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March 4, 2004

Administrative Judge Alan S. Rosenthal
Presiding Officer
Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Administrative Judge Richard F. Cole
Special Assistant
Atomic Safety and Licensing Board Panel
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001


Re: **FMRI, Inc. (Muskogee, Oklahoma Facility)**
Docket No. 40-7580-MLA-3

Dear Judges Rosenthal and Cole:

Enclosed for filing is "The Written Presentation of FMRI, Inc. in Opposition to the Written Presentation of the State of Oklahoma" in accordance with your Order of December 11, 2003. Originals of the signature pages of certain affidavits will be substituted for the fax copies when received.

For the information of the Presiding Officer, a letter to the NRC Project Manager from A. Fred Dohmann, President and CEO of FMRI, Inc. related to the pending litigation is also enclosed.

Respectfully submitted,


James R. Curtiss
Counsel for FMRI, Inc.

cc: Service List



March 4, 2004

Mr. James Shepherd, Project Manager
Facilities Decommissioning Section
Office of Nuclear Material Safety
and Safeguards
11545 Rockville Pike
Rockville, MD 20852-2738

Re: NRC License Number SMB-911; Docket #40-7580
License Condition 26
Remediation and Decommissioning Activities

Dear Mr. Shepherd:

Pursuant to Condition 26 of License SMB-911, FMRI, Inc. ("FMRI") has begun to undertake decommissioning activities at the Muskogee, Oklahoma site. These activities were initiated by FMRI on January 26, 2004, following the exit of Fansteel Inc. from bankruptcy on January 23, 2004 and upon the establishment of FMRI at that same time as the special-purpose entity solely responsible for fulfilling all obligations under License SMB-911, including the decommissioning of this site.

A number of decommissioning-related actions have been undertaken by FMRI at the Muskogee site since January 26, 2004, as provided for in FMRI's NRC-approved Decommissioning Plan. Among the actions that FMRI has carried out are several preparatory activities related to the selection of a contractor to carry out the Phase I decommissioning (removal of the WIP residues). In addition, FMRI continues to carry out all activities necessary to ensure the security of the Muskogee site, including all necessary monitoring and maintenance activities. Finally, FMRI continues to operate the collection interceptor trench (*i.e.*, the "French Drain") around the down gradient perimeter of the site, for the purpose of capturing and treating all shallow groundwater migrating towards the Arkansas River.

A. Fred Dohmann, President and CEO
FMRI, Inc.

#10 Tantalum Place, Muskogee, OK 74403
Phone 918-687-6303 Fax 918-687-6112

Notwithstanding the progress that we have already made in carrying out the planned activities pursuant to our Decommissioning Plan, we have substantial work ahead of us if we are to achieve the timely remediation of this site. As I have previously conveyed to you, I am increasingly concerned about the prospect that the litigation and ultimate resolution of the issues raised by the State of Oklahoma in the pending adjudicatory proceeding before Judge Rosenthal (ASLBP No. 04-816-01-MLA) could delay the remediation of the Muskogee site.

In particular, I am concerned that the funds that are currently being expended by FMRI -- funds that must be marshalled carefully, as they are limited -- might prove to be imprudently spent if, depending upon the outcome of the pending litigation, FMRI might be directed to substantially alter the approach that it is taking to decommissioning this site, as approved by the NRC staff on December 4, 2003.

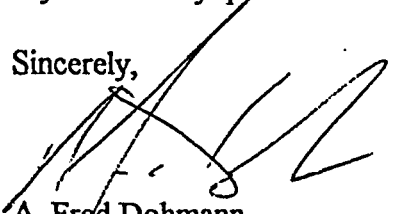
In view of our interest in moving forward with the timely remediation of the Muskogee site and at the suggestion of Judge Cole, FMRI undertook an effort to settle the issues raised by the State of Oklahoma, particularly those issues that are central to enabling FMRI to proceed with decommissioning activities without the risk of a substantial redirection of our effort depending upon the resolution of these issues by the Presiding Officer (e.g., the adequacy of site characterization and the need for an environmental impact statement). Our discussions with the State began in mid-February, and progressed in a positive direction for the next several weeks. Indeed, we had reason to believe that we would be able to settle those issues necessary for us to proceed with decommissioning activities at Muskogee, having identified an approach to addressing the key issues of concern identified by the State. As late as Tuesday of this week, a representative of the State expressed confidence that we could achieve a settlement based upon the terms that had been discussed between FMRI and the State, noting that the Oklahoma Department of Environmental Quality had viewed the proposed terms favorably. Unfortunately, we were advised mid-day yesterday that, upon further review, the approach that had been discussed during the preceding three weeks was not acceptable. Moreover, there were additional terms that the State sought as a condition of settling their issues. In view of these last-minute demands, and facing a March 5th deadline for submitting to the Presiding Officer our reply to the State's areas of concern, we terminated further discussions with the State and have now focused our attention on the resolution of the contested issues in the pending proceeding.

In view of the necessity that we now devote resources to the litigation of the issues raised by the State, and in light of the uncertain outcome, both as to timing and result, of this litigation, I do not currently anticipate that FMRI will be in a position to commit additional resources to the activities contemplated under the Decommissioning Plan until these issues are resolved. We will commit the resources necessary to ensure that the Muskogee site remains secure. We will also continue to operate the "French Drain" system. However, in view of the unfortunate prospect that we now face of having to commit substantial resources to the litigation of the issues raised by the State, we simply do not have the funds to carry out the activities contemplated under the Decommissioning Plan, particularly, as I hope you appreciate, with the prospect that our approach to decommissioning the Muskogee site might be redirected in material aspects upon the completion of the pending litigation.

Finally, I would also note that it will be necessary, in the near future, to request access to funds from the standby trust, as was contemplated by the Plan of Reorganization, for the purpose of funding decommissioning activities, including operation of the French Drain system and to maintain the security of the Muskogee site, at least until June 30th, when FMRI is scheduled to receive funding from Fansteel.

If you have any questions or would like to discuss this further, please feel free to contact me.

Sincerely,



A. Fred Dohmann
President and CEO

AFD/la

Copies to: Tom Fredrick, Nuclear Regulatory Commission
Gary Tessitore, Fansteel, Inc.
Jon Jackson, Fansteel, Inc.
Keyton Payne, FMRI, Inc.
Jim Curtis, Winston & Strawn
File (NRC-030404-1Shepherd)

March 4, 2004

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE PRESIDING OFFICER

In the Matter of:

FMRI, Inc.

(Muskogee, Oklahoma Facility)

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)

Docket No. 40-7580-MLA-3

ASLBP No. 04-816-01-MLA

WRITTEN PRESENTATION OF FMRI, INC. IN OPPOSITION TO
THE WRITTEN PRESENTATION OF THE STATE OF OKLAHOMA

March 4, 2004

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NUCLEAR REGULATORY COMMISSION

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March 4, 2004

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE PRESIDING OFFICER

In the Matter of:	)	Docket No. 40-7580-MLA-3
)	
FMRI, Inc.	)	ASLBP No. 04-816-01-MLA
)	
(Muskogee, Oklahoma Facility))	

WRITTEN PRESENTATION OF FMRI, INC. IN OPPOSITION TO
THE WRITTEN PRESENTATION OF THE STATE OF OKLAHOMA

I. INTRODUCTION

In accordance with the schedule established by the Presiding Officer's Order dated December 11, 2003, FMRI, Inc. ("FMRI") hereby submits its written presentation relating to the areas of concern proffered by the State of Oklahoma ("State").¹ As required by 10 C.F.R. § 2.1233, this filing is a written presentation consisting of this argument as well as attachments with supporting facts and documentary data in the form of sworn written testimony² and exhibits. The evidence overwhelmingly shows that FMRI's Decommissioning Plan ("DP") meets the requirements for approval pursuant to 10 C.F.R. § 40.42(g)(5), and that the associated license

¹ See State of Oklahoma's Written Presentation ("State Presentation"), dated January 30, 2004.

² This presentation is supported by experts in the field of geology, hydrogeology, and remediation of sites contaminated with radiological materials. These individuals are thoroughly familiar with the history and operations of the Muskogee site, as well as the financial issues faced by the licensee. The expert opinions supplied by these experts should be given great weight, particularly in the absence of *any* countervailing testimony from the State.

amendment was granted in accordance with NRC requirements.³ Accordingly, the relief sought by the State should be denied and the licensing action upheld.

The DP, the approval of which involved substantial negotiations in the bankruptcy context and with the Nuclear Regulatory Commission ("NRC") Staff, is structured to provide the funding estimated to be necessary for decommissioning the Muskogee site, and is designed to remove the most contaminated material first, and then to complete remediation of soil, structures, equipment, and groundwater, as necessary, in order to assure a structured and orderly cleanup of the site to correspond to the available funding.

II. BACKGROUND

A. Site History

Fansteel Inc. ("Fansteel"), FMRI's predecessor in interest, was licensed by the NRC to possess and use source material at the Muskogee site between January 27, 1967, and December 4, 2003, when the license was transferred to FMRI.⁴ (Affidavit of Gary L. Tessitore ¶ 7.) Specifically, the licensee was authorized to process ore concentrates and tin slags containing uranium and thorium in the production of refined tantalum products. (*Id.*) Licensable quantities of uranium and thorium are present in the slags, ores, concentrates, and process residues, and are contaminants in soil and sediment, on the site. (*Id.*)

³ In accordance with 10 C.F.R. § 2.1237(b), FMRI, as the applicant, has the burden of proof to demonstrate by the preponderance of the evidence in the areas challenged that the requested licensing action associated with approval of the decommissioning plan meets NRC requirements.

⁴ See Letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, "NRC Approval for Fansteel to Transfer Its License as License Amendment 12 (Hearing File Tab 50). In its Presentation, the State incorrectly references Fansteel as the current NRC licensee. The relationship between Fansteel and FMRI is discussed further below.

Operations ceased at the Muskogee site in December 1989. (*Id.* ¶ 8.) From 1989 through August 1996, Fansteel removed processing equipment, conducted limited site remediation, decommissioning of selected site areas, and completed a Remediation Assessment of the site. (*Id.*) Fansteel decontaminated approximately 35 acres of the Muskogee site designated as the “Northwest Property,” and the NRC released this area for unrestricted use in August 1996.⁵ (Tessitore Aff. ¶ 8.)

On January 25, 1995, Fansteel submitted an application to reprocess residues designated as “Work-In-Progress” (“WIP”) material, which were generated as a result of the initial hydrofluoric acid digestion of the ore concentrates. (*Id.* ¶ 9.) The purpose of the reprocessing was to recover tantalum and niobium concentrate, scandium oxide and aluminum trifluoride from the “recycled” material. (*Id.*) On March 25, 1997, the NRC granted a license amendment to allow reprocessing of the WIP residues. (*Id.*)

A groundwater interceptor trench was constructed on the site, beginning in 1997. (*Id.* ¶ 10.) This system was completed in April 1999, and began operations in August 1999, to mitigate the effects of groundwater contamination at the site pending remediation. (*Id.*) It has been successfully operating since. (*Id.*)

In accordance with the amended license, pilot production from the reprocessing plant began in late 1999; however, Fansteel encountered production problems which required significant additional capital to make improvements to the plant in order to achieve commercially viable production levels. (*Id.* ¶ 11.) After the additional expenditures were made, however, the market price of tantalum severely declined, and, as a consequence, Fansteel

⁵ See Letter from R.C. Pierson, NRC, to J.J. Hunter, Fansteel, “Release of the Northwest Property for Unrestricted Use,” dated August 23, 1996 (NRC ADAMS accession number

concluded that aggregate projected revenues in the processing operation would be insufficient to recover operating costs and suspended commercial reprocessing efforts. (*Id.*) Generally Accepted Accounting Principles then mandated that Fansteel take a pre-tax loss, in the third quarter of 2001, of \$83,500,000, representing a charge of \$31.5 million for construction, equipment and pilot production costs of the processing facility and a reserve of \$52 million representing the additional estimated costs (in addition to the reserve of \$4.2 million that Fansteel had on its balance sheet for remediation of the Muskogee site) for offsite decommissioning of all contaminated residues and soils. (*Id.*) The loss, charges and reserves resulted in defaults of various provisions of Fansteel's principal credit facility. (*Id.*) As a consequence, Fansteel's revolving credit facility was terminated by its principal lender and nearly all the cash being collected by Fansteel was automatically offset against the outstanding loan balance. (*Id.*) Unable to obtain outside financing, Fansteel was forced to file for bankruptcy protection under Chapter 11 of the United States Bankruptcy Code in the United States Bankruptcy Court for the District of Delaware on January 15, 2002. (*Id.*)

B. Events Following Fansteel's Bankruptcy Filing and Institution of This Proceeding

Fansteel recognized that one of the significant issues facing it in bankruptcy was the environmental remediation of a number of sites, including Muskogee. (*Id.* ¶ 12.) The company worked closely with the NRC, the Department of Justice ("DOJ"), the Pension Benefit Guaranty Corporation ("PBGC"), and the Environmental Protection Agency ("EPA") to craft a solution that would permit remediation of all environmental sites, while still meeting its obligations to other creditors in accordance with the bankruptcy laws. (*Id.*) A liquidation of the

9608290059). Nineteen acres of the Northwest Property was sold to the Port of Muskogee in 1999.

company, as demonstrated by financial analyses before the Bankruptcy Court, would have led to an inability to even begin remediation at the environmental sites. (*Id.*)

On June 25, 2002, Fansteel submitted to the NRC, pursuant to Condition 21 of License SMB-911, an updated decommissioning cost estimate for the Muskogee site, which reflected the revised estimate of \$57 million for the total cost of remediating the site.⁶ (Tessitore Aff. ¶ 13.) Due to the bankruptcy, Fansteel at that time requested that the NRC postpone consideration of financial assurance until December 20, 2002. (*Id.*) Thereafter, on August 27, 2002, Fansteel filed an application for renewal of license SMB-911.⁷ (Tessitore Aff. ¶ 13.) In response to both the June 25 letter and the license renewal application, on October 22, 2002, the NRC denied the license renewal application, primarily because Fansteel had not provided the financial assurance required by 10 C.F.R. § 40.36. (*Id.*) Accordingly, the NRC limited activities at the Muskogee site to those directly related to decommissioning and maintaining control of the site and licensed materials. (*Id.*) However, with no approved decommissioning plan, the only expenditures Fansteel was permitted to make related to maintaining control of the site and licensed materials. (*Id.*)

On December 20, 2002, Fansteel notified the NRC of its intent to submit a decommissioning plan within 12 months.⁸ (Tessitore Aff. ¶ 14.) Fansteel subsequently

⁶ See Letter from G.L. Tessitore, Fansteel, to L. Camper, NRC, dated June 25, 2002 (NRC ADAMS accession number ML021780437). It utilized the same preliminary analysis as the pre-bankruptcy cost estimate.

⁷ See Letter from A.F. Dohmann, Fansteel, to J.W. Hickey, NRC, "License Renewal Application," dated August 27, 2002; 10 C.F.R. § 40.42(d).

⁸ See Letter from A.F. Dohmann, Fansteel, to J. Shepherd, NRC, "NRC License Number SMB-911," dated December 20, 2002 (NRC ADAMS accession number ML030080232).

submitted its Decommissioning Plan ("DP") on January 14, 2003.⁹ (Tessitore Aff. ¶ 14.) In a letter dated April 28, 2003, the NRC indicated that, while it did not object to the proposed approach to decommissioning the Muskogee site, it had concluded that the DP did not contain sufficient information to conduct a detailed review.¹⁰ (Tessitore Aff. ¶ 14.) Following discussions in the context of settlement with the NRC and the U.S. Department of Justice ("DOJ") regarding the ongoing bankruptcy case, Fansteel made additional submissions on May 8 and May 9 describing a four-phased approach to decommissioning the site that would advance the original schedule set forth in the DP.¹¹ (Tessitore Aff. ¶ 14.) In a letter dated May 9, 2003, the NRC accepted the DP for technical review in light of the additional submissions.¹² (Tessitore Aff. ¶ 14.)

On June 26, 2003, Fansteel learned, during a telephone call with NRC Staff that the Staff had on that date suspended its review of the DP because Fansteel had not submitted an

⁹ See Letter from G.L. Tessitore, Fansteel, to J. Shepherd, NRC, dated January 14, 2003 (Hearing File Tab 1). The letter did not include certain sections of Chapter 15 related to decommissioning funding assurance. At that time, the terms and conditions of such financial assurance were still being negotiated in the context of the bankruptcy proceeding. It should also be noted that in 1998 Fansteel submitted a DP contemplating restricted release of a portion of the Muskogee site and construction of an onsite disposal cell for contaminated soils and building materials. Following the State of Oklahoma's objection to the proposed DP, based primarily on the presence of the containment cell, Fansteel withdrew that plan. See *Fansteel Inc. (Muskogee, Oklahoma Facility)*, LBP-01-2, 53 NRC 82 (2001) (terminating proceeding).

¹⁰ See Letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, "Results of Preliminary Review of Fansteel's Decommissioning Plan Dated January 2003," dated April 28, 2003 ("April 28 Letter") (Hearing File Tab 2).

¹¹ See Letter from G.L. Tessitore, Fansteel, to D.M. Gillen, NRC, dated May 8, 2003 (Hearing File Tab 3); Letter from R.M. McEntee, Fansteel, to NRC Document Control Desk, dated May 9, 2003 (Hearing File Tab 5).

¹² See Letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, "Results of Preliminary Review of Fansteel's Decommissioning Plan Dated January 2003," dated May 9, 2003 (Hearing File Tab 6).

associated license amendment request that, in the Staff's view, was required by 10 C.F.R. Part 40.¹³ (Tessitore Aff. ¶ 15.) Upon learning of the Staff's decision, Fansteel withdrew the DP in order to evaluate its path forward with respect to resolution of issues surrounding the DP in light of the pending bankruptcy proceeding.¹⁴ (Tessitore Aff. ¶ 15.) Thereafter, in a letter dated July 8, 2003, the NRC Staff acknowledged Fansteel's withdrawal of the DP, but also indicated its willingness to proceed with its review of the DP "upon receipt of notification in writing that the proposed DP should again be considered for review" including submission of a request to amend License SMB-911.¹⁵ (Tessitore Aff. ¶ 15.)

On July 24, 2003, following several months of discussions with numerous entities, including the NRC and DOJ, Fansteel filed with the Bankruptcy Court a proposed "Joint Reorganization Plan of Fansteel Inc. and Subsidiaries," ("Plan") together with the associated "Disclosure Statement With Respect to Joint Reorganization Plan of Fansteel Inc., *et al.*" ("Disclosure Statement"). (*Id.* ¶ 16.) Among other things, the Plan provided for remediation of the Muskogee facility and transfer of the Muskogee site (including real property, equipment and improvements), the NRC license, and other valuable consideration, including Fansteel's rights under the Decommissioning Trust established as NRC-mandated financial assurance for decommissioning, to a wholly-owned subsidiary of Reorganized Fansteel, now known as FMRI.

