

SAFETY EVALUATION REPORT
RADIOLOGICAL STATUS: ACCEPTABILITY FOR UNRESTRICTED USE OF THE CSX
TRANSPORTATION PROPERTY (INKSTER ROAD, LIVONIA, MICHIGAN)
DOCKET 040-00235

1.0 INTRODUCTION

The CSX Transportation, Inc. (CSXT) property of concern is not currently subject to a license issued by the NRC. The property consists of operating rail lines and associated right-of-way and is located to the west of Inkster Road in Livonia, Michigan. The parcel is adjacent to and runs parallel to the southern boundary of the AAR Manufacturing Inc. (AAR) site. CSXT is an operating railroad and the area of interest is the land where contaminants may have spread from the AAR site. The AAR site was previously owned by Brooks & Perkins, Inc., a former materials licensee of the NRC's predecessor agency, the U.S. Atomic Energy Commission (AEC). Brooks & Perkins's license was terminated by the AEC on May 17, 1971, but prior to that time Brooks & Perkins conducted licensed activities at the site using thorium master alloy and thorium magnesium alloy. In 1981, AAR purchased Brooks & Perkins and obtained ownership of the land. On February 23, 1994, an NRC inspector conducted an inspection of the AAR site, and subsequently notified AAR by letter dated March 29, 1994, that the NRC has "concluded that thorium was improperly disposed of at the site and certain areas of the building and grounds were in excess of the NRC release criteria for release of the facility for unrestricted use." AAR was directed to schedule and plan to characterize the extent of the contamination and to decontaminate the area to current NRC release criteria (ML110670259).

In May 1997, NRC inspectors performed a limited radiation survey of the CSXT right-of-way adjacent to the AAR site. NRC staff provided the inspection report to CSXT in a June 12, 1997, letter; the report identified three locations with elevated levels of thorium in the soil (ML091000360). NRC staff indicated that some residual radioactive material may have spread from the AAR site onto the CSXT property. In a September 8, 1997, letter NRC requested that CSXT provide an accurate characterization of the property (ML101250613). CSXT submitted the report to NRC September 13, 2000 (ML090680748). The CSXT conclusion in this report was that the dose modeling results demonstrate that no remedial actions or restrictions on site usage are required and that the total site dose does not exceed the 25 mrem/year NRC criteria for unrestricted release. NRC staff reviewed the CSXT report and concluded that the surveys and measurements were generally not consistent with NRC guidance and requested additional information from CSXT (ML003765576).

In 2009, project management for the CSXT property was transferred to NRC headquarters from NRC Region III. After evaluating the existing data for the CSXT property, the NRC staff decided to have the NRC independent survey contractor perform confirmatory surveys of the CSXT property. As a result of those confirmatory actions, as discussed below, the staff concludes that the CSXT property meets the criteria for release of the site for unrestricted use under 10 CFR 20.1402.

2.0 REGULATORY BASIS

10 CFR 20, Subpart E – "Radiological Criteria for License Termination" and specifically 10 CFR 20.1402, "Radiological Criteria for Unrestricted Use," establish the requirements for the release of a site for unrestricted use.

Enclosure

NRC NUREG-1757, Volume 2, "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria," provides guidance based on a risk-informed, performance based approach to demonstrate compliance with the radiological criteria of 10 CFR 20, Subpart E.

The Environmental Protection Agency (EPA)/NRC Memorandum of Understanding (MOU) consultation trigger values are provided in Appendix H of NUREG-1757, Vol. 1, "Consolidated Decommissioning Guidance: Decommissioning Process for Material Licensees."

3.0 EVALUATION

To address the technical survey issues, the NRC staff had its independent contractor, the Oak Ridge Institute for Science and Education (ORISE), perform radiological surveys at the CSXT property in September 2010. This Safety Evaluation Report describes the NRC staff evaluation of the survey results.

3.1 Facility Description

CSXT is an operating railroad and the area of interest is the land where contaminants may have spread from the AAR site. This CSXT property, which consists of operating rail lines and associated rights-of-way, is a narrow strip of land, approximately 12 m wide (including railbed and right-of-way along the tracks) by 370 m long. The property is located to the immediate west of Inkster Road in Livonia, Michigan. The parcel of potential concern is adjacent to and runs parallel to the southern boundary of the AAR site. A fence is in place along most of the border with the AAR site. The land terrain includes a drainage along the railbed, and the land surface slopes down from the railbed and down from the AAR site. The portion of the property other than the railbed is generally vegetated, with brush and some small trees. A small railroad building exists on the western end of the property. Currently, use of the property is for operating rail lines and use of immediate neighboring land is industrial. However, residential properties exist in the general area of the property.

