

NUCLEAR REGULATORY COMMISSION  
FANSTEEL INC.  
LICENSE NUMBER SMB-911  
FANSTEEL, INC. -- MUSKOGEE, OK

ENVIRONMENTAL ASSESSMENT, FINDING OF NO SIGNIFICANT IMPACT

## **1 INTRODUCTION**

The U. S. Nuclear Regulatory Commission (NRC) is considering amending Fansteel's Materials License Number SMB-911 to authorize decommissioning of its facility in Muskogee, Oklahoma. Consistent with the decommissioning ruling that appeared in the Federal Register on July 21, 1997, (62 FR 39088) the NRC has prepared this environmental assessment (EA) to determine the environmental effects from the approval of the decommissioning plan (DP) and subsequent release of the site for unrestricted use (as defined in 10 CFR 20.1402). As discussed in Section 1.3 below, the primary scope of this EA is the determination of the adequacy of the radiation release criteria and the adequacy of the final status survey as presented in the DP.

### **1.1 Background**

Fansteel's Muskogee plant is at Number 10 Tantalum Place, Muskogee, OK, northeast of the intersection of the Muskogee Turnpike (OK-165) and US-62. The Fansteel processing facility produced tantalum and columbium metals for approximately 33 years until operations ceased in 1989. The raw materials used for tantalum and columbium production contains uranium and thorium as naturally occurring trace constituents. These radioactive species are present in the process raw materials at approximate concentrations of 0.1 percent uranium oxide and 0.25 percent thorium oxide. These concentration are sufficient to cause the ores and slags to be classified by the NRC as source materials. Consequently, Fansteel operated under NRC License No. SMB-911 for the possession of source materials.

In July 2003, the licensee submitted a DP with the goal to complete decommissioning, except for ground water remediation, by 2011. Fansteel estimates that ground water remediation by capture and treat will require up to an additional decade. All structures on the site will remain. The licensee will remediate ponds containing radioactive waste, backfill, and re-grade to approximately the elevation prior to operations.

The proposed action is to amend NRC Material License SMB-911, issued to Fansteel in 1967 (as amended), to allow decommissioning activities to reduce the residual contamination at the site to levels that would result in a radioactive dose to a member of the public of less than 25 mrem per year. This includes removing the waste in process (WIP) and calcium fluoride (CaF) waste from the ponds on site, decontaminating the buildings, removing soil contaminated above site release limits, and treating the ground water to remove contamination above release limits.

### **1.2 Need for the Proposed Action**

The licensee plans to remediate the site and terminate the NRC license at the completion of remediation. It is necessary because Fansteel ceased principal activities in 1989 and 10 CFR 40.42(d) requires that the licensee decommission the site. The licensee has submitted the DP.

The NRC must determine whether procedures and activities (adequacy of radiation release criteria and the final status survey) planned for completing decommissioning appear sufficient as described in the DP, and, if implemented according to the plan, would demonstrate that the site is suitable for unrestricted use (as defined in 10 CFR 20.1402), or whether Fansteel would need additional planning, investigation, and other activities to support such a determination. This EA describes the potential environmental effects (both radiological and non-radiological), from a decision to approve the licensee's DP for subsequent release of the site for unrestricted use.

### **1.3 Scope**

NRC stated the scope of its approval of DPs in the final license termination rule (61 FR 39278):

The Commission must consider: (1) the licensee's plan for assuring that adequate funds will be available for final site release, (2) radiation release criteria for license termination, and (3) the adequacy of the final survey required to verify that these release criteria have been met.

In fulfilling its obligations under the National Environmental Policy Act (NEPA), the NRC must evaluate the environmental impacts associated with approval of the DP and subsequent termination of the license as discussed above. Both radiological and non-radiological impacts must be considered. These impact evaluations typically will involve an assessment of the remaining buildings/structures and residual material present at the site at the time of license termination.

#### **1.3.1 Issues Studied in Detail**

The well-defined scope of license termination activities at Fansteel results in few resource areas expected to be impacted. Consistent with NEPA regulations and guidance to focus on environmental issues of concern, land use, water resources, and human health resource areas were selected because of their potential to be affected by license termination. This EA discusses these resource areas in detail because of the potential for impacts from remaining structures and residual material left at the site.