¹³ As noted above, Fansteel previously had been informed by the NRC that the information provided by Fansteel was sufficient for the NRC staff to proceed with a detailed technical review of the DP; on June 26, the NRC Staff apparently changed its position in this regard. *See* NRC May 9 Letter.

¹⁴ *See* Letter from G.L. Tessitore, Fansteel, to J. Shepherd, NRC, "Fansteel Inc., License No. SMB-911, Docket No. 40-7580," dated June 26, 2003 (Hearing File Tab 7).

¹⁵ *See* Letter from J.C. Shepherd, NRC, to G.L. Tessitore, Fansteel, "Response to Fansteel Submittal of June 26, 2003," dated July 8, 2003, at 2 ("NRC July 8 Letter") Hearing File Tab 8).

(*Id.*) As the NRC licensee, FMRI is solely responsible for completion of site decommissioning pursuant to NRC regulations and the terms and conditions of the license. (*Id.*)

On July 24, 2003, contemporaneously with submission of the proposed Plan and Disclosure Statement to the Bankruptcy Court, Fansteel requested that the NRC resume its review of the January 14, 2003 DP. (*Id.* ¶ 17.) As part of this request, Fansteel supplemented the DP with information concerning financial assurance for decommissioning, as set forth in the proposed Plan.¹⁶ (*Id.*) In conjunction with its review of the DP, as supplemented, Fansteel also requested for the first time related approvals, including a request for amendment of the NRC license to reflect approval of the DP.¹⁷ (Tessitore Aff. ¶ 17.)

A notice of opportunity for hearing related to Fansteel's July 24, 2003 license amendment request was published in the *Federal Register* on August 11, 2003.¹⁸ The State filed its request for hearing on September 10, 2003. A Presiding Officer was designated in this

¹⁶ This submission attached the cost estimate and statement of cash flow provided to the NRC as proprietary information on May 9, 2003 for inclusion on the public docket.

¹⁷ See Letter from G.L. Tessitore, Fansteel, to D.M. Gillen, NRC, "Requests for Licensing Actions in Connection with the Decommissioning Plan for the Muskogee, Oklahoma Site," dated July 24, 2003 (Hearing File Tab 9). In a separate submission, Fansteel also requested NRC consent to transfer the SMB-911 license to FMRI Inc. See Letter from G.L. Tessitore, Fansteel, to D.M. Gillen, NRC, "Request for Consent to License Transfer," dated July 24, 2003. Notice of the proposed license transfer and an opportunity for a hearing thereon was published in the *Federal Register* on August 21, 2003. See 68 Fed. Reg. 50,558 (Aug. 21, 2003). In response to this notice, the State submitted a request for hearing, which was denied by the Commission, for lack of an admissible contention, on October 23, 2003. See *Fansteel Inc.* (Muskogee, Oklahoma Site), CLI-03-13, 58 NRC 195 (2003).

¹⁸ See Notice of Consideration of Amendment Request for Fansteel, Inc., to Authorize Decommissioning of Its Muskogee, Oklahoma Site, and Opportunity to Provide Comments and to Request a Hearing, 68 Fed. Reg. 47,621 (Aug. 11, 2003).

proceeding on October 2, 2003.¹⁹ Following briefing, the Presiding Officer granted the State's hearing request on November 3, 2003.²⁰

On October 31, 2003, the NRC Staff issued an Environmental Assessment ("EA") and Finding of No Significant Impact ("FONSI") in connection with the DP.²¹ (Tessitore Aff. ¶ 18.) In addition, in accordance with 10 C.F.R. § 2.1205(m), the NRC Staff issued its approval of the DP.²² (Tessitore Aff. ¶ 18.) On that same date, the NRC issued its approval of the transfer of the SMB-911 license from Fansteel to FMRI.²³ (Tessitore Aff. ¶ 18.)

In addition, during the pendency of this proceeding, Fansteel has exited bankruptcy. (*Id.* ¶ 19.) On December 23, 2003, Fansteel's Second Amended Joint Reorganization Plan ("Plan") was confirmed by the Bankruptcy Court.²⁴ (Tessitore Aff. ¶ 19.) The Second Amended Plan reflected a settlement with the State of Oklahoma of a dispute

¹⁹ See Fansteel Inc.; Designation of Presiding Officer, 68 Fed. Reg. 58,146 (Oct. 8, 2003).

²⁰ See *Fansteel Inc.* (Muskogee, Oklahoma Facility), LBP-03-22, 58 NRC __ (slip op. Nov. 3, 2003).

²¹ See Nuclear Regulatory Commission, Fansteel Inc., License Number SMB-911, Environmental Assessment, Finding of No Significant Impact, October 31, 2003 (Hearing File Tab 32). On December 8, 2003, the State filed an "Objection to Issuance of the Environmental Assessment and Finding of No Significant Impact." Both Fansteel and the NRC Staff filed oppositions to the Objection, which was dismissed in a Memorandum and Order dated January 14.

²² See Letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, "NRC Approval of Fansteel's Decommissioning Plan as License Amendment 11," dated December 4, 2003 (Hearing File Tab 51).

²³ See Letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, "NRC Approval for Fansteel to Transfer Its License as License Amendment 12 (Hearing File Tab 50).

²⁴ See Fansteel Inc., Order Pursuant to 11 U.S.C. §§ 1127(b) Confirming Debtors' Second Amended Joint Reorganization Plan Dated December 18, 2003, Case No. 02-10109 (JJF), December 23, 2003, appended hereto as Exhibit A. The Second Amended Plan can be found in the Hearing File, Tab 55.

regarding the transfer of the Oklahoma Pollutant Discharge Elimination System ("OPDES") permit for the Muskogee site issued by the Oklahoma Department of Environmental Quality ("ODEQ"). (*Id.*) Specifically, the ODEQ agreed to transfer the OPDES permit from Fansteel to FMRI without modification, in exchange for modification of the Plan to provide ODEQ with *pari passu* indemnity and third-party beneficiary rights to one of the financial assurance documents discussed below, the FMRI Secondary Note. (*Id.*) In addition, ODEQ was granted a security interest in the FMRI Secondary Note and the proceeds thereof. (*Id.*)

From the outset of their Chapter 11 cases, Fansteel (and its affiliated debtors) believed that the confirmation and consummation of a reorganization plan would require a consensus among their most significant creditor constituencies, including the Creditors' Committee, the NRC, EPA, PBGC, and various other state and federal agencies and regulatory authorities. (*Id.* ¶ 20.) The resulting Plan, which was agreed to only after substantial negotiations with the above-mentioned entities, is structured to provide a Reorganized Fansteel which is a viable entity, capable of fulfilling all its financial duties with regard to remediation and environmental obligations, and will maximize value for creditors while minimizing costs to the debtors' estates. (*Id.*) Given the cash flow projections for the debtors, the demands of the unsecured creditors that substantial assets be sold to provide a cash recovery, the claims by the PBGC which were joint and several for all debtors and the substantial environmental liabilities that would not be discharged by bankruptcy proceeding, the Plan represented the only reasonable, confirmable plan. (*Id.*)

FMRI's operations are to be funded by proceeds of certain insurance claims, use of the Decommissioning Trust, and a series of notes issued by Reorganized Fansteel to FMRI, as follows:

- The FMRI Primary Note, a \$30.6 million unsecured, non-interest bearing note maturing on December 31, 2013, issued by Reorganized Fansteel to FMRI and payable semi-annually, following the initial payment on the Effective Date of \$250,000 from Reorganized Fansteel, in payments of \$700,000, except that the first semi-annual payment following the Effective Date shall be in the amount of \$450,000, taking into account the \$250,000 paid on the Effective Date) and mandatory additional prepayments of up to a maximum of \$4 million funded by (i) 50% of Reorganized Fansteel's "excess available cash" (actual amount to be determined within 90 days of each fiscal year end by Reorganized Fansteel's outside auditors) and (ii) if the aggregate amount of the minimum semi-annual payments plus the amount, if any, paid under clause (i) above, is less than the budgeted amount for the current fiscal year, then up to 50% of prior fiscal year-end cash balance of Reorganized Fansteel (subject to limitations imposed by applicable law), including cash balances at Reorganized Wellman (to extent that such amounts are permitted under applicable law to be dividended or loaned to Reorganized Fansteel), shall be paid so as to satisfy in full the actual remediation costs for the prior year;
- The FMRI Secondary Note, a \$4.2 million unsecured, non-interest bearing note issued by Reorganized Fansteel to FMRI (to cover estimated costs of groundwater treatment and monitoring to be completed to a standard to be agreed upon between FMRI and the NRC consistent with applicable law), maturing December 31, 2023, with annual payments of approximately \$282,000 commencing on or about January 1, 2009, until maturity;
- An FMRI Contingent Note to be issued by Reorganized Fansteel to FMRI that will be in an amount determined by Reorganized Fansteel, FMRI, and the NRC after completion of additional site characterization during Phase 3 of the DP (or following dispute resolution, if no agreement); the FMRI Contingent Note will reflect, as and to the extent required, additional costs to remediate soils (in excess of costs estimated in the DP), and other additional costs required to complete the DP and remediate and monitor groundwater; and
- If Reorganized Fansteel is unable to timely and/or fully fund FMRI's remediation obligations under the DP in any given year, then FMRI may draw up to \$2 million from the existing Decommissioning Trust on a revolving basis (*i.e.*, subject to replenishment); provided that, at no time shall the aggregate amounts outstanding under such draws from the Decommissioning Trust exceed \$2 million.

(*Id.* ¶ 21.)

The NRC is a third party beneficiary of the notes and will be able to enforce them if Reorganized Fansteel defaults on the notes. (*Id.* ¶ 22.) The NRC has been granted a pledge on the proceeds from any of the FMRI Notes and will receive an indemnification from Reorganized Fansteel with respect to Reorganized Fansteel's obligations under the FMRI Notes. (*Id.*) Pursuant to certain license conditions imposed by the NRC, the NRC will be kept apprised of

payments on the notes and the application of the proceeds to NRC-approved decommissioning activities, as well as of the status of site remediation efforts. (*Id.*) The NRC also retains its right to audit these activities. (*Id.*)

Among other things, as stated above, the Plan also provides that ODEQ has a security interest in the FMRI Secondary Note. (*Id.* ¶ 23.) Specifically, the Plan provides that ODEQ has third-party and beneficiary rights equal to those of the NRC with respect to the Secondary Note, related to groundwater remediation, and is granted by FMRI a security interest in the Secondary Note and the proceeds thereof, again equal to the rights of the NRC. (*Id.*)

The Plan became effective on January 23, 2004. (*Id.* ¶ 24.) As of that date, Fansteel emerged from bankruptcy. (*Id.*) In connection with implementation of the Plan, among other things, NRC license SMB-911, and all equipment, real property, improvements, and all other assets of Fansteel comprising the Muskogee facility were transferred to FMRI, a subsidiary of Reorganized Fansteel.²⁵ (Tessitore Aff. ¶ 24.)

On January 30, 2004, the State filed its written presentation.

III. ARGUMENT

FMRI has the burden of proof with respect to the controversies placed into issue by the State. 10 C.F.R. § 2.1237(b); *see Babcock & Wilcox Co.* (Pennsylvania Nuclear Services Operations, Parks Township, Pennsylvania), LBP-95-1, 41 NRC 1, 3 (1995). *See Int'l Uranium (USA) Corp.* (White Mesa Uranium Mill), LBP-02-19, 56 NRC 113, 117 (2002) (petitioners must establish, without compelling refutation by the licensee and NRC Staff, the existence of a decisive legal impediment to the issuance of the license, *i.e.*, that the issuance was in direct violation of the provisions of an applicable statute or NRC regulation). As discussed below,

FMRI has demonstrated by an overwhelming weight of the evidence that the DP was properly approved pursuant to 10 C.F.R. § 40.42(g)(5). The State has not proffered any evidence to demonstrate otherwise.

A. The Site Characterization Is Adequate.

In this broad area of concern, the State argues that the DP is based on a site characterization which is incomplete, inaccurate, and does not reflect current conditions at the site. 10 C.F.R. § 40.42(g)(4)(i) requires that a decommissioning plan contain “a description of the conditions of the site . . . sufficient to evaluate the acceptability of the plan.” As described below, the existing characterization of the FMRI site meets that requirement, and the State has proffered no evidence to the contrary.

The State’s argument has two principal bases. First, the State has taken various topic headings from NUREG-1727, “NMSS Decommissioning Standard Review Plan,” and listed them, with the accompanying statement that the DP is insufficient because it does not contain detail in these listed areas concomitant to the detail requested by NUREG-1727. Second, the State lists several comments made by the NRC Staff in its April 28 Letter regarding the DP. The bulk of these NUREG-1727 line items and comments do not relate to the State’s areas of concern, which is characterization of the site. Rather, these items, as discussed in greater detail below, relate to how the DP will be implemented. Because they do not provide any evidence in support of the State’s characterization concern, these arguments should be stricken without further consideration as irrelevant and immaterial to the State’s concern. *See* 10 C.F.R. § 2.1233(e). The following items are listed by the State under the “Site Characterization” category and are discussed in turn below.

²⁵ *See* Notification to Presiding Officer from Counsel for FMRI Inc., dated January 29,

1. *The Site Characterization Is Not Incomplete.*

This concern consists, as a general matter, of two parts. As stated above, the first part of the concern argues broadly that the characterization information in the DP is insufficient because it is missing certain information purportedly required by NUREG-1727.²⁶ (State Presentation at 12-19.) As the second part of its concern, the State cites a number of requests for additional information (“RAIs”) posed by the NRC Staff in its April 28 Letter, for the proposition that they constitute “findings” by the NRC Staff that the DP does not comply with 10 C.F.R. § 40.42. (State Presentation at 19.) None of these baseless allegations should be accorded any weight in this proceeding.

As an initial matter, it is well established that NUREGs are not legally binding regulations. *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-01-22, 54 NRC 255, 264 (2001). *See Int’l Uranium (USA) Corp.*, CLI-00-1, 51 NRC 9, 19 (2000) (guidance documents “merely constitute NRC Staff advice on one or more possible methods licensee may use to meet particular regulatory requirements”); *Curators of the Univ. of Mo.*, CLI-95-1, 41 NRC 71, 149 (1995). Indeed, NUREG-1727 makes this point itself:

This Standard Review Plan (SRP) is being issued to describe and make available to the public methods acceptable to the NRC staff in implementing specific parts of the Commission’s regulations, to delineate techniques and criteria used by the staff in evaluating decommissioning plans, and to provide guidance to licensees or responsible parties *SRPs are not substitutes for regulations, and compliance with them is not required. Methods and solutions different from those set out in this SRP will be acceptable, if they provide a basis for concluding that the decommissioning plan is in compliance with the Commission’s regulations.*

2004.

²⁶ See NUREG-1727, “NMSS Decommissioning Standard Review Plan,” September 2000.

NUREG-1727 at ix (emphasis added). However, even if the guidance is applied to FMRI's DP for each of these items, the State has still failed to demonstrate that the DP does not meet the requirements of 10 C.F.R. § 40.42(g)(5).

Items Pertaining to Site Characterization

The State's lengthy list raised issues in only five areas related to site characterization, as follows:

Contaminated Structures. The State argues that the following information is not contained in the DP regarding contaminated structures: (1) the mode of contamination for each surface (*i.e.*, whether radioactive material is present only on the surface of the material, or if it has penetrated the material); and (2) the maximum and average radiation levels in mrem/hr in each room or work area. (State Presentation at 12.) *See* NUREG-1727 at 4.3-4.4.

Contaminated Systems and Equipment. The State argues that the following information is not contained in the DP regarding contaminated systems and equipment: (1) the maximum and average radiation levels, in millirem per hour, at the surface of each piece of equipment; and (2) a summary of the background levels used during scoping or characterization surveys. (State Presentation at 13.) *See* NUREG-1727 at 4.6.

Surface Soil Contamination. The State argues that the following information is not contained in the DP regarding surface soil contamination: (1) a list or description of all locations at the facility where surface soil contains residual radioactive material in excess of site background levels; and (2) the maximum and average radiation levels, in millirem per hour, at each location. (State Presentation at 13.) *See* NUREG-1727 at 4.7-4.8.

Subsurface Soil Contamination. The State contends that the following information is not contained in the DP regarding subsurface soil contamination: (1) a list or

description of all locations at the facility where subsurface soil contains residual radioactive material in excess of site background levels; and (2) the depth of the subsurface soil contamination at each location. (State Presentation at 13.) See NUREG-1727 at 4.9.

Characterization Surveys. The State argues that the following are not contained in the DP with respect to characterization surveys: (1) a description of the laboratory instruments and methods that were used for measuring concentrations and the sensitivities of those instruments and methods; (2) justification for considering areas to be non-impacted; and (3) a discussion of why the licensee considers the characterization survey to be adequate to demonstrate that it is unlikely that significant quantities of residual radioactivity have gone undetected. (State Presentation at 19.) See NUREG-1727 at 14.5.

As a general matter, as discussed in the DP, the site characterization information for the Muskogee site derives from a Remediation Assessment performed by Fansteel in 1993 (as further updated to reflect ongoing activities since that time, such as ongoing surveys of buildings and equipment). (Affidavit of Marcel David Tourdot, ¶ 8.) The work performed included installation of soil borings, monitoring wells, and test pits; collection and analysis of soil, sediment, surface water, groundwater, air, and pond residue samples; and performance of a radioactivity scoping survey.²⁷ (Tourdot Aff. ¶ 8.) Borehole, well, and test pit locations were based on information relative to plant history and operations. (*Id.*) Sample locations were

²⁷ The multi-volume Remediation Assessment, which addresses a number of the State's assertions, was submitted to the NRC following its completion, and can be found at NRC ADAMS accession numbers 9401240039, 9401240045, 9402030079, 9402030089, 9402030099, 9402030102, 9402030109, 9402030110, 9402030113, 9402030118, 9402030131, 9402030136, 9402030140, 9402030143, 9402030158, 9402030168, 9402030171, 9402030173, 9402030178, 9402030180, and 9402030181. Because the Remediation Assessment consists of multiple volumes and oversize drawings, it is not reproduced here. FMRI would be pleased to supply a copy for the Presiding Officer's review.

chosen based on such factors as the potential for the area to have been impacted by material handling and storage, past releases, manufacturing operations, and air emissions. (*Id.*) Sample locations were selected with the intent of characterizing areas of the plant that exhibited the potential for being impacted, as well as background conditions. (*Id.*) These selections resulted in a comprehensive site evaluation. (*Id.*)

The Remediation Assessment was preceded by a Remediation Assessment Work Plan, which was submitted to the NRC, U.S. Environmental Protection Agency, and the State of Oklahoma. (*Id.* ¶ 9.) Following the review of the Work Plan by these agencies, their comments were incorporated into the final July 1992 Work Plan that was submitted to the NRC for approval. (*Id.*) The Work Plan was approved by the NRC and incorporated into License SMB-911 by amendment dated December 21, 1992.²⁸ (Tourdot Aff. ¶ 9.)

