ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

December 26, 2002

Mr. John A. Grobe
U.S. Nuclear Regulatory Commission
Region III
801 Warrenville Road
Lisle, IL 60532-4351

SUBJECT: CALCULATIONAL METHODOLOGY FOR THE DAVIS BESSE INTERNAL DOSE RECONSTRUCTION TASK

Dear Mr. Grobe:

The final report for the Davis Besse internal dose reconstruction task will be issued to you in January, 2003 by the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE). In advance of that report, the purpose of this letter is to briefly describe the calculational method used to estimate the upper bounding dose of 48 rem (committed dose equivalent to the bone surfaces) from bioassay data. Additional details regarding the derivation of the dose estimate will be provided in the final report.

The basic calculational methodology and assumptions used to estimate the bounding dose were as follows:

- The LUDEP ("Lung Dose Evaluation Program") internal dosimetry computer code was used to determine dose conversion coefficients under the assumption that acute inhalation of a particle size occurred that was larger than the conventional default size of one micron used in NUREG/CR-4884. LUDEP is a computer code developed to be compatible with the ICRP-66 human (adult) respiratory tract system.

- Urine and fecal bioassay analytical measurement results from the Severn Trent Richland Laboratory (STRL), Richland, Washington, were evaluated for dose estimating purposes. The committed dose equivalent (CDE) to the bone surfaces was calculated for two of the workers involved in the incident that were believed to have received the highest anticipated internal doses. The transuranic radionuclides Pu-238, Pu-239/240, Pu-241, Am-241, Cm-242, and Cm-244 were utilized in these assessments.

  To calculate the individual CDE's for each radionuclide, the analytical results reported by STRL were converted into estimates of intake and converted into CDE's using dose conversion coefficients determined from LUDEP for a 10 micron size particle. To bound the dose to the bone surfaces, reported radionuclide minimum detectable concentrations (MDCs) were used in all cases except where a "positive" bioassay result was obtained. Additionally,

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Type "M" (moderate) clearance from the body was determined to result in higher estimates of intake (and accordingly higher dose estimates) than Type "S" (slow) clearance. The individual radionuclide CDE's calculated for each worker were summed to estimate the total CDE.

It is concluded that the highest estimated CDE to the bone surfaces of 48 rem (0.48 Sv) was associated with a fecal bioassay result from one of the two workers. This dose represents an underexposure relative to the 50 rem (0.50 Sv) NRC regulatory limit.

Please do not hesitate to contact me at (865) 576-3740 or Mr. Alex Boerner at (865) 574-0951 if you have any initial questions regarding the methodology and assumptions used in the Davis Besse internal dose calculations.

Sincerely,

Eric W. Abelquist

Eric W. Abelquist, Director
Environmental Survey and
Site Assessment Program

EWB:AJB:dkh

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