#### **1.3.2 Issues Eliminated From Detailed Study**

Note that NRC did not evaluate impacts from specific activities of decommissioning in this document because NRC previously has assessed decommissioning impacts in the Generic Environmental Impact Statement for Decommissioning (NRC, 1988). NRC also has assessed the impact to workers and the public from residual radioactivity from decommissioning in Generic EIS on criteria for license termination (NRC, 1997a). The activities and doses identified within the proposed decommissioning plan are bounded by these previous assessments.

Impacts to air quality, socioeconomic factors, transportation, noise, visual and scenic quality, waste management, and accident analyses are not expected to be impacted by approval of license termination activities (i.e., adequacy of radiation release criteria and the final status survey) and subsequent release of the Fansteel site for unrestricted use (as defined in 10 CFR 20.1402). Also, financial assurance review is not related to the environment and will not be discussed in this EA.

## **2 ALTERNATIVES, INCLUDING THE PROPOSED ACTION**

### **2.1 The Proposed Action**

The proposed action is the NRC review and approval of the licensee's DP. Before approving the DP, the NRC staff will review it to ensure that the licensee will perform the license termination activities (i.e., adequacy of radiation release criteria and final status survey) in accordance with NRC regulations to ensure that public health and safety are protected and there will be no significant impact on the quality of the human environment from the unrestricted release of the Fansteel site.

The licensee plans to remediate the site and terminate the NRC license at the completion of remediation. It is necessary because Fansteel ceased principal activities and 10 CFR 40.42(d) requires that the licensee decommission the site. The licensee plans to complete decommissioning of the site for unrestricted use, as described in NRC regulations at 10 CFR 20.1402. To meet the unrestricted release criteria, the licensee will divide areas of the site into survey units and sample/survey them in accordance with the DP to verify that the site meets derived concentration guideline levels (DCGLs), thus demonstrating compliance with the release criteria. This EA discusses the DCGLs in Sections 3.4, "Human Health" and 4.3 "Human Health Impacts."

### **2.2 No Action Alternative**

The NRC considered the no-action alternative relative to the licensee's request for approval of the DP. The no-action alternative would mean that the NRC would not approve the DP, and therefore, would not terminate the license. This alternative is in conflict with NRC regulations at 10 CFR 40.42. These regulations require the NRC to approve the DP, by license amendment, if it demonstrates that decommissioning will be completed as soon as practicable, and will adequately protect the health and safety of workers and the public. These regulations also require the NRC to terminate the license after the licensee has performed the decommissioning activities in accordance with the approved DP and successfully complied with release criteria, as demonstrated by the final status survey. Because of these requirements and NRC's statutory mission to protect public health and safety, the NRC has determined the no-action alternative is not reasonable unless the staff determines the DP does not satisfy NRC regulations. The NRC has reviewed the DP for the Fansteel site and determined that the plan, as amended by license conditions, meets the requirements of 10 CFR 40.42. Therefore, the no action alternative is not evaluated further in this EA.

## **3 AFFECTED ENVIRONMENT**

### **3.1 Site Description**

The Fansteel Muskogee plant is in Muskogee County, Oklahoma, and occupies approximately 91 acres of land adjacent to the 406-acre Port of Muskogee Industrial Park, 2.5 miles northeast of the Town of Muskogee. The site lies along the western edge of the Arkansas River (Webbers Falls Lock and Dam and Reservoir, part of the McClellan-Kerr Arkansas River Navigation System) and is bounded on the north by land owned by the Muskogee Port Authority, on the south by U.S. Highway 62, and on the west by Oklahoma State Highway 165 (Muskogee Turnpike) and a service road.

There are 15 structures on the site used for processing and administration, primarily of concrete or block construction; a few are metal “butler buildings.” Of the nine ponds constructed during site operations, two have been closed (1 and 4) and the remainder contain process waste contaminated with chemical and radioactive materials.