The Remediation Assessment represents the “worst case” of site contamination, as it was performed only a few years after site operations terminated in 1989. (Tourdot Aff. ¶ 13.) Site operations since 1990 have, as indicated above, consisted only of environmental monitoring, maintenance of buildings, grounds, and equipment remaining at the site, cleanup of operating areas, and a brief period of reprocessing operations which is discussed further below. (*Id.*) Given the comprehensive nature of the Remediation Assessment, FMRI has sufficient knowledge of the site to support the Staff’s approval of the decommissioning plan. (*Id.*)

Additional soil characterization at this time is not feasible and is unnecessary. (*Id.* ¶ 14.) The principal concern is to gather further information regarding the extent of contamination of soil beneath the ponds. (*Id.*) In order to characterize beneath the ponds, vertical borings would be required, which would penetrate the pond liners and potentially cause

additional contamination of subsurface soil. (*Id.*) Any information gained from horizontal borings from the side of the ponds, which are more complex and costly, would be limited, due to the limited areas under the ponds that could actually be sampled using this technique. Accordingly, horizontal borings would not provide sufficient data to make a statistically significant conclusion on the actual extent of any contamination that may be detected under the ponds. (*Id.*) The 1993 Remediation Assessment sufficiently represents the extent of contamination at the site, given the slow movement of radioactive contamination in the soil.²⁹ (*Id.* ¶ 14.) In addition, the interceptor trench is in place to divert contaminated groundwater that could otherwise cause additional site contamination or offsite releases. (*Id.* ¶ 14.) Rather than undertake this characterization now, the NRC Staff proposed license conditions regarding characterization to support the agreed-upon remediation schedule for site soils, which address this issue. (*Id.*)

Specifically, License Condition 29 provides:

In accordance with provisions of 10 CFR 40.42(g)(4)(i) Licensee shall, not later than May 31, 2004, provide a physical description – dimensions, types of liners, etc. – of Pond 1, Pond 1S and 1N, and Pond 4, the time during which each of the ponds were used, what process-related materials and how much was placed in each of the ponds, and how and where those materials were disposed when the ponds were closed.³⁰

²⁸ The amendment may be found at ADAMS accession number 9301050272. The July 1992 Work Plan may be found at ADAMS accession number 9208170060.

²⁹ See discussion *infra* and Affidavit of Marcel David Tourdot.

³⁰ Ponds 1, 1S, 1N, and 4 were closed at the time the 1993 Remediation Assessment was performed, and the characterization done at that time included those areas. Specifically, the area of former Ponds 1, 1N, and 1S was characterized by monitoring wells 62S, 66S, 65S, 67S, and 167D, as well as test borings B46, B32, B33, B34, B35, B74, B50, B49, B63, B2, B66, B48, B58, B62, B64, B47, B65, B53, B1, B52, B55, B56, B73, B61, and B54. The area of former Pond 4 was characterized by monitoring wells 68S, 55S, 70S, 64S, 73S, 71S, 174D, 74S, 72S, 75S and 69S, and by test borings B13, B14, B15, B36, B60, B38, B59, B71, B72, B70, B39, B20, B21, B67, B69, B22, and B68. See Figure 2 (Site Plan) of the Remediation Assessment. Additionally, these former pond areas were

License Condition 31 provides:

Licensee shall conduct an additional characterization of any additional contaminants at the site, including all soils, buildings, and groundwater on the site, using guidance in NUREG-1757, Vol. 2. Upon agreement by NRC that any additional contamination is adequately characterized, Licensee shall identify the cost to remediate all contamination identified in this study. Work shall be performed according to the following schedule:

- a. Submit a site characterization plan not later than February 28, 2011.
- b. Submit a site characterization report (SCR) not later than December 29, 2011.
- c. Develop detailed work plans to be submitted with the SCR, including cost and schedule, for any additional work identified in the SCR.

(Tourdot Aff. ¶ 14.)

For the reasons discussed above, it is unnecessary and wasteful to conduct additional characterization at the current time. The DP is designed to remediate the most contaminated material on the Muskogee site first, *i.e.*, the WIP and CaF material, then to undertake additional characterization and remediation of the site, including buildings and affected soils, with the goal of remediating the site effectively and efficiently. Moreover, given FMRI's current financial situation and limited decommissioning funds (approved by the NRC and the Bankruptcy Court), it makes no sense to conduct a full-scale characterization of the subsurface soils now. Compliance with the license conditions assures that, prior to remediation, the work plan, characterization results and detailed plans for remediation will be furnished to the

subject to an instrumentation survey to determine the presence of surficial contamination by radioactive materials and to indicate the possible presence of subsurface accumulations of radioactivity. Measurements of alpha, beta, and gamma radioactivity were obtained at the ground surface at designated points over the entire area. These activities and results can be found in the Remediation Assessment.

NRC.³¹ The license conditions, combined with the robust site characterization provided by the Remediation Assessment, ensures that the Muskogee site is characterized sufficiently to be in compliance with 10 C.F.R. § 40.42(g)(4)(i).

In any event, the State's mere recitation of line items from NUREG-1727 does not call into question the adequacy of FMRI's site characterization. The State has not provided any argument – much less any evidence – indicating that FMRI's existing site characterization and knowledge of the site, combined with the license conditions imposed by the Staff, do not result in compliance with 10 C.F.R. § 40.42(g)(4)(i). Even assuming the items listed by the State are missing from the DP, noncompliance with NUREG-1727 does not equate to noncompliance with NRC regulations. *Curators of the Univ. of Mo.*, CLI-95-1, 41 NRC 71, 98 (1995), citing *Petition for Emergency and Remedial Action*, CLI-78-6, 7 NRC 400, 406-07 (1978), *reconsideration denied*, CLI-80-21, 11 NRC 707 (1980). Only statutes, regulations, orders, and license conditions can impose requirements upon applicants and licensees. *University of Missouri*, CLI-95-1, 41 NRC at 98. Moreover, at least one Licensing Board has held that an allegation of failure to comply with regulatory guidance, *without more*, does not even meet the Subpart G pleading requirements. *Long Island Lighting Co.* (Shoreham Nuclear Power Plant, Unit 1), LBP-91-35, 34 NRC 163, 179 (1991). If that is the case, the State has certainly failed to meet its even higher burden – a demonstration that FMRI is out of compliance with NRC regulations. For these reasons, this concern should be dismissed.

Items Not Pertaining to Site Characterization

Each of the following “deficiencies” identified by the State does not pertain to its site characterization concern. For that reason alone, these line items should be stricken from the

³¹ See License Condition 31.

record by the Presiding Officer as immaterial and irrelevant to the site characterization issue and given no consideration. 10 C.F.R. § 2.1233(e). Moreover, because they are not within the area of concern proffered by the State, these issues have not been placed in controversy and should not be further examined. *Babcock & Wilcox*, 41 NRC at 4 (“the overall scheme of Subpart L clearly anticipates that specific concerns set out in the written presentation must fall within the scope of the areas of concerns advanced by a petitioner in the request for hearing and accepted as issues in the hearing by the presiding officer”). In any event, each of the allegations that the DP is insufficient is utterly without merit, as discussed below.

*Executive Summary.*³² The State argues that the following were not included in the DP: (1) The proposed initiation and completion dates of decommissioning; (2) any post-remediation activities (such as groundwater monitoring) that the licensee proposed to undertake prior to requesting license termination; and (3) a request for a license amendment to incorporate the decommissioning plan. See NUREG-1727 at 1.3. This allegation does not present any dispute, for the reasons discussed below.

The current proposed schedule for decommissioning of the Muskogee site was first set forth in Fansteel’s letter to the NRC Staff dated May 8, 2003 (Hearing File Tab 3), and again in Fansteel’s request for an alternate decommissioning schedule, dated July 24, 2003 (Hearing File Tab 9). The schedule was set forth as follows:

- Phase 1 – Remediation and offsite disposal of residue material in Ponds 2 and 3 (the “WIP” material) – Remediation is scheduled to begin by September 1, 2004 and end by March 31, 2006.

³² As a general matter, the executive summary of any document, including a decommissioning plan, has little regulatory significance; the NRC relies on the substance of a document in its review.

- Phase 2 – Remediation and offsite disposal of residue material in Ponds 5-9 (the “CaF material”) – Remediation is scheduled to begin by January 1, 2007 and end by April 30, 2011.
- Phase 3 – Complete remediation of buildings, equipment and soils, and conduct additional characterization by the end of 2011. Final site grading is to be completed in 2012, resulting in a nine-year cleanup schedule.
- Phase 4 – Groundwater monitoring and remediation. It is the intent of FMRI not to seek termination of the license until groundwater is satisfactorily remediated, or until alternative arrangements acceptable to the NRC are made.³³

This decommissioning schedule was approved by the NRC as part of its December 4, 2003 approval. *See* Safety Evaluation Report at § 7.5. As part of this approval, the NRC requires, pursuant to License Condition 42,³⁴ that FMRI update its decommissioning schedule yearly. FMRI provided its first update on January 14, 2004.³⁵ As to post-remediation activities, as stated above, Fansteel stated its intent to treat and monitor groundwater prior to seeking license termination. Fansteel requested a license amendment to approve the decommissioning plan on July 24, 2003 (Hearing File Tab 9). As the State is aware, the NRC Staff granted that request by letter dated December 4, 2003 (Hearing File Tab 51). Accordingly, the State’s concerns regarding the DP Executive Summary have no merit.

³³ Table 15-11, submitted to the NRC as part of the July 24, 2003 letter, provides for groundwater treatment for ten years following completion of remediation.

³⁴ *See* License Condition 42, which provides, “Licensee shall update Figure 8-3 of the January, 2003 DP submittal annually, and submit the revised figure to NRC not later than January 15 of each year until license termination.”

³⁵ *See* Letter from A.F. Dohmann, FMRI, to J. Shepherd, NRC, “License Condition 42 – Annual Update of Figure 8-3,” dated January 14, 2004.

Previous Decommissioning Activities. The State argues that the DP lacks “[a] summary of the results of the final radiological evaluation of the previously remediated area.” See NUREG-1727 at 2.5. The nature of the State’s concern is not clear, as Fansteel provided a detailed discussion of previous decommissioning activities in Section 2.3 of the DP,³⁶ and the State does not contravene in any way the information provided therein. In any event, the area of the site previously decommissioned, the Northwest Property, is not at issue in this proceeding.

License SMB-911 was amended in 1996 to remove that portion of the Fansteel property identified as the Northwest Property from the license for unrestricted use.³⁷ In so doing, the NRC determined that the site was adequately remediated.³⁸ Since that time, the Northwest Property has not been subject to NRC jurisdiction, and is not encompassed by the proposed DP.³⁹ An area of concern “must be sufficient to establish that the issues the requestor wants to raise regarding the licensing action fall generally within the range of matters *that properly are subject to challenge in such a proceeding.*” Final Rule, Informal Hearing Procedures for Materials License Adjudications, 54 Fed. Reg. 8269, 8272 (Feb. 28, 1989) (emphasis added); see *Chemetron Corp.* (Bert Avenue, Harvard Avenue, and McGean-Rohco Sites, Newburgh Heights and Cuyahoga Heights, Ohio), LBP-94-20, 40 NRC 17, 19 (1994) (“there exists the necessity for linking the concerns registered in [a] hearing petition to the matter under consideration”). Because the Northwest Property has been previously remediated and released from NRC

³⁶ See Hearing File Tab 1, at 2-13 – 2-15.

³⁷ See Letter from R.C. Pierson, NRC, to J.J. Hunter, Fansteel, “Release of the Northwest Property for Unrestricted Use,” dated August 23, 1996. DP Section 2.3.1 improperly states this amendment was granted in 1999.

³⁸ *Id.*, Safety Evaluation Report: Release of Northwest Property, dated August 23, 1996, at 3-4.

³⁹ A portion of the property was sold to the Port of Muskogee in 1999.

jurisdiction pursuant to a separate licensing action, it is not encompassed by the current license amendment. The State's concern is beyond the scope of this proceeding and beyond the jurisdiction of the Presiding Officer. For these reasons, this concern should be dismissed.

ALARA Analysis. The State argues that the following are not included with respect to FMRI's DP: (1) a quantitative cost benefit analysis; (2) a description of how costs were estimated; and (3) a demonstration that the doses to the average member of the critical group are ALARA. (State Presentation at 13.) See NUREG-1727 at 7.2. While a full-fledged ALARA ("As Low As Reasonably Achievable") analysis is not included in the DP, what has been provided was sufficient for the Staff to find, in Section 6 of the Safety Evaluation Report, that the decommissioning to be performed provides reasonable assurance that the remediation will result in residual radioactivity levels that are ALARA.

10 C.F.R. § 20.1402 provides, in pertinent part:

A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem (.25mSv) 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).

The purpose of this analysis is to demonstrate that the residual radioactivity resulting from decommissioning activities has been reduced to a level that is ALARA. In order to accomplish this, the proposed decommissioning activities are compared with removal of additional affected material with activity concentrations below the Derived Concentration Guideline Levels ("DCGL") values.

FMRI's ALARA analysis will use a cost-benefit approach to demonstrate that such additional remediation action is not cost-effective. In order to compare the benefits and costs of a remediation action, those benefits and costs are assigned a monetary value, to the

extent practicable. If the benefits from the remediation action are greater than the costs, the remediation action being evaluated is cost-effective and should be performed. Conversely, if the benefits are less than the costs, then the levels of residual radioactivity are already ALARA without taking the additional action. With respect to the FMRI site, the ALARA analysis will turn on removal of additional soils.

After remedial activities on the site are complete, it is highly unlikely that dose from soil as-left will equal 25 mrem or just below 25 mrem. Because of the conservatism in the analysis, they are likely to be significantly less. The soil activity concentrations in units of pCi/g (DCGL values) used to guide remediation and compare final status survey measurements to, are derived values based on projected exposure of 25 mrem in any one year for the next 1000 years. Conservative assumptions and input parameters are used in the derivation of the guideline values resulting in remediation of soils to levels below 25 mrem. An ALARA analysis is then performed to determine if additional remediation is justified. The dose from remaining soil contamination is assessed through final survey measurements and possibly a dose assessment, and the cost/benefit to continue to reduce exposure through additional remediation is determined. Because of the high cost of transportation and disposal of additional soil and the relative insensitivity of the thickness of contamination to the total dose, the results of the ALARA analysis are essentially predetermined: no additional soil removal is warranted.

In connection with the License Termination Rule, the NRC prepared a Generic Environmental Impact Statement in which it considered, among other things, ALARA analysis for soil contamination. The NRC concluded, "[T]here appears to be a strong indication that removing and transporting soil to waste burial facilities to achieve exposure levels at the site at or below a 0.25 mSv/u (25 mrem/y) unrestricted use dose criterion is generally not cost-effective

when evaluated using NRC's regulatory analysis framework presented in NUREG/BR-0058 and NUREG-1530. Further, even for a range of cleanup levels at or above a 0.25 mSv/y (25 mrem/y) criterion, there can also be cases where costs are unreasonable in comparison to benefits realized." Final Rule, Radiological Criteria for License Termination, 62 Fed. Reg. 39,057, 39,065 (July 21, 1997). In NUREG-1496, the NRC Staff concurred, stating that shipping soil for offsite disposal is unlikely to be cost-effective for unrestricted release. Removal of additional soils has not been proven cost beneficial at other decommissioned sites.

In the December 4, 2003 Safety Evaluation Report, the NRC Staff approved FMRI's ALARA analysis plan. Specifically, the Staff determined that FMRI's "preferred decommissioning option provides reasonable assurance that the remediation will result in residual radioactivity levels that are ALARA." Safety Evaluation Report at § 6. ALARA analyses will be performed as part of decommissioning activities to assess when specified remediation has achieved the goal of limiting exposure to 25 mrem/year as specified in 10 C.F.R. § 20.1402. ALARA analysis can only be accomplished once characterization has been completed and remediation is well on its way. These events will not occur for several years, because of the schedule necessitated by FMRI's financial status and the bankruptcy reorganization. Thus an ALARA analysis now would be both unnecessary and unrevealing.

Additional remediation may ultimately be performed if a significant reduction in exposure can be gained relative to the additional cost as determined using the ALARA analysis procedure described in Section 7.0 of the DP. In light of the NRC Staff's approval and FMRI's commitments, FMRI meets the requirements of 10 C.F.R. § 20.1402, and the State has not provided any evidence to the contrary.

Contaminated Structures. With respect to planned decommissioning activities regarding contaminated structures, the State claims that the DP does not contain “[a] description of the remediation techniques that will be employed in each room or area of the contaminated structure.” (State Presentation at 13.) See NUREG-1727 at 8.3.

Section 8.1.2 of the DP presents a general discussion of the techniques to be used, e.g., installation of engineering and access controls, cleaning of removable contamination from building surfaces, scabbling of nonremovable contamination. The NRC Staff imposed License Condition 32, which provides that FMRI “shall not have a removable fraction of residual radioactivity on any specific building surface that exceeds 3%.” Specific remediation techniques will be developed in conjunction with contractors for structures at the Muskogee site, and are of limited importance in light of the substantive limit set by License Condition 32. Given the relatively minor contamination of structures on the site and readily available remediation techniques, structures on the Muskogee site can be readily decontaminated.

Moreover, the licensee has experience with release of contaminated structures. In connection with the 1996 release of the Northwest Property for unrestricted use, Fansteel performed soil removal, interior building surface cleaning, and external building service cleaning in areas surrounding the “Service Building” (Building No. 1).⁴⁰ The building had been used for activities involving source material, such as storage of drums and ore material.⁴¹ Following remediation, Fansteel performed a final status survey of indoor and outdoor facility surfaces (ceiling, walls, floors, and remaining equipment) for direct fixed and removable surface contamination and exposure rate. The NRC Staff accepted as adequate the final status survey

⁴⁰ See Safety Evaluation Report: Release of Northwest Property, at 1-2.