3.2 Method for Comparing Survey Results to Criteria for Unrestricted Use

Although the CSXT property is not an NRC-licensed site, the NRC staff evaluated the CSXT property against the criteria for license termination for unrestricted use in 10 CFR 20.1402. For unrestricted use, the dose criterion is 25 mrem/yr to the average member of the critical group and as low as is reasonably achievable (ALARA). Staff used the derived concentration guideline level (DCGL) method to evaluate the CSXT property. That is, a DCGL is developed using computer modeling. The results of the survey of the CSXT property are compared to the DCGL. The CSXT DCGL is based on the dose assessment NRC staff performed for the neighboring AAR site (ML093490979). NRC staff contracted for the survey and evaluated the survey results, in part because CSXT is not an NRC licensee.

3.3 Applicability of the AAR Dose Assessment to the CSXT Property

In the previous dose assessment performed for the AAR site, the NRC staff considered a number of potential exposure scenarios. Because the CSXT property is being evaluated

against the unrestricted use criteria, staff considered the exposure scenarios used for the eastern parcel of the AAR site to be appropriate.

The exposure scenario in the AAR assessment recommended for comparison to the radiological criteria for license termination is a residential gardener scenario (ML093490979). The residential gardener scenario for this case assumes people live on the site and have a garden to supply a portion of their food. The exposure pathways include direct (external) exposure, inhalation (of suspended dust), and ingestion of plants, meat, and soil. Because of site-specific conditions, ingestion of drinking water from the site was not included as an exposure pathway (ML093490979). The NRC staff considers that the exposure scenarios included in the AAR resident gardener dose assessment are bounding for doses likely to occur for the CSXT property. The current use of the CSXT property is a right-of-way for railroad tracks. This use is expected to continue. The CSXT property is a narrow strip of land, approximately 12 m wide (including railbed and right-of-way along the three (3) tracks) by 370 m long. The rail line is a major transportation line with 3 tracks and therefore it is highly likely the property will continue to be a right-of-way for the foreseeable future. Non-residential commercial/industrial uses of the property would generally result in exposures less than those of a residential scenario because: (1) occupancy times for non-residential land use are expected to be much lower than for residential use, and (2) consumption of food grown on the site is unlikely for non-residential land use. The NRC staff considers residential use of the property in the future to be neither likely nor plausible. For any of the reasonably foreseeable or plausible cases, the NRC staff concludes that the residential gardener exposure scenario used in the AAR assessment is a bounding scenario for the CSXT property. Thus, the NRC concluded that it is appropriate to apply the wide-area DCGL (DCGL_w) to the CSXT property from the AAR dose assessment results. Consistent with the AAR dose assessment, no DCGL elevated measurement criteria (DCGL_{EMC}) was needed. Staff notes that the AAR dose assessment and its application to the adjacent CSXT property are site specific analyses that should not be applied to other sites.

3.4 Determination of DCGL_w for Application to CSXT Property

The NRC staff calculated a DCGL_w from the source term concentration of Th-232 and the calculated dose of the AAR assessment. The Th-232 concentration equal to the 25 mrem/yr unrestricted release criteria is 3.7 pCi/g. This DCGL_w is the concentration of Th-232, with its entire decay chain in equilibrium and with Th-230 at 2.62 times the Th-232 concentration. As discussed above, for the CSXT property, criteria for elevated areas (DCGL_{EMC}s) are not necessary.

3.5 2010 Radiological Survey of the CSXT Property

Prior to performing the CSXT property survey, ORISE prepared a project specific survey plan (ML102720146), which was approved by NRC staff. ORISE performed the field survey September 20–21, 2010 (ML110190181). For the 2010 radiological surveys, the CSXT property was divided into two survey unit (SU) areas. The total surface area of the entire survey area is about 3,080 m², with each survey unit covering approximately 1,500 m². Gamma surface scans and soil sampling were performed in each SU. ORISE had initially divided the CSXT property into three SUs in the survey plan; however, due to several of the original randomly selected soil locations being located within the railroad tracks or railbed and the impracticable logistics for surveying the uneven terrain, the originally planned radiological survey activities were modified

to survey the area from the edge of the railbed to the AAR fence-line. The NRC staff concurred with this field decision, in part because preliminary survey results (and historical results) showed no indications of residual radioactivity near the tracks. With this change, the area of the property surveyed was reduced in width to about 8 m; the survey was reduced to two SUs instead of three; and the random samples were reduced to 24 from 36. High density (approximately 90% scan coverage due to overgrowth and terrain) gamma radiation surface scans were conducted over the soil surface within each of the SUs.

In the survey plan (ML102720146), ORISE determined that twelve systematic soil samples from each SU would be adequate to estimate the mean concentrations. During the survey, biased surface soil samples were collected from locations where gamma scan results were elevated. Subsurface soil samples were collected based on an increase in gamma radiation levels at the bottom of the (surface) sampled location. ORISE had collected background soil samples during a previous site visit to the adjacent AAR facility in August 2003.