### **3.1.1 Radiological Contamination**

In 1993, Fansteel performed a characterization survey at the Fansteel Muskogee site to determine existing site conditions. It also conducted radiological survey activities over the interior and exterior of the site structures and the external open land areas of the Fansteel site. Results of this study are presented in this section. While the characterization event occurred in 1993, site operations since 1992 have been largely limited to asset maintenance and preservation so the data remain representative of current site conditions. After removal of contamination identified in this study, the licensee will conduct additional characterization, for example under the ponds, to determine if there is additional contamination that requires remediation. The results of the additional characterization will be the basis for any further remediation that may be required.

Site characterization surveys are conducted to determine the nature and extent of radiological contamination at the site. The purpose of the site characterization survey is to: (1) permit planning for remediation activities; (2) demonstrate that it is unlikely that significant quantities of residual radioactivity have gone undetected at the site after remediation; (3) provide information to design the final site survey (i.e., identify survey unit classifications for impacted areas); and (4) provide input to dose modeling. Site characterization activities include the collection of various types of samples, including soil, sediment, water, concrete, metal, and surface residues. Surveys and sampling conducted during site characterization are based on measurements taken in accordance with NRC guidance (NRC, 1992). In accordance with 10 CFR 40.42(g)(4)(i), Section 4 of the DP provided radiological conditions of the site (Fansteel, 2003). The results of sample analyses and the use of the results in identifying the significant radionuclides expected to be present after remediation are described in Section 4.0 of the DP.

Based on dose model assumptions (including the expected time at which the site will be remediated) the licensee has identified the potential contributions from the decay chains of natural uranium and thorium isotopes, which are the radiological constituents of the material processed at the site. The following radionuclides would be the primary contributors to the dose after license termination:  $^{238}\text{U}$ ,  $^{234}\text{U}$ ,  $^{230}\text{Th}$ ,  $^{232}\text{Th}$ ,  $^{228}\text{Ra}$ . Accordingly, these radionuclides will form the basis in planning and conducting all final status surveys, and demonstrating compliance with the site release criteria.

### **3.1.2 Hazardous and Chemical Contamination**

The 1993 characterization data demonstrates that the site has chemical contamination including ammonia, fluoride, and Methyl Isobutyl Ketone (MIBK). The NRC does not have regulatory authority to address the known chemical contamination at the site. After discussion with the State of Oklahoma, the State agreed (Oklahoma Attorney General's Office, 2003), that it would exercise jurisdiction over remediation of chemical contamination. If the proposed action is implemented, any chemical contamination remaining in site soils and water, after remediation of the radioactive materials, would be part of the property that is released from NRC's license.

## **3.2 Land Use**

The Muskogee plant is sited in an area zoned for industrial use. This industrial use restriction is expected to persist in the future in accordance with the updated Master Plan for industrial properties issued by the Port of Muskogee (Fansteel, 2003). Land uses within the general area of the site include urban and built up uses in the City of Muskogee, agriculture in the rural areas outside Muskogee, and recreational use of the river. The City of Muskogee is a mixed urban area with commercial, residential, and industrial uses. Commercial use is largely related to food products and mineral production. The closest residence is on the west side of State Highway 165, approximately one-quarter mile from the buildings on site.

Agricultural use of the land occurs outside the City of Muskogee and is an important component of the economy of the area. Soybeans, hay, corn, and sorghum are the primary crops grown. Dairy cattle, beef cattle, hogs, and chickens are all raised in the area around the site. Most farms in the area are classified as livestock farms and dairy farms.

Recreational land uses are also important around the site. Rolling scenic hills and man-made lakes are common. Fishing, hunting, and water sports are associated with the lakes. (Fansteel, 2003).

## **3.3 Water Resources**

This EA divides the discussion of water resources into surface water and ground water. The sections that follow provide a summary overview of the characteristics of each at and near the site.