⁴¹ *Id.* at 2.

data, and conducted confirmatory survey activities confirming Fansteel's results. Following remediation of additional contamination identified during the confirmatory survey, the Northwest Property was released. Due to these remediation and survey activities, FMRI is familiar with successful remediation techniques concerning contaminated structures, and will implement those techniques with respect to other structures on the Muskogee site.

The State has not presented *any evidence* contravening what has been set forth in the DP, and imposed on FMRI pursuant to License Condition 32. Accordingly, this concern has no merit.

Contaminated Systems and Equipment. Also with respect to planned decommissioning activities, the State complains that five elements are missing from the discussion of contaminated systems and equipment: (1) a summary of the remediation tasks planned for each system in the order in which they will occur, including whether activities will be conducted by licensee staff and which will be performed by a contractor; (2) a description of the techniques that will be employed to remediate each system in the facility or site; (3) a description of the radiation protection methods and control procedures that will be employed while remediating each system; (4) a summary of the equipment that will be removed or decontaminated and how the decontamination will be accomplished; and (5) a summary of the procedures already authorized under the existing license and those for which approval is being requested in the decommissioning plan. (State Presentation at 13-14.) *See* NUREG-1727, at 8.5-8.6.

DP Section 8.2.2 states that specific remediation techniques will be developed in conjunction with contractors for systems and equipment at the Muskogee site. Pursuant to License Condition 33, before release of any equipment, FMRI is required to characterize all

surfaces, interior and exterior, and remediate *all* contaminated equipment to the limits prescribed in NRC Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors." In essence, the information sought by the State need not be provided in the DP because the NRC is requiring *all* equipment onsite to be remediated to limits acceptable to the agency.

Moreover, FMRI has remediated contaminated systems and equipment in the past, and has procedures in place for doing so. With respect to large equipment, the licensee recently released a kinetic phosphorous analyzer for use by another company. In addition, the licensee has released a portable filter press that had been used in licensed operations to test CaF material. Both pieces of equipment were released following radiation surveys conducted pursuant to Procedure HSDI-402, Revision 3, "Performance of Radiation Surveys" (attached hereto as Exhibit B). FMRI also routinely conducts other free release surveys pursuant to HSDI-402 – 83 in 2003 (a majority of which are vehicle surveys). Similar tasks will not present difficulty for FMRI under the DP, given the relatively low levels of contamination present in contaminated systems and equipment.

For these reasons, the State's allegation simply does not demonstrate that FMRI's DP is in any way deficient, and this concern should be dismissed.

Soil. The State contends that the DP is missing (1) a description of the techniques that will be employed to remove or remediate surface and subsurface soil at the site; and (2) a summary of the procedures already authorized under the existing license and those for which approval is being requested in the decommissioning plan. (State Presentation at 14). See NUREG-1727 at 8.8.

DP Section 8.3.2 describes the remediation techniques that will be used to remove soil at the Muskogee site. Prior to remediation activities, the site will be prepared, then soil will

be excavated, segregated, air-dried (if necessary), and sent (most likely by rail) to a licensed facility for disposal. The pond excavations will then be backfilled with "clean" material to bring the site back to grade. The site will be restored to minimize weathering. The State has not challenged FMRI's description of techniques to remediate soil, or indicated how the description in the DP of these straightforward activities is in any way out of compliance with NRC regulations or NUREG-1727. As to procedures, DP Section 8.3.2.8 states that decommissioning activities will be conducted in accordance with written, approved procedures. The excavation, drying and shipping process involves simple, well-established procedures. FMRI was not required by regulation to have them in place at the time of the December 4, 2003 approval; and they will be in place prior to remediation activities involving soils. The State has not demonstrated that FMRI is in any way out of compliance with regulations by not having the procedures in place at this time, or that there is any technical deficiency which will lead to non-compliance with NRC regulations. Accordingly, this issue should be dismissed.

Surface and Groundwater. The State alleges that FMRI's DP lacks (1) a summary of the remediation tasks planned for ground and surface water in the order in which they will occur, including which activities will be conducted by licensee staff and which will be performed by a contractor; (2) a description of the remediation techniques that will be employed to remediate the ground or surface water; and (3) a summary of the procedures already authorized under the existing license and those for which approval is being requested in the decommissioning plan. (State Presentation at 14.) See NUREG-1727 at 8.10.

As early as May 8, 2003, in its letter to the NRC Staff of that date, Fansteel indicated that it would not seek termination of the SMB-911 license until groundwater is satisfactorily remediated. See May 8 Letter at 2 (Hearing File Tab 5). DP Section 8.4.1 states

that the existing groundwater treatment program will remain in place at the Muskogee site during most of the decommissioning activities. With respect to surface water, all stormwater runoff from affected areas (*e.g.*, the WIP and CaF ponds) will be collected and treated, and stormwater runoff from other areas will be managed such that contact with contaminated material is avoided.

The current groundwater remediation strategy consists of a collection trench around the down gradient perimeter of the site. (Tourdot Aff. ¶ 19.) This interceptor trench was installed in 1998-99, and keyed three feet into the underlying low permeability shale. (*Id.*) The trench was designated and operated to capture all shallow groundwater migrating into a west to east direction towards the Arkansas River. (*Id.*) The trench is connected to the existing wastewater treatment system by pumps. (*Id.*) Groundwater collected in the trench is treated (treatment consists of neutralization/flocculation by adding lime) and ultimately discharged to the Arkansas River pursuant to an OPDES permit issued by the ODEQ. (*Id.*) The State receives monitoring data from the outfalls. (*Id.*) The operation of the groundwater system, as confirmed by monitoring, has and will prevent any offsite release of contaminated groundwater until remediation to acceptable levels is complete. (*Id.*) These groundwater remediation activities will continue as part of the wastewater treatment system until it is determined that groundwater meets applicable regulatory standards.⁴² (Tourdot Aff. ¶ 19.) FMRI revised the DP pursuant to License Condition 40 on December 31, 2003, to describe current and future groundwater remediation activities. The State is well informed as to activities related to the OPDES permit, but has raised no technical concern regarding present or future groundwater remediation. The State's concern is without merit and should be dismissed.

⁴² FMRI revised the DP pursuant to License Condition 40 on December 31, 2003, to describe current groundwater remediation activities. *See* Letter from A.F. Dohmann,

Schedules. The State contends that the DP does not contain either (1) a statement acknowledging that the dates in the schedule are contingent on NRC approval of the decommissioning plan; or (2) a statement acknowledging that circumstances can change during decommissioning, and, if the licensee determines that the decommissioning cannot be completed as outlined in the schedule, the licensee or responsible party will provide an updated schedule to NRC. (State Presentation at 14). See NUREG-1727 at 8.11-8.12.

Even a cursory reading of Fansteel's request for license amendment, dated July 24, 2003, shows the following on page 4:

Fansteel acknowledges that the dates in the schedule as described above are contingent upon NRC approval of the DP, as implemented. Circumstances can change over the course of decommissioning. If it is determined that decommissioning cannot be completed by [FMRI] as outlined in the above schedule, it will provide an updated schedule . . . to the NRC.

Thus, contrary to the State's assertion, FMRI has complied with the guidance on this issue. In any event, as stated above, License Condition 42 requires FMRI to update DP Table 8-3, setting forth the schedule for remediation, no later than January 15 of each year until license termination. Thus, there is no dispute with the State on this point.

Decommissioning Management Positions and Qualifications. The State next contends that the DP lacks (1) the minimum qualifications for each of the positions described above (NUREG-1727 references chemical, radiological, physical and occupational safety-related position in the decommissioning organization, as well as engineering, quality assurance and waste management positions), and the qualifications for the individuals currently occupying the

FMRI, to J. Shepherd, NRC, "Current Groundwater Remediation Activities," dated December 31, 2003.

positions; and (2) a description of all decommissioning and safety committees. (State Presentation at 15.) *See* NUREG-1727 at 9.6.

Chapter 9 of the DP sets forth the minimum qualifications for the following positions in the decommissioning organization:

- Corporate Project Manager (DP Section 9.1.1) – BA/BS degree and a minimum of 10 years management experience, including 5 years of health, safety, and environmental management experience.
- Plant Radiation Safety Officer (DP Section 9.1.2) – BA/BS degree in physical sciences, industrial hygiene, or engineering from an accredited college or university, or an equivalent . . . combination of training and relevant experience in radiological protection.
- Site Project Manager (DP Section 9.1.3) – BS in science or engineering, and 2 years of management, or equivalent, experience.

Pursuant to License Condition 50, FMRI must provide to the NRC not later than August 2, 2004, the experience and education requirements for the Health Physics Supervisor, the Construction Supervisor, and the Quality Control Officer. There simply can be no dispute that FMRI meets the NRC's requirements for personnel qualifications.

FMRI need not provide, as part of the DP submittal, the names of the individuals who will fill these positions in order to demonstrate the technical qualifications of its personnel. A commitment to hire qualified personnel suffices. *Hydro Resources, Inc.*, CLI-00-12, 52 NRC 1, 4 (2000).

FMRI has in place a Radiation Safety Committee, which has as its mission ensuring that (1) effluent releases and employee exposures are ALARA; and (2) requirements of the NRC license are satisfied. *See* Procedure G-004, Revision 0, "Radiation Safety Committee"

(appended hereto as Exhibit C); Affidavit of A. Fred Dohmann ¶ 8. Throughout decommissioning activities, the committee will continue to meet and fulfill its responsibilities. Notwithstanding the existence of the committee, the State has not argued that NRC regulations require such a committee during decommissioning, or, if such a committee is required, what its duties must be.

For the reasons set forth above, the State has not presented a litigable issue, or demonstrated that FMRI is not in compliance with the regulations regarding decommissioning management positions and qualifications.

Training. The State argues that the DP is missing the following items relative to FMRI's training program: (1) a description of the radiation safety training that the licensee will provide to each employee; (2) a description of any daily worker "jobsite" [sic] or "tailgate" training that will be provided at the beginning of each workday or job task to familiarize workers with job-specific procedures or safety requirements; and (3) a description of the documentation that will be maintained to demonstrate that training commitments are being met. (State Presentation at 15.) See NUREG-1727 at 9.10.

10 C.F.R. Parts 19 and 20 require that training be provided to employees. FMRI has committed to provide (1) general radiation safety training (DP Section 9.4.1), and (2) "jobsite" or "tailgate" training (DP Section 9.4.3). In addition, DP Section 9.4.4 provides that FMRI will maintain training documentation that will be available for inspection by the NRC. The Safety Evaluation Report (at § 8.4) reiterates that such training will be required. FMRI has in place procedure[s] on training, and has routinely conducted training with regard to job-specific procedures and safety requirements. These procedures provide for comprehensive training, including of all employees, including chemical, physical, biological, and radiation safety, as well

as emergency response. *See, e.g.*, Procedure G-005, Rev. 0, "General Employee Training;" Procedure HSDI-100, Rev. 0, "Health & Safety Training Follow-Up Program" (February 5, 2002) (appended hereto as Exhibits D and E); Dohmann Aff. ¶ 8.

Those procedures will be modified as necessary to reflect training needed for decommissioning activities. Modified training procedures must be in place before decommissioning activities begin, to ensure proper training of licensee and contractor personnel performing remediation activities.⁴³ However, the State has not alleged (much less demonstrated) that FMRI must have those modified procedures in place now. Accordingly, FMRI is in compliance with NRC regulations. This concern should be dismissed.

Contractor Support. The State next argues that the DP lacks the following: (1) a summary of decommissioning tasks that will be performed by contractors; (2) a description of the management interfaces that will be in place between the licensee or responsible party's management and on-site supervisors and contractor management and on-site supervisors; (3) a description of the oversight responsibilities and authority that the licensee or responsible party will exercise over contractor personnel; (4) a description of the training that will be provided to contractor personnel by the licensee or responsible party and the training that will be provided by the contractor; and (5) a commitment that the contractor will comply with all radiation safety and license requirements at the facility. (State Presentation at 15.) *See* NUREG-1727 at 9.11.

In DP Section 9.5, FMRI states that it will use qualified contractors and consultants to implement the DP, but that contractor selections have not been made. License Condition 37 requires that FMRI provide to the NRC detailed plans, *including work to be performed by contractors and the qualifications of all contractors*, for each phase of

decommissioning. In this way, FMRI complies with Section 8.5 of the NRC Staff's Safety Evaluation Report, which states, "The scope of work and qualifications for contractors will be provided to NRC." FMRI is not required by NRC regulation to provide the identity and qualifications of contractors to the NRC at the time of the DP approval, but rather must provide that information prior to the commencement of remediation activities, which it has committed, and is required by license, to do. Accordingly, the State has not provided any evidence to demonstrate that FMRI is out of compliance with NRC requirements. This concern should be dismissed.

Air Sampling Program. The State contends that the DP lacks, with respect to the air sampling program, a discussion of the following: (1) the air sampling program is representative of the workers' breathing zones; (2) the criteria demonstrating that air samplers with appropriate sensitivities will be used, and that samples will be collected at appropriate frequencies; (3) the conditions under which air monitors will be used; (4) the criteria used to determine the frequency of calibration of the flow meters on the air samplers; (5) the action levels for air sampling results; and (6) how minimum detectable activities for each specific radionuclide that may be collected in air samples are determined.

An air sampling program is required to demonstrate compliance with the dose assessment requirements of 10 C.F.R. § 20.1204, the survey requirements of 10 C.F.R. § 20.1501(a)-(b), and requirements pertaining to respirators of 10 C.F.R. § 20.1703(a)(3)(i)-(ii). FMRI's Workplace Air Sampling Program is part of FMRI's Radiation Health and Safety Program. See Policy & Program Manual Chapter 1, "Environmental Monitoring," § 1.2.6 (February 15, 2001) (appended hereto as Exhibit F); Dohmann Aff. ¶ 8. As stated in DP Section

⁴³ The training program for any contractor employees will vary depending on the contractor

10.1, the air sampling program, which has been in place at the Muskogee site, will be updated to assure that it continues to meet the above-mentioned regulatory requirements. Specifically, Section 10.1.1 states as follows with respect to breathing zones:

Air sampling representative of workers' breathing zones will be required when a worker's intake is likely to exceed the criteria in [10 C.F.R. §] 20.1501(a)-(b) in any work areas in which a potential exists for airborne radioactive materials, as indicated in Regulatory Position 3 of Regulatory Guide 8.25 [Revision 1, "Air Sampling in the Workplace," June 1992]. The bases for designation of air sampler locations in all work areas in which a potential exists for airborne radioactivity will be as indicated in Regulatory Position 2 of Regulatory Guide 8.25.

Thus, the State is incorrect in alleging that the breathing zone description has not been provided. Indeed, the State has not in any way taken issue with FMRI's use of Regulatory Guide 8.25 in this regard.

Similarly, with respect to air sampler criteria, Section 10.1.1 states:

Sampler selection (low or high volume, general area, or breathing zone air), use (run time), and filter analysis (field screening with periodic laboratory confirmation) will provide sufficient sensitivity to detect air concentrations of nuclides of concern or surrogates over the ranges of concentrations encountered in the work areas, as indicated in Regulatory Position 1 of Regulatory Guide 8.25.

The State appears to have disregarded this discussion entirely. In the absence of any challenge, there is no basis for the State to argue that FMRI is not in compliance with air sampling requirements.

With respect to the calibration of flowmeters, Section 10.1.1 states:

Sampler flowmeter calibration will be performed as recommended by the equipment manufacturer or Regulatory Position 5 of Regulatory Guide 8.25, whichever is more frequent.

selected.

Here again, the State takes no issue with FMRI's planned actions with respect to flowmeter calibration. In the absence of any challenge, there is no basis for the State to argue that FMRI is not in compliance with NRC requirements in this regard.

With respect to action levels, Section 10.1.1 states:

Action levels for air sampling results, including actions to be taken when they are exceeded and their technical bases, will be as indicated in Regulatory Position 6.1 of Regulatory Guide 8.25.

Once again, the State disregards this discussion.

Finally, with respect to minimum detectable activity, Section 10.1.1 states:

The minimum detectable activity for each nuclide of concern or surrogate that may be collected in air samples will be calculated in accordance with Regulatory Position 6.3 of Regulatory Guide 8.25.

For each area of the air sampling program that the State argues is not discussed at all, FMRI has provided a description of how that element of the program will be handled under the DP. The State has not challenged these discussions, or FMRI's compliance with Regulatory Guide 8.25 as a way of meeting regulatory requirements, in any respect. For this reason alone, this concern should be dismissed. In any event, as stated above, FMRI already has in place a workplace air sampling program. The existing program will simply be updated as necessary to reflect decommissioning activities. In addition, pursuant to License Condition 52, FMRI is required to update and have available at the site the Radiation Health and Safety Program prior to the beginning of each phase of decommissioning. The State has not alleged – much less provided any evidence – that FMRI is out of compliance with NRC requirements with respect to workplace air sampling, or that any safety issue is present. Accordingly, this concern should be dismissed.

Respiratory Protection Program. The State alleges that the DP lacks the following descriptions with respect to its Respiratory Protection Program: (1) the medical screening and fit testing required before workers will use any respirator that is assigned a protection factor; (2) the written procedures maintained to address all elements of the respiratory protection program; (3) the use, maintenance, and storage of respiratory protection devices; (4) the respiratory equipment user training program; and (5) the considerations made when selecting respiratory protection equipment. (State Presentation at 16.) *See* NUREG-1727 at 10.5.

FMRI's respiratory protection program must meet the requirements of 10 C.F.R. §§ 20.1101(b), 20.1701-20.1704, and 10 C.F.R. Part 20, Appendix A. FMRI has an extensive existing respiratory protection program already implemented at the Muskogee site, which complies with NRC requirements and need only be modified to apply to decommissioning activities. *See, e.g.*, Policy & Program Manual, Chapter 2.0, "Respiratory Protection" (February 5, 2001); Procedure HS-300, Revision 0, "Selection, Issue and Use of Respiratory Protection Equipment" (February 5, 2001); Procedure HSDI-300, Revision 0, "Medical Evaluation for Respirator Wearers" (January 22, 2001); Procedure HSDI-301, "Fit Testing" (October 16, 2001); Procedure HSDI-302, "Cleaning Respirators" (October 16, 2001) (collectively, Exhibit G); Dohmann Aff. ¶ 8.

Section 10.2 of the DP states, among other things:

- Medical screening and fit testing will be required before workers will use any respirator that is assigned a protection factor, pursuant to Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection," Revision 1, October 1999.

