

July 28, 2000

MEMORANDUM TO: Mark Roberts, Acting Chief
Special Projects Section
Decommissioning Branch
Division of Waste Management, NMSS

FROM: Sandra Wastler, Chief */RA/*
Performance Assessment Section
Environmental & Performance Assessment Branch
Division of Waste Management, NMSS

SUBJECT: TECHNICAL ASSISTANCE REQUEST REGARDING THE
WATERTOWN ARSENAL MALL SITE

James Danna, of my staff, has completed the actions described in the Technical Assistance Request (TAR) regarding the Watertown Arsenal Mall site, dated July 20, 2000. The NRC-HQ Project Manager for the site and the point-of-contact for the TAR is Dominick Orlando. The committed completion date for the TAR is July 28, 2000. The stated objective of the TAR is as follows:

Objective: Review the dose assessment developed by the licensee to determine if it is valid and adequately supported.

The TAR identifies the following required actions:

- 1) Review dose assessment done by licensee's contractor*
- 2) Evaluate potential doses from three "hot spots"*

With respect to these actions, we find:

- 1) The dose assessment done by the licensee's contractor (pertaining to an existing manhole and sewer line at the site) is valid and adequately supported.
- 2) Potential doses from the three "hot spots" (on the Building 421 pad) are estimated to be less than one millirem.

Attachment: Technical Evaluation Report for
the Watertown Arsenal Mall Site

CONTACT: James Danna, NMSS/DWM/EPAB
301-415-6253

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- 1) This document **should** be made available to the PUBLIC JGD 7/28/00
- 2) The document **is not** related to the HLW program. If it is related, it should/should not be placed in the LSS. JGD 7/28/00
(Initials) (Date)

TECHNICAL EVALUATION REPORT:
WATERTOWN ARSENAL MALL SITE

Licensee: U.S. Army Research Laboratory
Reviewer: James Danna, NMSS/DWM/EPAB

On July 10, 2000, the U.S. Army Research Laboratory (ARL) submitted a request to the U.S. Nuclear Regulatory Commission (NRC), Region I, to remove the Arsenal Marketplace ("Mall") site from the NRC Site Decommissioning Management Plan (SDMP) list. The site is located in Watertown, Massachusetts. ARL's request was based, in part, on a dose assessment documented in *Radiological Risk Evaluation and As Low As Reasonable Achievable (ALARA) Analysis of Buried Sewer Piping, Watertown Arsenal* (Cabrera Services; April 14, 2000). ARL's request also references radiological survey results and analyses documented in *Radiological Survey of the Building Site 421* (DOE/EV-0005/19; Argonne National Laboratory; February 1980). The survey report evaluates potential doses attributable to three small areas of elevated radioactivity remaining on the Building 421 concrete pad.

In response to a Technical Assistance Request regarding the Watertown Arsenal Mall site, (M. Roberts to S. Wastler; July 20, 2000), I have (1) reviewed the Cabrera dose assessment to determine whether it is valid and adequately supported, and (2) evaluated potential doses attributable to the three small areas of elevated radioactivity on the Building 421 pad. I provide the following discussion regarding these two evaluations.

Review of dose assessment done by licensee's contractor

The licensee's contractor (Cabrera Services, Inc.) documented its dose assessment for the Watertown Arsenal in a report entitled *Radiological Risk Evaluation and ALARA Analysis of Buried Sewer Piping* (April 14, 2000). The report provides a dose assessment related to a manhole (#9) and 980 feet of buried clay sewer line remaining at the site that are assumed to be contaminated.

The dose assessment report stated that the contaminant of concern is depleted uranium (DU), based on a recent survey performed by Oak Ridge Institute of Science and Education for the NRC. I confirmed this with Marie Miller, NRC, Region I.

The contractor calculated DU surface concentrations for the inside surface of the sewer line and the manhole, based on the average of five direct surface measurements taken inside the contaminated manhole. It is reasonable to assume that the manhole contamination is representative of the sewer line contamination, given (1) the relative locations of the manhole and sewer line, and (2) measurements in the closest downstream manhole that show no contamination. This was discussed with Ms. Miller, and she also confirmed that it was reasonable to assume that the calculated surface concentration adequately accounted for activity within the wall of the sewer pipe.