### **3.3.1 Surface Water**

Waters of the Arkansas River at Muskogee are generally well regulated by upstream flood protection facilities on the main stem of the Arkansas River and its major tributaries. The Keystone Reservoir impounds the Arkansas River above Muskogee, 15 miles upstream from Tulsa, Oklahoma. The Verdigris River Basin is generally well regulated by upstream flood protection structures at Elk City, Fall River, Hulah, and Oologah reservoirs. The Neosho River is controlled through its entire length in Oklahoma. Controlling reservoirs include Grand Lake O' the Cherokees, Lake Hudson, and Lake Fort Gibson. Lake Fort Gibson is the main regulating impoundment on the Neosho River and provides Muskogee, with a good water supply. In the immediate area, the Arkansas River is impounded as Webbers Falls Reservoir above Webbers Falls Lock and Dam. During the period of record, peak streamflow ranged from 63,000 cubic feet per second (cfs) to 384,000 cfs in May 1898 and 366,000 cfs. Mean annual streamflow for the period of record ranged from 1,902 cfs to 42,120 cfs.

Surface water users in the area include: Public Water Supply in Braggs, in southeastern Muskogee County; Surface Water Intakes at Camp Gruber and Greenleaf State Park on Greenleaf Lake, and two Public Water Supplies, also in southeastern Muskogee County; Surface Water Intake at Birdena's Brushy Mt. Spring, downstream on the Arkansas River; and Surface Water Intake at Ft. Gibson Grand River and a Public Water Supply northeast of the site.

The maximum probable flood level has been determined to be at 525 feet msl (Fansteel, 2003). The 100-year flood plain zone is approximately 517 feet msl. The Fansteel plant facilities are above these elevations.

The plant's Oklahoma Pollutant Discharge Elimination System (OPDES) permit will be in effect until the end of license termination activities. The permit currently imposes limits for flow, and effluent chemistry.

### **3.3.2 Ground Water**

Fansteel characterizes groundwater flow through the unconsolidated materials at the Fansteel Muskogee site as follows:

- \* The general direction of groundwater flow across the majority of the site is toward the east and the Arkansas River. There is an east-west divide in the direction of groundwater flow in the northwest corner of the facility which results in radial flow to the northeast, southeast, and southwest. Shallow groundwater flow across the southernmost portion of the site is toward the south parallel to the flow direction of the river.
- \* The Arkansas River is an effluent stream in regard to the alluvial aquifer at the Fansteel site.
- \* The principal component of groundwater flow is in a horizontal direction parallel to the bedrock surface. The flow of groundwater is concentrated in the basal sand and gravel deposits of the alluvial aquifer.
- \* The hydraulic gradient across the facility is very low. Gradients calculated across the site varied according to the flow direction.

Fansteel installed 29 groundwater monitoring wells to sample from two distinct zones of saturation: the unconsolidated zone of saturation, and a water-bearing zone within the bedrock.

Groundwater within the unconsolidated deposits is at the base of the sediments within the coarse-grained materials. The unconfined saturated sand unit overlying bedrock is laterally persistent across the Muskogee site. The saturated thickness of this unit ranges from approximately 1.5 feet in the SW part of the site to 17.5 feet in the western part of the site. Perched zones of saturation were not encountered. In the instance where a coarse-grained lens of material was encountered overlying a finer-grained material, the lens was dry.

A groundwater contour map was constructed from groundwater elevation data for wells communicating with this unit across the entire Muskogee site. A groundwater divide identified in the unconsolidated zone of saturation in the Northwest Property Area results in radial flow northeast, southeast, and southwest to other portions of the facility at hydraulic gradients of 0.0076, 0.003, and 0.0064 respectively.

The characterization study encountered groundwater within the McCurtain Shale at the Muskogee site. The rock core above and below the fractured sequence was determined to be dry from core inspection. Groundwater in this zone of saturation was encountered under confined conditions and is separated from the overlying unconsolidated zone of saturation by approximately 30 feet of shale bedrock. The significant difference in static groundwater elevation observed between nested monitoring wells indicates the pairs of monitoring wells are in two distinct zones of saturation.