- The program will be implemented using written procedures to address all elements of the respiratory protection program as required by 10 C.F.R. § 20.1703, as indicated in Regulatory Guide 8.15.
- Respiratory protection devices will be used, maintained, and stored in such a manner that they are not modified and are in like-new condition at the time of issue, pursuant to Regulatory Guide 8.15.
- A training program will be established and implemented as indicated in Regulatory Guide 8.15.
- The program will require review of Occupational Safety and Health Administration regulations when selecting respiratory protection equipment to mitigate existing chemical or other respiratory hazards instead of, or in addition to, radioactive hazards, as required by Footnote (a) of 10 C.F.R. Part 20, Appendix A.

The State ignores this discussion entirely and does not take issue with FMRI's proposed compliance with Regulatory Guide 8.15. For this reason alone, this concern should be dismissed. In any event, as stated above, FMRI already has in place a respiratory protection program, as part of its larger Radiation Health and Safety Program. The existing program will simply be updated as necessary to reflect decommissioning activities. In addition, pursuant to License Condition 52, FMRI is required to update and have available at the site the Radiation Health and Safety Program prior to the beginning of each phase of decommissioning. The State has not alleged – much less provided any evidence – that FMRI is out of compliance with NRC requirements with respect to respiratory protection, or, indeed, that any safety issue is present. Accordingly, this concern should be dismissed.

Other Elements of FMRI's Radiation Health and Safety Program. The State next lists seven items – internal exposure determination; external exposure determination; summation of internal and external exposures; contamination control program; instrumentation program; nuclear criticality safety; and health physics audits, inspections, and record-keeping program – and states only that “Fansteel just gave reference documents and did not provide the detail requested.” (State Presentation at 16.) Each of these items is a part of FMRI's Radiation Health and Safety Program. The items are discussed in turn below.

An internal exposure determination method is required to assign a worker's internal exposure in compliance with 10 C.F.R. §§ 20.1101(b), 20.1201(a)(1), 20.1201(d), 20.1201(e), 20.1204, and 20.1502(b). FMRI has an existing procedure for making internal exposure determinations. *See* Policy & Program Manual Chapter 3, “Radiation Safety” at § 3.2.2.2 (appended hereto as Exhibit H). This procedure complies with existing NRC requirements. (Dohmann Aff. ¶ 8.)

DP Section 10.3 specifies how FMRI will make internal exposure determinations, following certain specified NRC guidance documents. Contrary to the State's allegation, the DP does set forth the specific actions that will be taken to develop the internal exposure determination method, and the State challenges none of the information provided, and, indeed, never argues that FMRI's planned method is contrary to NRC requirements or presents a safety issue.

An external exposure determination method is required to assign a worker's external exposure in compliance with 10 C.F.R. §§ 20.1101(b), 20.1201, 20.1203, 20.1501(a)(2)(i) and (c), 20.1502(a), and 20.1601. FMRI has an existing procedure for making

external exposure determinations. *See* Policy & Program Manual Chapter 3, “Radiation Safety” at § 3.2.2.1 (Exhibit H). This procedure complies with NRC requirements. (Dohmann Aff. ¶ 8.)

DP Section 10.4 specifies how FMRI will make external exposure determinations, following certain specified NRC guidance documents. Contrary to the State’s allegation, the DP does set forth the specific actions that will be taken to develop the internal exposure determination method, and the State challenges none of the information provided, and, indeed, never argues that FMRI’s planned method is contrary to NRC requirements.

The NRC also reviews the licensee’s description of its radiation monitoring program to verify that the calculations and procedures used to sum external and internal doses satisfy 10 C.F.R. §§ 20.1202, 20.1208(c)(1) and (2), and 20.2106. Section 10.5 of the DP sets forth the method that FMRI will use to make the exposure summation, and references specific guidance documents with which FMRI will comply. Contrary to the State’s allegation, the DP does set forth the specific actions that will be taken to develop the exposure summation, and the State challenges none of the information provided, and does not argue that FMRI’s planned method is contrary to NRC requirements.

FMRI maintains a contamination control program to monitor and control radioactive contamination during decommissioning operations, in order to comply with 10 C.F.R. §§ 20.1501(a), 20.1702, 20.1905(b), (d), and (f). *See* Policy & Program Manual Chapter 3, “Radiation Safety” at § 3.2.6.3.5 (Exhibit H). The program complies with NRC requirements. (Dohmann Aff. ¶ 8.) This program will be updated to include decommissioning activities envisioned in the DP and not already addressed in the existing procedure. Section 10.6 of the DP sets forth the contents of the proposed contamination control program, and references specific guidance documents with which FMRI will comply. Contrary to the State’s allegation, the DP

does set forth the specific actions that will be taken to develop the contamination control program, and the State challenges none of the information provided, and does not argue that FMRI's program is contrary to NRC requirements.

The purpose of the instrumentation program is to provide operable instruments and equipment to make quantitative radiation measurements during decommissioning operations and final status surveys in compliance with 10 C.F.R. §§ 20.1501(b) and (c). FMRI maintains an instrumentation control program, which will be updated to include decommissioning activities envisioned in the DP and not already addressed in the existing procedure. *See, e.g.*, Policy & Program Manual Chapter 3, "Radiation Safety" at § 3.2.9 (Exhibit H); Dohmann Aff. ¶ 8. Section 10.7 of the DP sets forth the contents of the instrumentation program, and references specific guidance documents with which FMRI will comply. Contrary to the State's allegation, the DP does set forth the specific actions that will be taken to develop the instrumentation program, and the State challenges none of the information provided, and does not argue that FMRI's program is contrary to NRC requirements.

The purpose of the health physics audits, inspections, and record-keeping assurance program is to evaluate, control, and monitor health and safety procedures to ensure timely notification and correction of issues, in compliance with 10 C.F.R. §§ 20.1101 and 20.2102. FMRI maintains such a program, which will be updated to include appropriate decommissioning activities envisioned in the DP and not already addressed in the existing procedure. Section 10.9 of the DP sets forth the contents of the program, and references specific guidance documents with which FMRI will comply. Contrary to the State's allegation, the DP does set forth the specific actions that will be taken to develop the program with respect to the

DP, and the State challenges none of the information provided, and does not argue that FMRI's program is contrary to NRC requirements.

As stated above, each of these six programs is part of FMRI's Radiation Health and Safety Program, which is currently in compliance with NRC requirements. Moreover, the NRC has required, pursuant to License Condition 52, that FMRI update this program prior to each phase of decommissioning. Because the State has not proffered any evidence to demonstrate that FMRI is not, or will not be, in compliance with NRC requirements for any of these programs, this concern should be dismissed.

Also in this section, the State erroneously argues that FMRI does not address nuclear criticality safety. Section 10.8 of the DP states, "Protection of public [health and safety] from the risk of nuclear criticality during decommissioning is not required at the Muskogee site since source materials requiring nuclear criticality safety controls do not exist." In short, the Muskogee site contamination consists of low-level uranium and thorium solids that are too diffuse to constitute a criticality risk. Section 9.8 of the NRC Staff's Safety Evaluation Report reaches the same conclusion: "Criticality is not a risk during decommissioning at the Muskogee site because there are no source materials present in concentrations that could result in nuclear criticality." The State has neither challenged that determination nor proffered a scintilla of evidence for a finding that nuclear criticality is a concern at the Muskogee site.

Effluent Monitoring and Control Programs. With respect to effluent monitoring, the State argues that the following are not provided in the DP: (1) a demonstration that samples will be representative of actual releases; (2) a summary of the sample collection and analysis procedures; (3) a summary of the sample collection frequencies; (4) a description of the environmental monitoring recording and reporting procedures; and (5) a description of the

quality assurance program to be established and implemented for the effluent monitoring program. With respect to effluent control, the State argues that the following are not provided in the DP: (1) a description of the controls that will be used to minimize releases of radioactive material to the environment; (2) a summary of the action levels and description of the actions to be taken should a limit be exceeded; (3) a description of the leak detection systems for ponds, lagoons, and tanks; and (4) a summary of the estimates of doses to the public from effluents and a description of the method used to estimate public dose. (State Presentation at 17.)

As stated in DP Section 11.0, FMRI has in place a site Environmental Monitoring Program ("EMP") that is in compliance with NRC requirements. *See, e.g.,* Policy & Program Manual Chapter 1.0, "Environmental Monitoring" (Exhibit F); Dohmann Aff. ¶ 8. This EMP will be revised as necessary to include decommissioning activities beyond the scope of the current EMP, as discussed in greater detail in Section 11. In addition, FMRI is required, pursuant to License Condition 52, to update and have the EMP available at the Muskogee site prior to the beginning of each phase of decommissioning. In this way, FMRI is in compliance with NRC requirements in 10 C.F.R. Part 20 with respect to environmental monitoring and control. The State has neither alleged, nor put forth any evidence that would indicate, that the information provided by FMRI in Section 11.0 does not comply with NRC requirements. Accordingly, this concern is without merit and should be dismissed.

Radioactive Waste Management Program. In its next concern, the State argues that the DP failed to discuss solid and liquid radioactive waste, as well as mixed waste,⁴⁴ but rather provided "only a statement of what would be included." (State Presentation at 17.)

⁴⁴ Fansteel, FMRI's predecessor in interest, determined some time ago that there is no mixed waste on the Muskogee site. *See* Letter from J.J. Hunter, Fansteel, to A. Datta, NRC, dated November 10, 1994, Att. at 6 ("Fansteel has not identified any hazardous

As stated in DP Section 12.0, FMRI has in place Radioactive Waste Management Program ("RWMP") procedures that comply with NRC requirements. See Policy & Program Manual Sections 3.2.3.1.1, 3.2.3.1.2, and 3.2.4 (Exhibit H). Dohmann Aff. ¶ 8. These procedures will be revised as necessary to include decommissioning activities beyond the scope of the current procedures, as discussed in greater detail in Section 12. In addition, License Condition 52 requires that FMRI make available at the Muskogee site for review by the NRC, not later than August 1, 2004, a RWMP for Phase 1 of decommissioning activities. Thereafter, FMRI must update and have available at the site a RWMP prior to the beginning of each phase of decommissioning. In this way, FMRI is in compliance with NRC regulatory requirements for radioactive waste management. Accordingly, the State's concern should be dismissed.

Quality Assurance Program Issues. The State argues that several elements are missing from FMRI's Quality Assurance ("QA") Program, in several areas, as follows:

- *Organization* – According to the State, the DP lacks (1) a description of the duties and responsibilities of each unit within the QA organization and how delegation of responsibilities is managed within the decommissioning program; (2) a description of how work performance is evaluated; (3) a description of the authority of each unit within the QA Program; and (4) a chart of the QA Program organization. (State Presentation at 17-18.) See NUREG-1727 at 13.3.
- *QA Program* – With respect to the QA Program itself, the State argues that "all items [are] not included." (State Presentation at 18.)

wastes at the site which would require classification as hazardous materials under RCRA. Since there are no hazardous wastes, the definition of mixed wastes would not be applicable.") This document is appended hereto as Exhibit I.

- *Document Control* – The State contends the DP lacks (1) a summary of the types of QA documents that are included in the program, and (2) a description of how the licensee or responsible party develops, issues, revises and retires QA documents. (State Presentation at 18.) *See* NUREG-1727 at 13.7.
- *Control of Measuring and Test Equipment* – The State argues that the DP does not provide (1) a summary of the test and measurement equipment used in the program; (2) a description how equipment will be calibrated; (3) a description of the daily calibration checks that will be performed on each piece of test or measurement equipment; and (4) a description of the documentation that will be maintained to demonstrate that only properly calibrated and maintained equipment was used during decommissioning. (State Presentation at 18). *See* NUREG-1727 at 13.9.
- *Corrective Action* – The State would require descriptions of (1) the corrective action procedures for the facility; (2) the documentation maintained for each corrective action and any follow-up activities by the QA organization after the corrective action is implemented; (3) the manner in which QA records will be managed; (4) the responsibilities of the QA organization; and (5) the QA records storage facility. (State Presentation at 18-19.) *See* NUREG-1727 at 13.10-13.12.
- *Audits and Surveillances* – In this area, the State argues that the DP lacks descriptions of (1) the audit program; (2) records and documentation generated during audits and the manner in which these documents are managed; (3) all follow-up activities associated with audits or surveillances; and (4) trending and tracking that will be performed on the results of audits and surveillances. (State Presentation at 19.) *See* NUREG-1727 at 13.13.

FMRI has basic quality elements implemented into its programs, procedures and instructions. FMRI's Procedure GG-001, "Operating Procedure System," (appended hereto as Exhibit J) establishes a uniform system for development, distribution, implementation and maintenance of procedures at the Muskogee site. (Dohmann Aff. ¶ 8.) In addition, FMRI has in place Procedure GG-003, "Condition Reports" (appended hereto as Exhibit K), which sets forth the process to identify, document, and respond to concerns or adverse conditions, including failure to conform to a specific procedure, license condition or other permit requirement. (*Id.*) Moreover, basic quality elements are implemented into all programs, procedures and instructions. These QA program elements will be revised as necessary to include appropriate decommissioning activities beyond the current scope of the program. In addition, License Condition 52 requires FMRI to make available at the site, prior to August 1, 2004, a revised QA Program for NRC Review. Thereafter, License Condition 52 requires FMRI to update the QA Program and have it available at the site prior to the beginning of each phase of decommissioning. In this way, FMRI is in compliance with NRC QA requirements. Beyond a bare recitation of the guidance document, the State has not presented any evidence demonstrating that FMRI is somehow out of compliance with NRC requirements. Accordingly, this concern should be dismissed.

Site Maintenance and Financial Assurance. The State alleges, without elaboration, that a discussion regarding "site maintenance and financial assurance" is required in the DP. (State Presentation at 19.) It appears – although a citation is not provided – that the State is referencing the NUREG-1727 discussion of guidance for sites being released for restricted use or under alternate criteria. *See* NUREG-1727 at 16.9-16.12. Pursuant to 10 C.F.R. § 20.1403(c), a licensee requesting release of a site under restricted conditions must provide

sufficient financial assurance to enable an independent third party to assume and carry out responsibilities with respect to institutional controls. The Muskogee site will be remediated for *unrestricted* release pursuant to 10 C.F.R. § 20.1402. Accordingly, this section of the guidance does not apply to FMRI. Because the State has set forth a concern beyond the scope of this proceeding, and for which relief cannot be granted, this concern should be dismissed.

Obtaining Public Advice. Once again, with no explanatory language or other argument, the State asserts that the DP is required to contain information regarding “obtaining public advice.” (State Presentation at 19.) Here again, it appears that the State attempts to impose requirements on FMRI that have no basis in NRC’s regulations.

Licensees seeking *restricted release* of a site are required, pursuant to 10 C.F.R. § 20.1403(d)(2), to seek public input as to proposed institutional controls. Section 16.1.4 of NUREG-1727, to which the State is apparently referring, addresses this requirement. Because FMRI is seeking *unrestricted release* of the Muskogee site pursuant to 10 C.F.R. § 20.1402, however, this portion of the guidance is not applicable. Because the State has set forth a concern beyond the scope of this proceeding, and for which relief cannot be granted, this concern should be dismissed.

One of the State’s requests for relief (State Presentation at 5) is that all “mechanisms” be in place to “ensure worker safety and the protection of the public” prior to commencement of decommissioning. As discussed above, the necessary programs are already in place, and will be updated prior to the commencement of decommissioning activities, as specifically required by certain license conditions. Accordingly, this request for relief should be denied.

The State's second broad basis for its concern regarding incompleteness of characterization consists of a list of thirty-two requests for additional information ("RAIs") posed by the NRC as an attachment to the April 28 Letter. (State Presentation at 19-26.) The State characterizes these RAIs as "findings by the NRC [S]taff that the DP as submitted does not comply with 10 C.F.R. § 40.42 and does not contain the detail required by NUREG 1757 and NUREG 1727". (State Presentation at 19.) The Staff directed that, "if Fansteel elects to amend this DP, and resubmit it for review, it should address all of these comments." April 28 Letter at 1. Therefore, the comments are the equivalent of requests for additional information ("RAIs").

It is well established that the issuance of RAIs "indicates nothing more than that the Staff requested further information and analysis from the Licensee." *Duke Energy Corp.* (Oconee Nuclear Station, Units 1, 2, & 3), CLI-99-11, 49 NRC 328, 336-37 (1999). The Commission has emphasized that a petitioner in a Subpart G proceeding must do more than "rest on [the] mere existence" of RAIs as a basis for its contention. *Oconee*, CLI-99-11, 49 NRC at 336, citing *Baltimore Gas & Elec. Co.* (Calvert Cliffs Nuclear Power Plant, Units 1 & 2), CLI-98-25, 48 NRC 325, 350 (1998). Similarly, in a Subpart L proceeding such as this, a petitioner should not be permitted to simply rely on preliminary NRC comments, prior to the submission of an application, to demonstrate failure to comply with NRC regulations. The hearing process – whether formal or informal – is not intended to duplicate the NRC Staff's review. RAIs show only an ongoing dialogue with the NRC Staff and do not demonstrate that the DP is materially deficient. NRC Staff questions will be resolved in the ordinary course of the review (e.g., based on the licensee's clarifications, justifications, or other responses). *Oconee*, CLI-99-11, 49 NRC at 336. RAIs do not, as alleged by the State, demonstrate that the DP "does not comply with 10

C.F.R. § 40.42.” Moreover, none of the RAIs represents a barrier to the NRC approval issued on December 4.

In addition, a number of these RAIs do not pertain in any way to characterization of the Muskogee site. In particular, comments 8.2, 9.1, 9.2, 10.1, 10.2, 10.3, 11.1, 11.2, 12.1, 13.1, 14.2, and 15.5 pertain to the actual performance of decommissioning activities, as opposed to site characterization. As such, they are irrelevant to the State’s concern regarding site characterization and should be stricken as irrelevant, pursuant to 10 C.F.R. § 2.1233(e).

We address the substance of each comment in Exhibit L, and demonstrate that there are no health and safety issues outstanding which would call into question the ability of FMRI to successfully remediate the Muskogee site. (Tourdot Aff. ¶ 29.) Thus, the mere allusion to these RAIs by the State does not support the assertion that the site characterization is deficient.

The State next contends that the 1993 Remediation Assessment, upon which the site characterization is based, is incomplete in two ways. First, the State argues that the Remediation Assessment fails to include the rationale underlying the selection of the boring, groundwater well, test pit, and other sample locations. (State Presentation at 26-27.) Second, the State complains that the Remediation Assessment does not include a discussion of why the licensee considers the characterization survey to be adequate to demonstrate that it is unlikely that significant quantities of radioactivity have gone undetected. These arguments fail for the simple reason that the State has not provided any evidence demonstrating that the Remediation Assessment in any way fails to represent the extent of contamination on the site.

