leaching, and transport of the primary source (using SAIC's models); and second, through infiltration, leaching, and retardation in the RESRAD analysis (using RESRAD code). The current analysis appears to dilute the source in the aquifer twice and appears to have an undefined mixing approach. In addition, the analysis allows for double retardation of radionuclides before reaching the receptor. Such analysis is inconsistent with typical dose impact analyses conducted for LLW and decommissioning.

7. **Impacts of Multiple Sources from Neighboring Waste Management Areas:**

The current analysis involves a single WMA source-term. Dose impacts and transport of radionuclides from one WMA to another were not analyzed to derive the total dose impacts. This issue should be addressed because it is likely to increase the source term of each waste management area and subsequently increase the dose impacts.

8. **Space and Time of Source Term Concentration:**

As was indicated above, the analysis derived a secondary source-term from the original WMA source using leach and transport models. The paper assumed a constant secondary source-term in time and space. In actuality, such a source-term is variable in time in space (e.g., location, concentration, and extent of contamination) due to constant leaching and

transport. Therefore, SAIC should assess source-term variation due to leaching, mixing, transport, and retardation within the dose impact period assumed in the analysis.

9. Review of Release Models and Integrated Codes:

The paper relied heavily on release models and integrated codes for the overall dose impact analysis. These models and codes were not available to the reviewer to examine assumptions and adequacy of these codes. Therefore, to allow for a comprehensive future review of the dose impact analysis approaches, these codes/models should be provided.

10. Sensitivity/Uncertainty of the Dose Impacts:

The current analysis did not present sensitivity/uncertainty analyses of dose impacts assuming variation of parameters associated with source-term (e.g., thickness, area, distance from receptor, distance from primary source), site physical condition (e.g., erosion rate, infiltration rate, hydraulic conductivity, retardation factors, porosity, and length of contaminated zone parallel to aquifer flow), and scenario parameters (e.g., occupancy, dust inhalation, exposure times). To be complete, the analysis should include uncertainty analyses of dose impacts using the most sensitive parameters.

11. Derived Dose Conversion Factors:

Dose conversion factors presented in Table 3 appear to be less conservative than those factors for a near surface source term. In addition, it is not known how these factors will be reflected in the total receptor dose and how the total radionuclide inventory will be factored in when deriving such dose. PAHL staff conducted a RESRAD analysis for a typical source term with similar parameters assumed in Table 5. The SAIC derived dose factors appear to be inconsistent with those derived by PAHL staff. It is not known if such inconsistencies are due to using a different RESRAD code version, due to the elimination of certain pathways, and/or due to assumptions made in the SAIC analysis.

12. Institutional Controls/Expected Conditions Issues:

The paper assumed that institutional controls would be maintained indefinitely (e.g., for 1,000 to 10,000 years) during the post implementation phases of Alternatives II (On-Premises Storage), III (In-Place Stabilization), and IV (No Action: Monitoring and Maintenance). This assumption was considered as the "expected condition." Alternatively, the "expected condition" for Alternative V was considered as "the immediate loss of institutional control at year 2000." The paper did not present justification for the institutional control time frame. For future analyses, PAHL staff recommends that SAIC review NRC's policies regarding institutional control for LLW disposal sites and new policies in support of the decommissioning rule on license termination. SAIC should avoid using the terms "expected" and "unexpected" because such terms may contemplate an initial support of an option over another prior to derivation of cost/risk factors. Preferably, SAIC should use the term "scenario" or "alternative" without referring to the expected/unexpected status of the scenario.