Sample ID	Gross Alpha	Gross Beta	U-234	U-235	U-238	Th-228	Th-230	Th-232	Ra-226	Ra-228
MW-69S	12.2	8.4	NA	NA	NA	NA	NA	NA	NA	NA
MW-70S	30.7	807	3.5	0.1	2.4	0.1	0.2	0.2	NA	NA
MW-71S	70.7	107	36.9	1.5	40	0.3	0.3	0.2	NA	NA
MW-72S	20.7	24.4	2.7	0.2	2.1	0.1	0.0	0.0	NA	NA
MW-73S	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-74S	329	343	69.4	2.8	70.6	1.4	0.9	0.9	NA	NA
MW-75S	3.6	10.1	0.4	0.0	0.4	0.2	0.0	0.1	NA	NA
Min:	0.3	4.4	0.4	0.0	0.1	0.1	0.0	0.0		
Max:	2130	1290	774	28.1	768	1.4	1.9	0.9		

NA is Not Analyzed

Fansteel sampled four monitoring wells screened in the bedrock aquifer. They analyzed water samples from these wells for gross alpha and gross beta radioactivity. Radionuclide concentrations in the bedrock monitoring wells were below the Oklahoma Water Resources Board values of 15 pCi/L for alpha radioactivity and 50 pCi/L for beta radioactivity. Following several sampling and analysis events, Fansteel concluded that elevated radioactivity was not present in the bedrock monitoring wells. Based on these results, radioactive contamination of groundwater appears to be confined to the alluvium at the top of bedrock. To preclude potential cross contamination with the shallow water aquifer, all of the deep wells were closed and abandoned as approved by the ODEQ in a letter dated April 14, 1995.

### 3.4 Human Health

Potential human health hazards associated with the Fansteel site range from potential exposure to varying levels of radioactivity in ground water, soils and buildings, to relatively high levels of radioactivity within the process waste ponds.

The intent of the final decommissioning activity at Fansteel is to reduce radiological contamination at the site to meet NRC's unrestricted release criteria. After decommissioning activities are complete, license termination activities will verify adequacy of the radiological release criteria (i.e., DCGLs) and the Final Status Survey (FSS). NRC defines unrestricted use of the site in 10 CFR 20.1402, as follows:

“A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE [total effective dose equivalent] to an average member of the critical group that does not exceed 25 mrem [millirem] (0.25 mSv) [milliSievert] per year, including that from groundwater sources of drinking water, and that the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA) . . . ”

NRC defines a critical group as the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity given the assumptions of a given scenario. To

ensure a high level of conservatism, such scenarios and their associated modeling are designed to overestimate, rather than underestimate, the potential dose. Industrial workers make up the critical group at the Fansteel site. The industrial worker spends eight hours per day on the site. Of the eight hours, six hours are spent indoors and two hours are spent outside. The primary activity of the industrial worker during the eight hours on site is work.

At the time of the FSS and license termination, the site will consist of two large industrial buildings, and several smaller ones, on an open land area of approximately 180,000 m<sup>2</sup>. The open land area will generally contain uniform residual radioactivity at an average area-weighted depth of 0.85 m. It is likely that some areas of the site that have deeper and or thicker layers of residual radioactivity deposits located east of the Chemical "A" Building and east of Former Pond No. 2. The sensitivity analysis results indicate that increases in either thickness or area of residual radioactivity do not substantially affect the peak annual TEDE to the average member of the critical group under an industrial use scenario. This is primarily because the external exposure pathway limits dose from residual radioactivity in soil at the Fansteel site.

The deterministic mode of RESRAD Version 6.21 was used to derive the radionuclide-specific DCGL<sub>W</sub>s for the residual radioactivity present in soil at the time of the site FSS and site release. The deterministic mode of RESRAD-Build Version 3.21 was used to derive the radionuclide-specific DCGL<sub>W</sub>s for the residual radioactivity present on building and component surfaces at the time of the FSS and site release.

## **4 ENVIRONMENTAL IMPACTS**

### **4.1 Land Use**

Termination of the Fansteel license should not change onsite and adjacent land use. Land use at and directly adjacent to the site is expected to remain relatively diverse and would continue to include primarily industrial, commercial, and farmland. Offsite land use near the town of Muskogee would continue with fishing, hunting, tourism, power production, electrical distribution, and recreation. The previous EA (NRC, 1997b) identified 21 sites in the vicinity that are listed on the National Register of Historic Places. The closest is Fort Davis, two miles to the northwest.