Borehole, well, and test pit locations were selected based on information relative to plant history and operations. (Tourdot Aff. ¶ 10.) Sample locations were chosen based on such factors as the potential for the area to have been impacted by material handling and storage,

past releases, manufacturing operations, and air emissions. (*Id.*) The majority of sample locations were selected with the intent of characterizing areas of the plant that exhibited the potential for being impacted. (*Id.*) Other sampling locations were chosen to characterize background conditions. (*Id.*)

The number of samples and their locations were chosen in order to characterize the conditions of the site based on the information available at the time the Work Plan was prepared and implemented. (*Id.* ¶ 11.) For example, the test pits were dug in one location because historic information suggested that drums of ore may have been buried at this location. (*Id.*) Initially, a geophysical survey was conducted over the area in an attempt to identify any anomalies that might suggest the presence of buried metallic objects. (*Id.*) Although the geophysical survey did not identify any such anomalies, a conservative decision was made to proceed with the test pit installations to definitively rule out the possibility of buried drums in this area. (*Id.*) Of seven surface water/sediment samples, four were collected from or immediately downstream of FMRI's OPDES-permitted outfalls. (*Id.*) This was done to assess the potential for impacts to occur as a result of treated discharges to surface water. (*Id.*) The other three were collected from along the length of a shallow drainage located to the west of Ponds 8 and 9. (*Id.*) These locations were chosen to give a representative sampling along the entire drainage. (*Id.*)

Moreover, the number of samples chosen was based on the NRC-approved Remedial Assessment Work Plan that was submitted to the EPA and the State. (*Id.* ¶ 12.) Fansteel and its contractor, Earth Sciences Consultants, Inc., addressed NRC and State comments to the Work Plan (EPA provided no comments). (*Id.*) All areas of the site investigated to date have been sufficiently characterized and contamination present in these areas has been

adequately identified. (*Id.*) Additional characterization of soils under the ponds will be performed pursuant to License Condition 31.

The State next argues that the Remediation and Assessment and the DP do not provide “a conceptual model of the site that discusses all contamination sources, exposure pathways, and human/ecological receptors.” (State Presentation at 27.) Specifically, the State argues that, by not considering the groundwater pathway, the accuracy of the following is questionable: (1) designation of the industrial worker as the critical group for dose assessment; (2) calculated annual dose to the critical group; (3) cleanup standards and release criteria derived from dose assessment; (4) volumes of contaminated soils to be removed and contaminated groundwater to be treated; and (5) cost and schedule for “the decommissioning activity.” (*Id.* at 27-28.)

Although the groundwater pathway was not included in the DP because FMRI believed such exclusion to be technically justifiable and in accordance with NRC requirements, guidance, and precedent, the NRC Staff imposed License Condition 35 on FMRI, which provides:

Licensee shall remediate the site to residual radioactive levels to ensure that exposure to residual radiation in all media from applicable pathways will not result in a dose exceeding 25 mrem/y, as specified in 10 CFR 20.1402. Licensee will establish remediation levels (DCGLs) as part of the Phase 3 Workplan, approved by NRC, that demonstrate the 25 mrem/y dose limit will not be exceeded.

Accordingly, the groundwater pathway is required to be considered in response to this license condition in determining the applicable pathways to be used in determining compliance with the 25 millirem limit. Moreover, FMRI has already committed to continue its existing groundwater treatment program until groundwater is satisfactorily remediated. (*See* Tourdot Aff. ¶ 28.)

The State next alleges that the Remediation Assessment “does not include information that Fansteel sampled the surface water and sediment in downstream areas of the Arkansas River to identify adverse impacts to environmental quality” of the River. (State Presentation at 28.)

Downstream surface waters and sediments of the Arkansas River were not sampled during the 1993 Remediation Assessment. (Tourdot Aff. ¶ 20.) However, it is noteworthy that the NRC, EPA, and State of Oklahoma reviewed the Remediation Assessment Work Plan in 1990, and eventually approved it in 1992. (*Id.*) The Work Plan was incorporated into License SMB-911. (*Id.*) Sampling of surface water and sediments in downstream areas of the Arkansas River was not included in the approved Remediation Assessment Work Plan. (*Id.*) Additionally, there is no scientific basis to believe that the levels of chemical and radiological constituents identified on site, if released into the river, could be detected by standard analytical methods because of the significant dilution factor and flow (20,600 cubic feet per second) of that river. (*Id.*)

The highest measured gross alpha contamination in an onsite monitoring well is approximately 2600 pCi/liter. (*Id.* ¶ 21.) If one assumes the highly unlikely event of 100,000 liters of groundwater discharged directly into the river (unlikely due to the interceptor trench and treatment system on site) at the maximum alpha activity of 2600 pCi/liter (also unlikely due to various other monitoring wells with average alpha activity concentrations approaching background), a total activity of 2.6×10^8 pCi would be discharged. (*Id.*) Dilution from the flow rate of the Arkansas River (26,000 cubic feet per second or 736,100 liters per second) would quickly render the activity to levels undistinguishable from background (0.1 pCi/liter). (*Id.*) If ingestion exposure were calculated from this pathway, the results would be in the 10^{-20} mrem

range. (*Id.*) This is not a creditable pathway for analysis. (*Id.*) To further extrapolate to fish intake followed by human ingestion through fish would result in comparable doses. (*Id.*)

The State next argues that neither the Remediation Assessment nor the DP contains details on the design and operation of the site groundwater interceptor trench that are “sufficiently detailed to objectively evaluate its efficacy to prevent the migration of contaminated groundwater to potentiometrically down gradient areas of the site and the Arkansas River.” (State Presentation at 29.)

Detailed plans for the groundwater interceptor trench were provided to the NRC in 1997, and the NRC approved those plans in connection with a December 18, 1997 amendment to authorize processing of CaF wastewater treatment residues. (Tourdot Aff. ¶ 15.) Specifically, activities to be conducted under this approval included “(1) processing of the WIP sludges, (2) processing of wastewater treatment residues in [P]onds 6, 7, 8 and 9; (3) *pumping and treating of contaminated groundwater*; and (4) auxiliary activities such as environmental and effluent monitoring and laboratory activities.”⁴⁵ (Tourdot Aff. ¶ 15.) Section 2.1.2.2 provided specific details of groundwater collection and treatment, as follows:

A subsurface drain (conduit) will be installed at the base of the shallow groundwater aquifer to intercept and collect groundwater. The conduit will channel groundwater to sumps via gravity flow. To install the conduit, a .61-meter (2-foot) wide trench will be excavated along the eastern and southern down gradient [sic] boundaries of the site (citation omitted). An impermeable barrier (20- to 30-millimeter high-density polyethylene (HDPE) liner or sheet rock) will be installed along the down gradient side of the trenches. A subsurface drain conduit will consist of a 10- to 15-centimeter (4- to 6-inch) diameter HDPE pipe with a nylon sock fitted around the piping. The pipe will be placed directly on the excavated shale surface or on 15 centimeters (6 inches) of filter pack (pea gravel). The piping will be covered with 0.61 to 0.91 meter (2 to 3 feet) of pea

⁴⁵ See “Environmental Assessment, License Amendment for Material License No. SMB-911,” December 1997 (NRC ADAMS accession number 9712310292), at § 2.1.2 (emphasis added).

gravel as filter pack material. A trenching machine will excavate the trench and position the conduit, impermeable barrier, and filter pack in one step. The excavation will be backfilled with clean soil to the original ground surface elevation.

The eastern trench will be approximately 640 meters (2100 feet) long,⁴⁶ and the southern trench will be approximately 265 meters (870 feet) long. The slopes of the conduits in the trenches will be between 0.5% and 3% to minimize bacteria growth and plugging. Access to the conduits for clean-out will be provided for each trench. The eastern trench will have three sumps, and the southern trench will have one sump (citation to figure omitted). The sumps will extend 0.9 to 1.5 meters (3 to 5 feet) below the conduits. Each sump will be equipped with pumps to transfer groundwater to the treatment system via double-walled piping with a leak detection system. The combined average yield from the collection trenches is estimated to be approximately 45 liters (12 gallons) per minute (reference omitted).

The effectiveness of groundwater collection will be monitored using existing facility groundwater monitoring wells, located up gradient and down gradient of the trenches, as piezometers. Additional piezometers will be installed in the filter pack the length of the trenches to monitor the water level and to assess trench effectiveness and to ensure that plugging has not occurred (reference omitted). . . .

The existing wastewater treatment system will be modified for treating collected groundwater. . . . Several treatment methods, including aeration, metals precipitation, microfiltration, and air stripping will be used to remove heavy metals, ammonia, fluoride, MIBK, and radionuclides.

Collected groundwater will be pumped at 45 liters (12 gallons) per minute to two equalization tanks to aerate the groundwater for removal of ammonia and MIBK. Calcium hydroxide will be added to remove metals and fluoride by precipitation. Co-precipitating agents such as calcium chloride may be required to remove fluoride and precipitate heavy metals that may not be [] removed with calcium hydroxide The precipitated solids containing calcium fluoride will be dewatered in a filter press and either further processed or stored on-site.

Microfiltration, consisting of multiple tubular units constructed of an inert fluorocarbon-based membrane, with a 0.1-micron pore size, will be used for further removal of heavy metals and radionuclides. Water will be forced through the membrane pores, and the concentrated liquid containing suspended contaminants will be returned to a concentrate tank.

⁴⁶

As constructed, the trench exceeds 3000 feet in length.

Settled solids in the concentrate tank will be stored on site for further processing. Excess liquids will be recycled through the groundwater treatment system.

Air stripping will be used for further removal of ammonia and MIBK. Exhausted air will be released to the atmosphere. The liquid effluent will be neutralized and then routed to the existing wastewater treatment sedimentation ponds (ponds 6 through 9) at a rate of approximately 45 to 114 liters (12 to 30 gallons) per minute. Solids will settle out, and supernatant from the ponds will be discharged to the Arkansas River through an NPDES outfall.

Environmental Assessment at § 2.1.2.2. (*Id.*) FMRI is not required to reiterate this detail regarding the design of the interceptor trench, as it was approved by the NRC Staff in an earlier, distinct licensing proceeding. Accordingly, such design issues are beyond the scope of the DP approval.

The interceptor trench was constructed pursuant to the NRC approval in 1998 and 1999. (Tourdot Aff. ¶ 16.) Construction was completed the week of April 19, 1999.⁴⁷ (Tourdot Aff. ¶ 16.) Operation of the system began in August 1999,⁴⁸ and has been inspected regularly by the NRC since that time.⁴⁹ (Tourdot Aff. ¶ 16.) FMRI is not now required to resubmit all of that

⁴⁷ See Letter from D.D. Chamberlain, NRC, to M.J. Mocniak, Fansteel, "NRC Inspection Report 40-7580/99-01, dated July 7, 1999, at § 4.2(b) (NRC ADAMS accession Number 9907140057). There are minor variations in the design of the interceptor trench, as constructed. However, its function was not affected by these variations.

⁴⁸ See Letter from D.D. Chamberlain, NRC, to M.J. Mocniak, Fansteel, "NRC Inspection Report 40-7580/99-02," dated December 23, 1999, at § 1.3 (NRC ADAMS accession Number ML993610124).

⁴⁹ See *id.* § 4.2(c)(3); Letter from D.D. Chamberlain, NRC, to M.J. Mocniak, Fansteel, "NRC Inspection Report 040-7580/00-01 and Notice of Violation," dated May 2, 2000, at § 5.2(c)(3) (NRC ADAMS accession number ML003710588); Letter from D.D. Chamberlain, NRC, to M.J. Mocniak, Fansteel, "NRC Inspection Report 40-7580/01-01," dated March 29, 2001, at § 2.1 (NRC ADAMS accession number ML010880451); Letter from D.D. Chamberlain, NRC, to M.J. Mocniak, Fansteel, "NRC Inspection Report 040-7580/01-02 and Notice of Violation," dated August 22, 2001, at § 4.2(a) (NRC ADAMS accession number ML012340479); Letter from D.D. Chamberlain, NRC, to A.F. Dohmann, Fansteel, "NRC Inspection Report 040-07580/01-03, dated December 18,

information in connection with the DP. Because the interceptor trench was the subject of a separate NRC approval and ongoing NRC inspection activities, the State may not now re-open the issue of its design and operations. As demonstrated by the environmental sampling program, the interceptor trench has been operating successfully to control groundwater flow and discharge of contaminated groundwater. It will continue to do so until necessary groundwater remediation is completed. The State has not produced *any* evidence setting forth *any* deficiency in FMRI's treatment or remediation of groundwater.

Finally, the State alleges that the site geology has not been fully characterized. (State Presentation at 29.) The State references two statements in particular for the proposition that the DP fails to fully characterize the nature and extent of groundwater contamination at the site, as follows:

However, because these three borings [OW-1, OW-2, and OW-3] were not fully advanced to bedrock, the thickness of the water-bearing zone at these locations was unquantifiable.

DP at 3-10.

The bedrock encountered beneath the facility is the McCurtain Shale Few relatively intense zones of horizontal fracturing were observed which included the presence of a few fractures on a 45-degree plane from horizontal. . . . Some of the fractures in the basal 30 feet of shale are clay filled, indicating groundwater flow through fractures in this portion of the shale.

DP at 3-11. As an initial matter, beyond quoting a general discussion of the bedrock from the DP, the State has proffered no evidence to demonstrate that hydrogeologic characterization of the

2001, at § 1.2(e) (NRC ADAMS accession number ML013520619); Letter from D.D. Chamberlain, NRC, to A.F. Dohmann, Fansteel, "NRC Inspection Report 040-07580/2002-01," dated July 18, 2002, at § 4.2 (NRC ADAMS accession number ML021990597); Letter from K.E. Brockman, NRC, to A.F. Dohmann, Fansteel, "NRC Inspection Report 040-07580/2002-02, dated December 13, 2002, at § 4.2 (NRC ADAMS accession number ML023510077).

site is in any way incomplete or non-representative of groundwater contamination at the site. For this reason alone, the State fails to meet its burden to demonstrate that FMRI is somehow out of compliance with Section 42.42(g)(4)(i). As discussed below, however, the Muskogee site has been characterized sufficiently to demonstrate that there is no hydrogeologic connection between the shallow groundwater on the site and the underlying bedrock, such that contaminants in the shallow groundwater could migrate into the bedrock and to underlying groundwater.

Unconsolidated deposits underlying the FMRI site and overlying bedrock range in thickness from approximately 8.75 feet to 34.5 feet. (Affidavit of Scott C. Blauvelt, ¶ 7.) These unconsolidated materials consist of natural soils and heterogeneous fill materials. (*Id.*) The natural soils identified at the site are alluvial terrace deposits. (*Id.*) Shallow groundwater was generally encountered within the alluvial terrace deposits.

Below the shallow groundwater is an approximately 80-foot-thick layer of bedrock, consisting of dark gray shale known as the McCurtain Shale (the “Bedrock Layer”). (*Id.* ¶ 8.) Groundwater monitoring wells drilled through the uppermost portion of the Bedrock Layer in 1993 (discussed below) did not detect any groundwater. (*Id.*) Deeper in the Bedrock Layer, groundwater was detected in a zone of permeable bedrock (the “deep groundwater”). (*Id.*) This zone of deep groundwater was separated from the overlying shallow groundwater by approximately a 30-foot-thick Bedrock Layer which has been shown to have extremely low permeability. (*Id.*)

In 1982, water levels in the groundwater monitoring wells around Pond 3 began to rise, fluoride was detected in the French drain (installed around Pond 3 when it was constructed to prevent groundwater from accumulating under the liner), and the pH of the water decreased, indicating increased levels of acidity and suggesting that the liner was leaking. (*Id.* ¶ 10.)

Fansteel reported this information to the NRC, which approved the placement of lime into the pond to seal the leak. (*Id.*) The water levels subsequently decreased, as did the other indicators that suggested the presence of a leak, and NRC advised Fansteel in 1984 that no further action was required. (*Id.*)

In 1989, the liner of Pond 3 again failed, allowing radiological and non-radiological materials to escape from the pond. (*Id.* ¶ 11.) Fansteel reported the Pond 3 failure to the NRC, the EPA, the Oklahoma Water Resources Board, and the Oklahoma Department of Health. (*Id.*) At the direction of the NRC, Fansteel implemented a series of remedial actions to mitigate the impacts of the Pond 3 leak, and then agreed to design and perform a site-wide Remediation Assessment to evaluate the extent that the Muskogee site had been impacted by past and current operations, and to provide data that could be used for its eventual decommissioning. (*Id.*) As stated above, Fansteel's NRC license was amended in December 1992 to incorporate the Remediation Assessment as a foundation for decommissioning of the site. (*Id.*)

The Remediation Assessment was performed in 1992 and 1993. (*Id.* ¶ 12.) Geologic and hydrogeologic work included installing a total of 429 samples, consisting of 322 soil samples, 64 pond samples 6 stream sediment samples, 30 monitoring well groundwater samples, and 7 surface water stream samples. (*Id.*) In addition, 25 groundwater monitoring wells were installed in the shallow groundwater, and 4 groundwater monitoring wells were installed in the Bedrock Layer. (*Id.*) The timing of the Remediation Assessment represents a review of data demonstrating a likely worst case because it was conducted after site operations had ceased and after two known breaches of the liner in Pond 3. (*Id.*)

Both soil and groundwater results showed that the contaminated areas of the site were the areas immediately down gradient of the buildings where reprocessing took place, WIP

Ponds 2 and 3 located in the northeast corner of the site, and the CaF ponds located in the southeast corner of the site. (*Id.* ¶ 13.) The portion of the Muskogee site that was most impacted is the area near the WIP ponds that received the commingled waste residues from the processing operation. (*Id.*)

This pattern of contamination shows that the radiological and non-radiological contaminants are found together. (*Id.* ¶ 14.) This result is consistent with the areas where the production process commingled radiological and non-radiological constituents, and the WIP ponds where the commingled waste residues were deposited. (*Id.*) For example, monitoring well MW-67S exhibited elevated radiological levels in the form of gross alpha particles and also had the highest concentrations of fluoride, arsenic and ammonia. (*Id.*) The highest concentration of alpha radiological contaminants was found at MW-74S at the northeast corner, which also had the highest concentrations of cadmium, columbium and tantalum. (*Id.*) MW-73S, also located in the northeast corner of the site, had the highest site-wide concentrations of radiological contaminants in the form of gross beta particles and MIBK. (*Id.*)

The shallow groundwater is still being monitored and collected in the interceptor trench (discussed above) as part of the wastewater treatment system. (*Id.* ¶ 15.) Monitoring data as recent as April 2003 show that concentrations of organic compound MIBK in the shallow groundwater have decreased to below detectable levels at all points through degradation and natural attenuation. (*Id.*) Concentrations of inorganic chemicals and radiological constituents in the shallow groundwater have remained mostly stable, while some have decreased. (*Id.*)

Stated simply, the chemical production process at the Muskogee site resulted in the generation of radiological waste (uranium and thorium) and non-radiological byproducts and

waste residues (ammonia, heavy metals and MIBK) that were discharged as one combined waste stream and placed in the on-site ponds. (*Id.* ¶ 16.)