3.6 Overview of Results of 2010 Survey

Gamma radiation surface scans identified several areas of elevated gamma radiation, primarily along the northern fence line. Eleven (eight surface and three subsurface) biased soil samples were collected from locations identified as having elevated gamma radiation levels during the gamma surface scans. The radiological survey results demonstrate that some residual soil contamination exceeding the DCGL_w of 3.7 pCi/g is present along the fence line in several small areas. Detailed results are provided in the ORISE report (ML110190181).

The NRC staff calculated an area-weighted mean Th-232 concentration to evaluate the impact of elevated areas on the overall average concentration (and thus on dose). The calculated weighted mean net (after subtracting background) Th-232 concentrations are 0.6 pCi/g for both survey units. This is substantially lower than the Th-232 DCGL_w of 3.7 pCi/g. The NRC staff concludes that the weighted mean concentration provides reasonable assurance that the unrestricted use criteria are satisfied.

3.7 Potential for Additional Elevated Areas

The NRC staff acknowledges the possibility of elevated areas that have not been detected or evaluated at the CSXT property. The gamma radiation surface scans were conducted over approximately 90% of the CSXT property; roughly 10% of the property could not be scanned (due to the presence of a small building and overgrown vegetation). Areas not scanned may potentially include elevated concentrations. However, in addition to the multiple scan surveys performed by the ORISE and NRC staff of all accessible areas adjacent to the AAR property, systematic gamma measurements and soil samples and judgmental soil samples were taken in each survey unit. The combination of multiple surveyors and the measurements make it very unlikely that a large elevated area would not be detected. In addition, the calculated weighted mean concentration was substantially below the DCGL_w. Thus, the NRC staff concludes that there is reasonable assurance that elevated areas do not exist to an extent that would cause the weighted mean concentration to exceed the DCGL_w.

3.8 Comparison of 2010 Elevated Areas to 1996 NRC Inspection Results

The staff compared the soil sample results of the May 15, 1997, NRC inspection report (ML091000360) with the results of the 2010 radiological survey of the CSXT property (ML110190181). During the 1997 NRC inspection, three areas were identified with elevated thorium soil concentrations. The three elevated concentrations were located from one to twenty feet of the fence line with the AAR property. The three highest Th-232 concentrations from the ORISE 2010 survey were reasonably consistent with the previous activity levels. It appears that the elevated areas reported in the 1997 inspection report are in the same general vicinity as the elevated areas identified in the 2010 radiological survey.

3.9 ALARA Consideration

The unrestricted use dose criterion also requires that doses be reduced to ALARA levels. The NRC staff notes that the weighted mean Th-232 concentrations for the two survey units are at a small fraction of the 3.7 pCi/g DCGL_w. For a site like the CSXT property that is meeting the unrestricted use dose criteria, the main ALARA consideration is the use of typical good practice efforts, including the removal of readily removable radioactivity in soils. Based on the 2010 survey results, there are no indications of large intact pieces of slag on the CSXT property that might be readily removable. The NRC staff concludes that for ALARA considerations, there are no additional decontamination or remediation activities required for the unrestricted use of the CSXT property.

3.10 Evaluation of EPA/NRC MOU Consultation Triggers

The NRC Staff evaluated the DCGL values in comparison to values that trigger consultation with the EPA. The EPA/NRC MOU trigger values are provided in NUREG-1757, Vol. 1, Appendix H. The trigger values for Th-232 and Th-228 are 5 pCi/g and 15 pCi/g, respectively. There is not a trigger value for Th-230. The DCGL_w used for the CSXT property is 3.7 pCi/g for Th-232, with the assumption that Th-228 is in equilibrium with Th-232. For the MOU, the sum of fractions approach does not apply to Th-232. Thus, the DCGLs for Th-232 and Th-228 were compared directly to the trigger values, and do not exceed the trigger values. The NRC staff concludes that consultation with the EPA under the EPA/NRC MOU is not required.

4.0 CONCLUSIONS

As discussed in detail above, the NRC staff makes the following conclusions:

1. The 2010 ORISE survey was performed using appropriate methods consistent with NRC guidance. The survey results demonstrate that concentrations of Th-232 are generally very low, but there are small areas of elevated residual radioactivity on the property.
2. A DCGL_w for Th-232 of 3.7 pCi/g was determined acceptable for use for the CSXT property. The overall, weighted average Th-232 concentrations are substantially below the DCGL_w. This was determined from general area systematic sampling and elevated area judgmental/biased sampling.
3. Additional (undetected) elevated areas may exist, but the NRC staff considers the likelihood of large undetected elevated areas to be very small. Thus, impacts to the overall average thorium concentration from undetected elevated areas are expected to be small and have no dose consequence.

Therefore, the NRC staff concludes that the CSXT property meets the criteria for release of the site for unrestricted use under 10 CFR 20.1402 as the total effective dose equivalent for the site is well below 25 mrem/yr and the residual radioactivity at the site is ALARA. Accordingly, the NRC staff also concludes that no soil remediation or cleanup is required.

Principal Contributors:

Stephen Giebel, FSME/DWMEP/DURLD

Duane Schmidt, FSME/DWMEP/DURLD