The NRC previously approved the licensee's request for a partial site release of the North West Property (NRC, 1996). As discussed in the license amendment, the residual radioactivity on that land met unrestricted release criteria and is not expected to have any impact on the remaining license termination activities.

### **4.2 Water Resources**

Fansteel will remediate existing contamination in the ground water. Remediation activities and license termination for the Fansteel site are not anticipated to result in any potentially significant and adverse impacts to either surface or ground water.

#### **4.2.1 Surface Water**

Land areas from which precipitation runs off to surface waters, will be subject to further investigations, remediation if necessary, and an FSS in accordance with DP to verify that the site will meet the DCGLs, thus demonstrating compliance with the release criteria. The

licensee will install sheet piling, berms, and other engineered features to protect surface water during remedial activities. We would also not expect license termination to result in any adverse impact to river flow or quality, because discharges would cease along with other license termination activities.

Until decommissioning is complete, the licensee would continue to monitor effluent discharges for compliance with discharge standards. The current OPDES permit reflects the decommissioning activities. Both the existing water supply system and sewage system would remain in place.

#### **4.2.2 Ground Water**

Fansteel has captured ground water at the site and treated it since the 1990's, when it installed a french drain along the eastern side of the site, that intercepts all ground water. After treatment, any water released through the permitted outfalls meets the criteria specified in the permit. The Licensee will continue to do this until the ground water meets the release criteria.

#### **4.3 Human Health Impacts**

Compliance with 10 CFR Part 20.1402 for unrestricted release is conditional upon successful remediation and removal of contaminated soil, groundwater, ancillary contaminated materials, and structures to acceptable levels (corresponding to a total dose of 0.25 mSv/y (25 mrem/y) or less per year) to an average member of the critical group. In addition, residual radioactivity must meet the ALARA requirements of the rule.

The licensee has identified levels of residual radioactivity for various sources at the site that result in a calculated dose that meet the requirements for unrestricted release. These acceptable levels are defined as the DCGLs. Potential radiation doses for the bounding exposure scenarios are calculated by assuming an average fixed concentration level of potential sources of residual radioactivity. These are groundwater, surface water, pond sediments, building surfaces, and soil. The DCGLs were then derived using the radiation doses per unit activity and the 0.25 mSv/y (25 mrem/y) limit proposed by the licensee. Each DCGL was selected so that the total dose to the average member of the critical group from all sources would meet the limit. Fansteel documents the manner in which it derives the DCGLs in Chapter 5 of the DP (Fansteel, 2003). Because of the conservatism in both the modeling and the assumption that the entire source would have residual radioactivity at the DCGL, any actual doses likely would be much less than the limit. Provided the licensee demonstrates compliance with the limit through the results of the FSS, there would be no anticipated adverse impacts to human health from approval of license termination, as described in the final rule "Radiological Criteria for License Termination" (62 FR 39058).

Because the site is in a zoned industrial area and is surrounded by other industrial sites, industrial workers are considered to comprise the critical group. External exposure to penetrating radiation, inhalation of soil dust (while outdoors and during building occupancy), and inadvertent ingestion of soil are the exposure pathways considered in deriving radionuclide-specific DCGLs for residual radioactivity in site soil for the industrial worker dose assessment. Exposure pathways considered in the derivation of radionuclide-specific DCGLs for residual radioactivity on building and component surfaces included direct external gamma exposure. These include submersion, inhalation of resuspended residual radioactivity, inadvertent ingestion of residual radioactivity from surface sources, and ingestion of deposited

radioactivity resulting from resuspension. Fansteel shows the individual DCGLs, assuming that no water or food from the site is consumed, in the following tables copied from the DP:

**Table 5-11 Industrial Worker Scenario Individual Radionuclide Decay Chain DCGL<sub>w</sub>s for Soils**

<b>Radionuclide and Entire Decay Chain in Equilibrium</b>	<b>Industrial Worker DCGL<sub>w</sub>s at Time Zero (pCi/g)</b>	<b>Time of Maximum Dose (yrs)</b>
U-238 – Uranium Chain	14.1	0
U-235 – Actinium Chain	37	0
Th-232 – Thorium Chain	10	0