The fate and transport of these radiological and non-radiological materials through the subsurface soil and then into the groundwater are controlled by various factors, such as how the particular constituents may be adsorbed or bound to soil particles, the solubility of the constituents in groundwater, the extent to which they may be degraded by microorganisms, and how quickly they may move in groundwater. (*Id.* ¶ 17.)

Constituents such as uranium, thorium and some heavy metals tend to adsorb to the kinds of soils that are found beneath the Muskogee site, have low solubility in water, which means they do not easily dissolve into groundwater from the soils to which they are bound, and are not highly mobile in water. (*Id.* ¶ 18.) In contrast, ammonia has a higher solubility and is known as a "leading edge indicator" because it migrates almost at the same rate as the groundwater flow. (*Id.*) The absence of ammonia in the deep groundwater monitoring data is significant. (*Id.*) Given the length of time that operations were conducted at the Muskogee site, the known releases of radiological and non-radiological materials as early as 1982, and the highly mobile nature of ammonia, one would expect to see evidence of ammonia in the deep groundwater if there were any hydrogeologic connection between the shallow groundwater and deep groundwater. (*Id.*) The absence of ammonia in the deep groundwater suggests that the groundwater contamination at the Muskogee site is confined to the shallow groundwater. (*Id.*)

A review of the geologic and hydrogeologic data for the Muskogee site indicates that the contaminants present in the shallow groundwater are isolated from the underlying deep groundwater by a natural barrier that is effectively blocking the downward migration of the contaminants. (*Id.* ¶ 19.) The deep groundwater was detected in wells MW-151D, MW-161D,

MW-167D and MW-174D where the shale bedrock exhibits some fracturing (as noted in the DP). (*Id.*) The bedrock shale above and below this permeable sequence was determined to be dry. (*Id.*) This deep groundwater in the zone of permeable bedrock is separated from the overlying shallow groundwater by approximately 30 feet of bedrock shale which has been demonstrated to have extremely low permeability. (*Id.*)

Moreover, there was a significant difference in the static groundwater levels in the four sets of nested shallow groundwater and deep groundwater monitoring wells that were installed at the Muskogee site. (*Id.* ¶ 20.) Monitoring wells MW-51S, MW-61S, MW-67S and MW-74S (designed to communicate with the shallow groundwater) and MW-151D, MW-161D, MW-167D and MW-174D (designed to communicate with the deep groundwater) indicate two distinct and separate zones of groundwater. (*Id.*) One would expect to see little difference between the static groundwater elevation level in the shallow and deep wells if there had been a hydrogeologic connection between the shallow groundwater and the deep groundwater. (*Id.*) These data establish that the 30-foot layer of bedrock shale was acting as an effective barrier between the contaminated shallow groundwater and the uncontaminated deep groundwater. (*Id.*)

Based upon this information, while the shallow groundwater may be currently contaminated to some level with radiological and non-radiological materials, it is effectively isolated from the deep groundwater by a thick layer of impermeable bedrock that is acting as an Aquiclude, or natural barrier. (*Id.* ¶ 22.) As a result, there is no hydrogeologic connection between the contaminated shallow groundwater and the uncontaminated deep groundwater such that contamination could migrate to and impact the deep groundwater. (*Id.*) In addition, the contamination in the shallow groundwater is being collected by the groundwater interceptor trench system, which is a barrier to prevent lateral migration offsite. (*Id.*) Therefore, the

remediation activities that will be performed as part of the DP to address the contaminated soils and contaminated shallow groundwater will be effective in preventing further contamination of the groundwater at the Muskogee site. (*Id.*) The State has not provided any evidence to controvert this conclusion. Accordingly, its concern should be dismissed.

Overall, the State has failed to provide any evidence that the characterization of the Muskogee site is incomplete. On the contrary, through existing information and NRC-imposed license conditions, FMRI has demonstrated that it meets the requirements of 10 C.F.R. § 40.42(g)(4)(i). The State's concern has no merit.

2. *The Site Characterization Is Not Inaccurate.*

The State next proffers four concerns in support of the proposition that the DP is inaccurate. Each concern is related to FMRI's reliance on the 1993 Remediation Assessment, and is addressed in turn below.

First, the State alleges that the DP "acknowledges that releases of radioactive and hazardous constituents to soils and groundwater have occurred and that these releases have impacted groundwater quality. . ." (State Presentation at 30.)

FMRI agrees with the State that site groundwater is impacted and must be addressed. It is not clear that the State has articulated any dispute with FMRI in raising this point. As stated earlier in this Presentation, in its May 8, 2003, letter to the NRC Staff, Fansteel indicated that it would not seek termination of the SMB-911 license until groundwater is satisfactorily remediated. *See* May 8 Letter at 2. DP Section 8.4.1 states that the existing groundwater treatment program will remain in place at the Muskogee site during most of the decommissioning activities. The State has not articulated any dispute with FMRI with regard to this issue.

Next, the State provides a calculation and argues that, with regard to groundwater velocity, “lateral migration of contamination in excess of 2,000 feet since the 1993 study period is possible.” (State Presentation at 30.)

As stated above, the movement of radiological and non-radiological materials through the subsurface soil and then into the groundwater are controlled by various factors such as how the particular constituents may be adsorbed or bound to soil particles, the solubility of the constituents in groundwater, the extent to which they may be degraded by microorganisms and how quickly they may move in groundwater. (Blauvelt Aff. ¶ 17.) Constituents such as uranium, thorium and some heavy metals tend to adsorb to the kinds of soils that are found beneath the Muskogee facility, have low solubility in water (which means that they do not easily dissolve into groundwater from the soils they are bound to), and are not highly mobile in water. (*Id.* ¶ 18.) Thus, the simplistic calculation of groundwater movement contained in the State’s argument, and unsupported by any affidavit, has no demonstrated relevance to the potential movement of the radiological contaminants and is entitled to no evidentiary weight.

The Muskogee site is underlain by extremely low permeability shale which prevents the downward migration of constituents of concern from the site. (*Id.* ¶ 21.) Moreover, constituents of concern migrating laterally in the shallow groundwater flow system are prevented from migrating downgradient beyond the site boundary toward the Arkansas River by the site interceptor trench. (*Id.*) Accordingly, the radioactive constituents in the soil at the Muskogee site simply will not move as posited by the State.

The State then alleges that groundwater sampling performed in 2002 shows “wide fluctuations in gross alpha and beta wells and order of magnitude increases in Well MW-67s.” (State Presentation at 30.) “Wide fluctuations” in constituents of concern in the groundwater

chemistry data base at the Muskogee site are not unexpected and may occur on a seasonal basis. Even assuming such “wide fluctuations” occur, the State has not demonstrated why such variations would be of concern.

Finally, the State argues that (1) the monitoring network is incapable of characterizing groundwater down gradient from the interceptor trench; and (2) the existing network of monitoring wells “cannot be used to validate the efficacy of the interceptor trench” to prevent the migration of contamination. (State Presentation at 31.)

Again, the Muskogee site is underlain by extremely low permeability shale which prevents the downward migration of constituents of concern from the site. (Blauvelt Aff. ¶ 21.) Constituents of concern migrating laterally within the shallow groundwater flow system are prevented from migrating downgradient beyond the site boundary toward the Arkansas River by the interceptor trench. (*Id.*) Beyond the property boundary and the interceptor trench, the shallow water bearing zone is absent due to erosion by the Arkansas River, preventing the installation of a monitoring network downgradient of the trench itself. (*Id.*) The lack of a water-bearing zone beyond the property boundary obviates the need for monitoring wells down gradient of the trench. Moreover, the State has provided no evidence whatsoever that the trench is not working effectively.

For the reasons set forth above, the State has not provided any evidence demonstrating that the site characterization is inaccurate from the standpoint of groundwater migration. This concern should be dismissed, and the State’s request for a groundwater remediation plan (State Presentation at 48) should be denied.

3. *The Site Characterization Accurately Reflects Current Conditions at the Facility.*

The State next argues that the site characterization contained in the DP is insufficient because it does not accurately reflect current conditions at the facility. (State Presentation at 31.) Each area of concern is discussed in turn below.

First, the State argues that neither the RA nor the DP describes the physical design and operation of the groundwater interceptor trench. (*Id.* at 31.) This concern merely repeats the concern raised above (*see* Section A(1) *supra*) and is invalid for the reasons set forth there. *See* pages 55-58, *supra*.⁵⁰

Second, the State argues that the characterization of buildings, equipment, and areas between the ponds discussed in the 1993 Remediation Assessment does not include the effects of “reprocessing” activities that occurred through November 2001. (State Presentation at 32.) Here again, the State has not provided any evidence whatsoever to support its bare allegation that characterization of the site has been affected since the 1993 Remediation Assessment such that a safety issue arises. As set forth below, however, the concern is baseless in any event. The NRC performed periodic inspections during the pilot project activities that occurred from April 1, 1999, through October 2001. (Tourdot Aff. ¶ 22.) Numerous NRC inspections over the course of the pilot project operation did not identify any concerns regarding release of radioactivity which would require additional site characterization at this time.⁵¹

⁵⁰ The State repeats this argument again at 35.

⁵¹ *See* NRC Inspection Report 40-7580/99-01, dated July 7, 1999; NRC Inspection Report 40-7580/99-02 and Notice of Violation, dated December 23, 1999; NRC Inspection Report 040-7580/00-01 and Notice of Violation, dated May 2, 2000; NRC Inspection Report 40-7580/01-01, dated March 29, 2001; NRC Inspection Report 040-7580/01-02 and Notice of Violation, dated August 22, 2001; and NRC Inspection Report 040-07580/01-03, dated December 18, 2001.

(Tourdot Aff. ¶ 22.) In accordance with its license, FMRI is required to survey buildings and equipment. This survey information is available for inspection at the site.

The State next disputes Fansteel's discussion of a release of material in connection with a 1999 tornado that struck the site. (State Presentation at 32.) Section 2.4.2 of the DP states, in relevant part:

The only release of radioactive material was contained on site. The damage to the Sodium Reduction Building allowed bagged Pond No. 5 material to fall out of the building and tear open. . . . Approximately 500 pounds of material were released to the ground surface within a 10-foot diameter area before being recovered and rebagged.

The State argues that, without further analysis, "it cannot be assumed that the release caused by this tornado was confined to a 10 foot diameter." (State Presentation at 32.) As discussed below, this concern is merely speculation and not adequately supported, and should be dismissed.

In 1999, a moderate-strength tornado touched down near the Port of Muskogee. (Tourdot Aff. ¶ 17.) The tornado damaged some of the buildings at the Muskogee site, and wind-blown debris tore the liners of Ponds 3, 8, and 9 above the water line and damaged a stored soil cover. (*Id.*) Bags containing material that had been excavated from Pond 5 were damaged, allowing low-level radiological material to spread over a 10-foot diameter area. (*Id.*) Fansteel collected and removed the material. (*Id.*)

Following the June 1, 1999, tornado, the NRC performed an inspection to assess Fansteel's response to, and planned recovery from, the damage. (*Id.* ¶ 18.) In an inspection report dated December 23, 1999, the NRC Staff determined that Fansteel had recovered from the

tornado and had adequately addressed facility repairs, including cleanup of spilled material.⁵² (Tourdot Aff. ¶ 18.) The State fails to explain why the Staff's prior evaluations of Fansteel's cleanup efforts are deficient, or that material from the spill was not cleaned up. For this reason, this concern is inadequately supported and should be dismissed.

The State also argues that the site characterization "does not account for the probable movement of soluble isotopes and their impact on the groundwater." (State Presentation at 33.) Here, the State merely parrots NRC Staff comments in the April 28 Letter. (See Encl. 1 at Comment 1.3.) The State did not posit any reason of its own to indicate that the DP is materially deficient in this regard. Compare *Oconee*, CLI-99-11, 49 NRC at 337 ("It is [the petitioner's] job to review the application and to identify *what* deficiencies exist and to explain *why* the deficiencies raise material safety concerns")(emphasis in original). In any event, Section 4.5.2 of the DP provides and discusses results of groundwater sampling and analysis performed during Spring 2002. The State has not even suggested any specific deficiency in that analysis. Accordingly, the concern should be denied as vague and unfounded.

Moreover, as stated above, constituents such as uranium and thorium tend to adsorb to the kinds of soils that are found beneath the Muskogee site, have low solubility in water (which means that they do not easily dissolve into groundwater from the soils they are bound to) and are not highly mobile in water. Accordingly, the radioactive isotopes in the soils on the site are not expected to move in the soils.

⁵² See NRC Inspection Report 40-7580/99-02 and Notice of Violation, dated December 23, 1999. The NRC issued an NOV to Fansteel in connection with the tornado event with respect to Fansteel's *reporting* of the event to the NRC, but did not take issue with any cleanup activities. It should be noted that NRC Staff inspectors determined that the spill covered approximately 2,000-3,000 square feet of property. *Id.*, Encl. 1 at 1; Encl. 2 at 17. Nonetheless, it did not determine that Fansteel's actions to clean up the spill were in any way inadequate.

In its Presentation (at 33), the State lists as a concern “possible groundwater changes caused by the placement of a mound of soil under an impermeable plastic tarp.” It is unclear from this statement what “mound of soil” the State is referencing, but it is likely the State is referring to 7,000 cubic yards of contaminated soil removed during the excavation of the interceptor trench, currently stored onsite in “storage pillows.” *See* DP at § 2.3.5. As correctly noted by the State, the soils are enclosed in *impermeable* “storage pillows”; that is, the soils are entirely encapsulated by a synthetic container which prevents any release of radioactive material. Apart from the issue of which soils are referenced, the State has not specified site characterization data which are now incorrect – or even which *may have* changed by virtue of the presence of that encapsulated soil on the site in its current location. This concern is without basis and should be dismissed.

The State also argues that the site characterization does not “address the radiological contamination of the northwest property which the licensee originally believed to be uncontaminated.” (Presentation at 33.) As stated above, license SMB-911 was amended in 1996 to remove that portion of the Fansteel property identified as the Northwest Property from the license for unrestricted use.⁵³ Since that time, the Northwest Property has not been subject to NRC jurisdiction, and is not encompassed by the proposed DP.⁵⁴ Because the Northwest Property has been previously remediated and released from NRC jurisdiction pursuant to a separate licensing action, it is not encompassed by the license amendment at issue. The State’s concern is beyond the scope of this proceeding.

⁵³ See Letter from R.C. Pierson, NRC, to J.J. Hunter, Fansteel, “Release of the Northwest Property for Unrestricted Use,” dated August 23, 1996. DP Section 2.3.1 improperly states this amendment was granted in 1999.

⁵⁴ A portion of the property was sold to the Port of Muskogee in 1999.

The State next makes the following assertion: "Plus potential sources of elevated subsurface contamination, e.g. [,] B-36 and MW-71S [citation omitted] are not discussed nor are Ponds 1/1S-1N and 4 [citation omitted]." (State Presentation at 33.) Without more, this statement does not provide sufficient information to determine whether these concerns are anything more than mere speculation. The State does not specify how Fansteel's site characterization effort with respect to "potential sources of elevated subsurface contamination" is insufficient, and, indeed, provides no basis at all as to its concerns regarding Ponds 1, 1S, 1N, and 4.⁵⁵ Vague, unfounded statements such as these are utterly insufficient to establish that FMRI is not in compliance with NRC regulations. In any event, the areas in which these ponds were located were characterized as part of the 1993 Remediation Assessment.

Finally, the State notes that there is no explanation for the conclusion, set forth in DP Section 11.3.4, that no measurable doses to the public are anticipated from effluents discharged into the Arkansas river due to the "dilution factor of the Arkansas River."

As previously stated, the highest measured gross alpha contamination in an onsite monitoring well is approximately 2600 pCi/liter. (Tourdot Aff. ¶ 21.) If one assumes the highly unlikely event of 100,000 liters of groundwater discharged directly into the river (unlikely due to the interceptor trench and treatment system on site) at the maximum alpha activity of 2600 pCi/liter (also unlikely due to various other monitoring wells with average alpha activity concentrations approaching background), a total activity of 2.6×10^8 pCi would be discharged. (*Id.*) Dilution from the flow rate of the Arkansas River (26,000 cubic feet per second or 736,100 liters per second) would quickly render the activity to levels undistinguishable from background (0.1 pCi/liter). (*Id.*) If ingestion exposure were calculated from this pathway, the results would

⁵⁵ In any event, the areas of Ponds 1, 1S, 1N and 4 have been characterized. See footnote

be in the 10^{-20} mrem range. (*Id.*) This is not a creditable pathway for analysis. (*Id.*) To further extrapolate to fish intake followed by human ingestion through fish would result in comparable doses. (*Id.*)

As set forth above, overall, the State has not provided any basis, let alone any evidence, for the proposition that the DP fails to meet the standard for site characterization set forth in 10 C.F.R. § 40.42(g)(4)(i). Indeed, much of what the State offers as a basis for its concerns consists of unsubstantiated speculation or allegations, a recitation of issues raised by the Staff that have been subsequently resolved, or both. The overwhelming evidence set forth by FMRI above demonstrates that it has provided a description of site conditions that was sufficient for the NRC Staff to evaluate the acceptability of the DP.

Accordingly, the State's requests for relief regarding site characterization should be denied. The State's first request for relief, in which it asks that FMRI be required to submit supplemental site characterization information which includes sampling to account for events occurring after 1993, should be denied as unnecessary to demonstrate compliance with NRC regulations. Moreover, a "limited remediation assessment" to identify the current total site soil and pond contamination is unnecessary, in light of the license conditions that have been put in place to address additional remediation.

B. The Industrial Use Scenario Is Appropriate for the Muskogee Site.

The State argues that the industrial worker scenario is not appropriate for the Muskogee facility because "it condemns the site to an industrial use only." (State Presentation at 39.) The State also argues, on a related note, that Fansteel "failed to consider all the sources, exposure routes and pathways in conducting its dose modeling. . ." (*Id.* at 40.) For the reasons

30, *supra*.

set forth below, the industrial worker scenario is the appropriate scenario for the Muskogee site to measure compliance with the license termination rule, 10 C.F.R. § 20.1402.