The contractor assumed a resident farmer scenario for the analysis, consistent with an approach described in *Preliminary Guidelines for Evaluating Dose Assessments in Support of Decommissioning* (memo from John Hickey, NRC; March 16, 1999). The contractor described the resident farmer scenario as "improbable, yet presumably bounding." The resident farmer

scenario is considered conservative because the site is currently paved over and serves as a parking lot for the Watertown Arsenal Mall, located in an urban setting. This would make the agricultural exposure pathways unlikely. Obtaining drinking water from a well drilled on the site is also considered unlikely.

The contractor calculated the total DU and the individual isotopic inventories within the sewer line and manhole, and assumed this as the source inventory in a screening analysis using DandD, Version 1. I confirmed the inventory calculations. The contractor calculated soil concentrations by assuming that the DU inventory was distributed in surface soil over an area of 2400 square meters and to a depth of 15 centimeters (DandD default values). The contractor performed the DandD screening analysis by running the DandD code (Version 1) with all default values. I confirmed the execution of the DandD code.

I evaluated an alternative, more plausible scenario to compare to the DandD screening analysis. The alternative scenario assumed the sewer line was left in place and radionuclides leached from the line downward to the water table. I developed a source term consistent with the information given in the contractor's dose assessment report and used RESRAD (Version 5.95). To get a general estimate of dose, I assumed a 10.5-foot cover (the current depth to the sewer line), a 0.1-meter thick unsaturated zone, and default values for the remaining parameters. The resulting dose estimate was less than one millirem per year. Also, 99 percent of the calculated dose was attributed to the drinking water exposure pathway, not considered a viable pathway at the Watertown Arsenal site.

The contractor's dose assessment included an evaluation of dose to a public works employee who excavates, and is exposed to, the inside of the pipe. The contractor evaluated external exposure using MicroShield (Version 5.05). The evaluation conservatively assumed that the employee was exposed to an infinite plane at the calculated surface contamination concentrations. Estimated doses, even assuming a 2000-hour exposure period, are less than one millirem per year.

The contractor's dose assessment for a public works employee did not evaluate dose incurred through an inhalation exposure pathway. Assuming a sustained elevated breathing rate, a very high dust burden, and continuous exposure for a full work year (2000 hours), inhalation dose to a worker may reach 25 millirem. However, it is very unlikely that either the dust burden or the elevated breathing rate would be sustained for 2000 hours, so the 25-millirem estimate is likely conservative by several orders of magnitude.

Based on my review, I conclude that dose assessment is valid and adequately supported.

Evaluation of potential doses from three "hot spots"

The radiological survey report referenced above (DOE/EV-0005/19) indicates that three areas of elevated activity ("hot spots") may remain on the Building 421 concrete pad at the Watertown Arsenal site. The pad is presently paved over and is used as a tennis court. According to the survey report, the areas and concentrations are:

5000 cm² @ 85,000 dpm/100 cm² (one spot)
100 cm² @ 220,000 dpm/100 cm² (two spots)

(According to the report, these activities have been equated to natural uranium.)

The report documents a hazard evaluation associated with the “hot spots.” The evaluation assumes the spots are excavated using a jack hammer, and contaminated dust is inhaled during the excavation. The evaluation assumes a very high dust burden. The evaluation calculates a kidney burden; however, using the same assumptions, I estimated the committed effective dose equivalent resulting from inhalation of the contaminated dust to be much less than one millirem.

I used RESRAD-Build and MicroShield (Version 5.05) to evaluate potential dose through external exposure to an individual located near the unexcavated spots. I assumed the pavement was removed and the individual was located one meter from the spots for 2000 hrs. The estimated dose was significantly less than one millirem.

Based on my evaluation, I conclude that potential dose from the areas of hot spots is less than one millirem.