**Table 5-12 Industrial Worker Scenario Individual Radionuclide Decay Chain DCGL<sub>w</sub>s for Building and Component Surfaces**

<b>Radionuclide Decay Chain DCGL<sub>w</sub></b>	<b>Industrial Worker DCGL<sub>w</sub>s at Time Zero (dpm/100 cm<sup>2</sup>)</b>	<b>Time of Maximum Dose (yrs)</b>
U-238 – Uranium Chain	5,200	0
U-235 – Actinium Chain	840	0
Th-232 – Thorium Chain	3,160	0

The NRC evaluated the appropriateness of the postulated exposure scenarios and the methodology used for deriving the DCGLs. The staff concluded that the licensee has not provided a sufficient argument in the DP to eliminate the drinking water pathway. Therefore, prior to license termination, the licensee is required by license conditions to adjust the DCGLs to include contributions to dose from all appropriate pathways. The staff has concluded that any potential radiation exposures from residual radioactivity present after license termination will not be underestimated by the licensee and are protective of the general public. The NRC staff's Safety Evaluation Report associated with this licensing action provides more details.

The partial site release, discussed previously, was based upon the determination that residual radioactivity met Site Decommissioning Management Plan (SDMP) criteria for release for unrestricted use. The SDMP criteria are the same as the dose based criteria for thorium. For uranium, the SDMP is slightly lower: 10 vs 14 pCi/g. However, surveys from the licensee (Fansteel, 1996) demonstrate the residual radioactivity is much lower than the limits. The NRC has determined that increasing the area in the analysis beyond 180,000 square meters, used by the licensee to calculate DCGLs, does not significantly change the DCGL values. This is because doses from exposure to the suite of radionuclides found at the site, under the assumed scenario, are primarily from direct radiation, and the large area used in the analysis approximates exposure from an infinite plane source. Thus, in the final status survey, the DCGL values could be applied to survey units of any size. Therefore, dose contributions from more than one area of the site will not result in a calculated dose that exceeds the 0.25 mSv/y (25 mrem/y) limit.

The licensee will use a series of surveys, including the FSS, to demonstrate compliance with the radiological release criteria consistent with the Multi-Agency Radiation Survey and Site Investigation Manual (NRC, 1997c) and Volume 2 of the Consolidated Decommissioning Guidance (NRC, 2003). Planning for the FSS involves an iterative process that requires appropriate site classification (from the potential residual radioactivity levels relative to the DCGLs) and formal planning using the Data Quality Objective process. The licensee has committed to the selection of appropriate survey and laboratory instrumentation and procedures, including a statistically-based measurement and sampling plan for collecting and evaluating the data needed for the FSS. The staff has determined that the sampling strategy and survey data evaluation methodology presented in the DP, as modified by license conditions, are adequate.

#### **4.4 Cumulative Effects**

The NRC approval of the Fansteel DP (the proposed action), when combined with known effects on notable resource areas at the site, is not anticipated to result in any cumulative impacts. Rather, decommissioning and remediation of the facility, resulting in the release of the site for future unrestricted use, would reduce the opportunity for potential negative cumulative impacts.

### **5 AGENCIES AND PERSONS CONSULTED AND SOURCES USED**

NRC communicated with Mr. Jerry Brabander of the Tulsa, Oklahoma field office of the U.S. Fish & Wildlife Service who provided information regarding federally listed endangered species. As stated in a previous EA (NRC, 1997b), no threatened or endangered species are known to occur at the Fansteel site.

The NRC also contacted Mr. Michael Broderick and Ms. Pamela Bishop of the Oklahoma Department of Environmental Quality regarding the classification of the ground water underlying the site. The role of the State in the overall remediation effort and the oversight of remediation of chemical contamination was discussed with Ms. Sara Penn, Esq., of the Oklahoma Office of the Attorney General.

Mr. Charles Wallis of the Oklahoma State Historic Preservation Office did not identify any sites near the site other than those in the previous EA.

### **6 CONCLUSION**

The NRC staff has prepared this EA in support of the proposed action to amend Material License No. SMB-911 to authorize decommissioning. From this EA, NRC has concluded there are no significant environmental impacts and the proposed license amendment does not warrant the preparation of an Environmental Impact Statement. Accordingly, it has been determined that a Finding of No Significant Impact is appropriate.

### **7 LIST OF PREPARERS**

J. Shepherd, Project Manager, Division of Waste Management, Environmental Issues.

G. Purdy, Health Physicist, Division of Waste Management, Final Status Survey, Radiation Release Criteria.

M.Thaggard, Senior Systems Performance Analyst, Division of Waste Management, Dose Assessment, Groundwater Issues.

## 8 LIST OF ACRONYMS

ALARA	As Low As is Reasonable Achievable
CaF	Calcium fluoride
CFR	Code of Federal Regulations
cfs	cubic feet per second
DCGL	Derived Concentration Guideline Limit
DP	Decommissioning Plan
dpm/100cm <sup>2</sup>	disintegrations per minute per 100 square centimeters
EA	Environmental Assessment
EPA	Environmental Protection Agency
FR	Federal Register
FSS	Final Status Survey
MIBK	Methyl Isobutyl Ketone
mrem/y	millirem per year
mSv/y	milliSievert per year
NEPA	National Environmental Policy Act
NRC	The U.S. Nuclear Regulatory Commission
ODEQ	Oklahoma Department of Environmental Quality
OPDES	Oklahoma Pollutant Discharge Elimination System
pCi/L	picocurie per Liter
TEDE	Total Effective Dose Equivalent
WIP	Waste in process

## 9 REFERENCES

10 CFR 20. Code of Federal Regulations, Title 10, Energy, Part 20, "Standards for protection against radiation."

10 CFR 40. Code of Federal Regulations, Title 10, Energy, Part 40, "Domestic licensing of source material."

10 CFR 51. Code of Federal Regulations, Title 10, Energy, Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions."

62 FR 39058. "Radiological Criteria for License Termination. Final Rule." Federal Register. July 21, 1997.

Fansteel, 1996. Letter from J. Hunter (Fansteel) to R. Hogg (NRC) June 10, 1996

Fansteel, 2003. "Decommissioning Plan, Fansteel, Muskogee, Oklahoma Site." Rev. 0, January 14, 2003. ADAMS Accession No.: ML.

NRC, 1988. "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities." NUREG-0586. U.S. Nuclear Regulatory Commission, Washington, D.C. August

NRC, 1992. "Manual for Conducting Radiological Surveys in Support of License Termination." NUREG/CR-5849. U.S. Nuclear Regulatory Commission, Washington, D.C. June

NRC, 1996. "Amendment 6 to SBM-911." U.S. Nuclear Regulatory Commission, Washington, D.C. August

NRC, 1997a. "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities." NUREG-1496. U.S. Nuclear Regulatory Commission, Washington, D.C. July

NRC, 1997b. "Environmental Assessment for License Amendment for Materials License No. SMB-911." U.S. Nuclear Regulatory Commission, Washington, D.C. December

NRC, 1997c. "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)." NUREG-1575. U.S. Nuclear Regulatory Commission, Washington, D.C. December

NRC, 2003. "Consolidated NMSS Decommissioning Guidance." NUREG-1575. U.S. Nuclear Regulatory Commission, Washington, D.C. September

Oklahoma Attorney General's Office, 2003. Communication from Sara Penn (OAG) to James Shepherd (NRC). October 24, 2003,

Oklahoma Department of Environmental Quality. Communication from Pamela Bishop (ODEQ) to James Shepherd (NRC). September 18, 2003

Fansteel's amendment request and related documents are available for inspection and copying for a fee in the Public Document Room, 11545 Rockville Pike, Rockville, MD 2052. The documents may also be viewed in the Agency-wide Documents Access and Management System (ADAMS) located on the NRC website at [www.nrc.gov](http://www.nrc.gov)