1. *Background – The Industrial Worker Exposure Scenario*

Under the industrial worker scenario, the dose to an individual who works in an industrial setting is modeled. (Tourdot Aff. ¶ 23.) It is assumed that the industrial worker (the average member of the critical group) spends a certain percentage of his time in buildings or outdoors on a site in order to determine the as-remediated state needed to comply with 10 C.F.R. § 20.1402.⁵⁶ (*Id.*) It is further assumed that the individual occupies a commercial facility for most of a typical working day. (*Id.*) As stated in Section 5.2.1.2.3 of the DP, external exposure to penetrating radiation, inhalation of soil dust (while outdoors and during building occupancy), and inadvertent ingestion of soil are the exposure pathways that were considered in developing radionuclide-specific DCGLs for residual radioactivity in site soil for the industrial worker dose assessment. (*Id.*)

Table 5-2 of the DP summarizes the exposure pathways identified for use in the industrial worker scenario. (*Id.* ¶ 24.) As indicated in Table 5-2, ingestion of water or groundwater from an on-site well has not been included as the pathway for the purposes of calculating industrial worker exposure. (*Id.*) Table 5-3 of the DP summarizes key parameters used in the industrial worker scenario. Contaminated zone parameters are presented in DP Table 5-4. (*Id.*) Contaminated zone input data is provided in DP Table 5-5. (*Id.*) Soil inhalation and external gamma parameters are set forth in Table 5-6, and Table 5-7 presents building occupancy

⁵⁶ Effectively, the scenario “back-calculates” the remediation criteria for soils, buildings and structures which would yield 25 mrem or less total effective dose equivalent (“TEDE”) to a worker on the site, using specific assumptions as to occupancy, breathing rate, percentage of time onsite spent indoors and outdoors, and ingestion of contaminated soil.

parameters.⁵⁷ (*Id.*) Aside from FMRI's decision not to use the groundwater pathway, discussed below, the State does not challenge these parameters or their application.

2. *The Industrial Worker Scenario is Appropriate for the Muskogee Site, Given its Industrial Character.*

First, the reasonably foreseeable intended use of the site is industrial. It is clear that the characteristics of the site lend themselves naturally to an industrial use, almost to the exclusion of any other use. The site, which is already zoned as light industrial/commercial, is located contiguous to the Muskogee City-County Port Authority ("Port"). (Dohmann Aff. ¶ 9.) The Port provides service transloading facilities for barge, rail and truck cargo. (*Id.*) The FMRI property is bounded by the Arkansas River, State Highway 62, the Muskogee Turnpike, and the Port, and lies on a proposed right-of-way to bring additional access to the Burlington Northern Railroad to the Port. (*Id.*) Other industrial businesses, including Koch Pavement Solutions (paving asphalt materials) and Zapata Industries, Inc. (former producer of bottle caps) are contiguous or in close proximity to the FMRI facility. (*Id.*)

In such circumstances, the appropriate land use for purposes of establishing risk-based soil or groundwater cleanup levels would be for an industrial worker. (*Id.* ¶ 10.) Indeed, the Port plans, in its Master Plan of Development for the Muskogee Port and Industrial Park, to utilize certain of the areas to be remediated under the DP. (*Id.*) To accomplish this, the Port has amended its Master Plan to change the status of these areas to "Land to be Appraised and Purchased."⁵⁸ (Dohmann Aff. ¶ 10.) In addition, the Port has specifically stated its intent to acquire the Muskogee site property, to further develop certain areas of the property for use by the

⁵⁷ DP Chapter 5, "Dose Modeling Evaluations," is appended hereto as Exhibit M.

⁵⁸ See Letter from S. Robinson, Director, Muskogee City-County Port Authority, to F. Dohmann, Fansteel, dated November 4, 2002 (appended hereto as Exhibit N).

Port. (*Id.*) Specifically, the Port has expressed a desire to construct (1) a proposed 50-foot railroad right of way across the Muskogee site, and (2) a proposed Asphalt Terminal Expansion site on the Muskogee site.⁵⁹ (*Id.*) As previously stated, 19 acres of the Muskogee site were sold to the Port in 1999. The Port's stated intent to acquire and use the site for industrial purposes – and the fact that it has already acquired part of the site – provides incontrovertible evidence that the industrial worker scenario is the appropriate release scenario for the site. Although the State alludes to other uses, it does not provide any evidence as to why this property is particularly suitable for farmland or residential use. It merely speculates about such possible uses, notwithstanding all of the evidence to the contrary, recited above, about the current and planned industrial uses of this site.

3. *Use of the Industrial Worker Scenario Would Not Yield Any Offsite Doses.*

The State is also concerned with potential impacts to the area around the Muskogee site were the site to be remediated pursuant to the industrial worker scenario. In its presentation (at 39), the State notes that there is a recreational area across the river, and there are numerous recreational lakes in the area, including Fort Gibson and Lake Eufala. The State alleges, “It is therefore not possible to preclude the potential use by sportsmen and outdoor enthusiasts who will take fish, game or natural plants from the area for food.” (*Id.*)

This concern is totally without merit. For the industrial worker exposure scenario, dose from the primary pathways (shine, ingestion and inhalation) is limited by time and distance. (Tourdot Aff. ¶ 25.) Therefore, any offsite scenario is, by virtue of the distance from the source material and the limited time of exposure, significantly less (by factors of 10) than the exposure scenario for the industrial worker on which the DP is based. (*Id.*) For example, external gamma

⁵⁹ See Letter from S. Robinson, Director, Muskogee City-County Port Authority, to S.A.

shine is the primary dose pathway for the industrial worker pathway. (*Id.*) This pathway is limited by how close to the remaining source material an individual is and how long the individual is close to the source material. (*Id.*) Any distance greater than a few meters offsite (or at any point beyond the remediated area) reduces exposure to zero. A boat-launch across the river or any offsite activity by virtue of the distance from the site and the time spent on activity has an associated exposure of zero, and is not a creditable pathway. (*Id.*) A postulated trespasser's exposure, for example, is limited by the amount of time spent onsite and the proximity to the remaining source material. (*Id.*) Thus, it is highly unlikely that the dose to a trespasser will become the critical scenario compared to an industrial worker. (*Id.*)

4. *Because Groundwater at the Muskogee Site Is Not Usable, the Exclusion of the Groundwater Pathway in Performing Dose Modeling Is Appropriate.*

The State is also concerned with consideration of the groundwater pathway in performing dose modeling. (*See* State Presentation at 38.) As a practical matter, groundwater at the site is not usable, and therefore the drinking water pathway can be excluded from consideration. (Tourdot Aff. ¶ 26.) The "Ground Water Atlas of the United States – HA 730-E," prepared by the United States Geological Survey ("USGS"), indicates that the alluvial aquifer of the Arkansas River is not present on the west bank, near Muskogee. (*Id.*) This document also indicates that there are no major bedrock aquifers in this region of Oklahoma. (*Id.*) USGS Water Supply Paper 1809-T indicates that the bedrock and the terrace aquifers are not capable of being developed for wells of large yield. (*Id.*) Groundwater at the Muskogee site is not currently used as a source of drinking water or for irrigation purposes. (*Id.*) The domestic water supply for the site is currently, and for the foreseeable future will come, from a municipal source.

Thompson, ODEQ, dated July 17, 2003 (appended hereto as Exhibit O).

(Dohmann Aff. ¶ 11.) The municipal source is capable of supplying sufficient water for typical manufacturing industries in the area. (*Id.*)

Overburden groundwater is present in a terrace deposit, which can produce groundwater for domestic purposes. (Tourdot Aff. ¶ 27.) However, the down gradient extent of the terrace aquifer at the site is truncated by the cutbank of the Arkansas River. (*Id.*) The bedrock is not in hydrogeologic connection with the overburden, and hydraulic conductivities are too low to produce usable quantities of groundwater in the shale underlying the FMRI site. (*Id.*) Indeed, a review of information published by the Oklahoma Geologic Survey concerning the water resources in the area (*Reconnaissance of the Water Resources of the Fort Smith Quadrangle, 1988*), indicated that the FMRI site is located in a region rated least favorable for groundwater supplies due to the low yield of geologic materials underlying the site (*i.e.*, shallow and deep groundwater) and the generally fair to poor quality of groundwater contained within those geologic materials. (Blauvelt Aff. ¶ 9.) For those reasons, the groundwater pathway need not be considered in performing dose modeling for site release, as the groundwater is not usable. (*Id.*)

Having said this, although the groundwater pathway was not included in the DP because FMRI believed such exclusion to be technically justifiable and in accordance with NRC requirements, guidance, and precedent, the NRC Staff imposed License Condition 35 on FMRI, which provides:

Licensee shall remediate the site to residual radioactive levels to ensure that exposure to residual radiation in all media from applicable pathways will not result in a dose exceeding 25 mrem/y, as specified in 10 CFR 20.1402. Licensee will establish remediation levels (DCGLs) as part of the Phase 3 Workplan, approved by NRC, that demonstrate the 25 mrem/y dose limit will not be exceeded.

Accordingly, the groundwater pathway is required to be considered, in response to this license condition, in determining the applicable pathways to be used in determining compliance with the 25 millirem limit. (Tourdot Aff. ¶ 28.) Moreover, as discussed above, FMRI already has committed to continue its existing groundwater treatment program until groundwater is satisfactorily remediated. (*Id.*)

For these reasons, it is appropriate for the DP to utilize the industrial worker exposure scenario in determining compliance with 10 C.F.R. § 20.1402. The State's request for relief, which would require the use of the residential farmer scenario, should be denied.

C. The NRC Staff Had the Authority to Grant Fansteel's Request for Exemption From the Requirements of 10 C.F.R. § 40.36(e), and Fansteel Has Submitted to the NRC Original Financial Instruments.

In this concern, the State argues that the December 4, 2003, exemption granted to Fansteel from the requirements of 10 C.F.R. § 40.36(e) should be revoked.⁶⁰ For the reasons stated below, issuance of the exemption was proper.

As an initial matter, the State argues (State Presentation at 42) that NUREG-1556 "does not endow the NRC with the ability to waive the financial assurance requirements." This argument has no merit. An NRC regulation, 10 C.F.R. § 40.14, sets forth the Commission's standards for specific exemptions from the requirements of 10 C.F.R. Part 40. It is axiomatic that the Commission has legal authority to grant exemptions from its licensing requirements.

⁶⁰ The State erroneously claims that the exemption was granted from 10 C.F.R. § 40.36(d). That section provides that a decommissioning funding plan must contain (1) a cost estimate for decommissioning, (2) a description of the method of assuring funds for decommissioning from Section 40.36(e), including a means for adjusting cost estimates over the life of the facility, and (3) a certification of financial assurance. Fansteel provided to the Commission both a cost estimate and a certification of financial assurance. However, because Fansteel was unable to provide financial assurance via one of the mechanisms set forth in Section 40.36(e) – prepayment, a surety method, or an external sinking fund – an exemption was necessary from that section.

Carolina Power & Light Co. (Shearon Harris Nuclear Power Plant), CLI-86-24, 24 NRC 769, 774 n.5 (1986), citing Final Rule, Specific Exemptions; Clarification of Standards, 50 Fed. Reg. 50,764, 50,766-67 (Dec. 12, 1985) (“the authority of an agency to provide for exemptions from its regulations is well-established”). See *United States v. Allegheny-Ludlum Steel*, 466 U.S. 742 (1972); *Alabama Power Co. v. Costle*, 636 F.2d 323, 357 (D.C. Cir. 1979).

The State next notes its uncertainty as to whether, once notified of Fansteel’s bankruptcy, the NRC established a Bankruptcy Review Team (“BRT”) pursuant to NUREG-1556, Volume 15.⁶¹ (State Presentation at 42.) In fact, the NRC Staff established a BRT in advance of Fansteel’s bankruptcy filing.⁶² However, the activities of the BRT are not at issue in this proceeding. The State may challenge the particular action that is the subject of the proceeding (here, the DP), but it may not proceed on the basis of allegations that the NRC Staff has somehow failed in its performance. To the extent that a party seeks to litigate the adequacy of the staff’s work in a particular proceeding, it proposes a contention that is not litigable. See *Florida Power & Light Co.* (St. Lucie Nuclear Power Plant, Unit 1), ALAB-921, 30 NRC 177, 186 (1989); *Louisiana Power & Light Co.* (Waterford Steam Electric Station, Unit 3), ALAB-812, 22 NRC 5, 55-56 (1985); *Pacific Gas & Elec. Co.* (Diablo Canyon Nuclear Power Plant, Units 1 & 2), ALAB-728, 17 NRC 777, 809 (1983). See also *Duke Energy Corp.* (Catawba Nuclear Station, Units 1 & 2), CLI-04-06, 58 NRC __ (Feb. 18, 2004), slip op. at 11 (“Licensing boards simply have no jurisdiction over non-adjudicatory activities of the Staff that the

⁶¹ See NUREG-1556, Vol. 15, “Guidance About Changes of Control and About Bankruptcy Involving Byproduct, Source, or Special Nuclear Materials Licenses,” November 2000, § 6.

⁶² See Letter from L.C. Fields, NRC, to G.L. Tessitore, Fansteel, “Fansteel, Inc. – NRC Formation of a Bankruptcy Response [sic] Team for Fansteel Muskogee Facility (TAC No. L31577),” dated December 20, 2001 (NRC ADAMS accession number ML013600593).

Commission has clearly assigned to other offices unless the Commission itself grants that jurisdiction to [the] Board”).

The State’s Request for Relief 10 (State Presentation at 49) states that “NRC should be required to convene a [BRT] to ensure the proposed funding scheme complies with the funding requirements allowed by Appendix H of NUREG-1556, Volume 15.” Because a BRT already has been convened, there is no genuine dispute as to this issue. The State’s request for relief should be denied. In any event, it is clear from the Safety Evaluation Report that the NRC Staff has fully reviewed the funding mechanism.

It appears that the crux of this concern, however, is that the State is unsure as to whether an original copy of the Plan or any of the executed financial instruments have been submitted to the NRC as required by 10 C.F.R. § 40.36(d). The NRC is in possession of original, executed financial instruments for the Muskogee site. (Tessitore Aff. ¶ 25.) A chronology of the events surrounding their submission follows.

On November 5, 2003, counsel for Fansteel submitted to the NRC, by electronic mail, drafts of the following financial assurance instruments for approval as to form and content: the FMRI Primary Note, FMRI Secondary Note, FMRI Contingent Note, Indemnification Letter, Pledge Agreement, Decommissioning Trust Agreement, and Certification of Financial Assurance.⁶³ (Tessitore Aff. ¶ 26.) Later that day, counsel for Fansteel received a response from

⁶³ See E-mail message from J. Curtiss, Winston & Strawn LLP, to M. Schwartz, T. Fredrichs, and J. Shepherd, NRC, “FW: Fansteel Financial Assurance Materials,” dated November 5, 2003, 12:48 p.m. (Hearing File Tab 41).

Thomas Fredrichs of the NRC Staff, responding that these documents would satisfy the NRC.⁶⁴

(Tessitore Aff. ¶ 26.) Thereafter, in a letter dated November 7, 2003, the NRC stated:

Fansteel has submitted its proposed financial instruments that, when executed, will provide the necessary funding. NRC has reviewed these instruments and has concluded that, when executed and in combination with license conditions regarding financial accounting, planning, reporting, payment collection, and Trust Fund replenishment, they are acceptable in form and content to provide funding for decommissioning of the Muskogee site. However, these instruments must be executed and delivered to NRC before the NRC can approve the DP . . .⁶⁵

Fansteel responded to the NRC Staff's November 7, 2003, letter on November 24, 2003,⁶⁶ at which time Fansteel provided the NRC with executed originals of the Decommissioning Trust Agreement, FMRI Primary Note, FMRI Secondary Note, FMRI Indemnification Letter, FMRI Pledge Agreement, and Certification of Financial Assurance.⁶⁷ (Tessitore Aff. ¶ 27.) At the time these executed documents were delivered to the NRC, the NRC Staff supplied a necessary signature for the FMRI Indemnification Letter. (*Id.*) Also on November 24, 2003, Fansteel delivered to the NRC an original, executed FMRI Contingent Note and associated Escrow Agreement. (*Id.*) The NRC Staff signed the Escrow Agreement at that

⁶⁴ See E-mail message from T. Fredrichs, NRC, to J. Curtiss, Winston & Strawn LLP, M. Schwartz and J. Shepherd, NRC, "Re: FW: Fansteel Financial Assurance Materials," dated November 5, 2003, 1:55 p.m. (Hearing File Tab 42).

⁶⁵ See Letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, "NRC Agreement to Fansteel's Proposed License Amendments," dated November 7, 2003 (Hearing File Tab 43).

⁶⁶ See Letter from G.L. Tessitore, Fansteel, to D.M. Gillen, NRC, "Response to NRC Letter of November 7, 2003," dated November 24, 2003 (Hearing File Tab 48).

⁶⁷ See Attachments to Fansteel letter of November 24, 2003 (Hearing File Tab 49).

time.⁶⁸ (Tessitore Aff. ¶ 27.) The NRC Staff specifically approved these financial instruments as part of its December 4, 2003 approval of the DP. *See* Safety Evaluation, Section 14.3.1.1.

Thereafter, in the context of the bankruptcy, Fansteel entered into negotiations with the State regarding the transfer from Fansteel to FMRI of Fansteel's OPDES Permit for the Muskogee site. (Tessitore Aff. ¶ 28.) A settlement was reached with the State that upon approval by the Bankruptcy Court permitted transfer of the OPDES Permit from Fansteel to FMRI without substantive modification or reissuance.⁶⁹ (*Id.*) As part of that settlement, the State became a third party beneficiary to the FMRI Secondary Note, and a secured party under the FMRI Pledge Agreement, with rights under these respective instruments equal to the rights of the NRC. (*Id.*) In the Bankruptcy Court, Fansteel filed a motion seeking confirmation of the Plan as modified to reflect the Settlement Agreement. (*Id.*) On December 23, 2003, the Bankruptcy Court approved the settlement and confirmed the Second Amended Plan, making the effective date for Fansteel's emergence from bankruptcy January 23, 2004. (*Id.*)

Fansteel notified the NRC of these developments by letter dated December 24, 2003.⁷⁰ (Tessitore Aff. ¶ 29.) In that letter, Fansteel described the following changes to the financial instruments, and executed new original financial instruments as follows:

⁶⁸ See Escrow Agreement (NRC ADAMS accession number ML033350044), dated November 24, 2003, and FMRI Contingent Note (NRC ADAMS accession number ML033350053).

⁶⁹ The only notable differences between the new permit, issued on December 12, 2003, and transferred to FMRI on December 23, 2003, were to add requirements to monitor gross alpha radiation and to line certain ponds.

⁷⁰ See Letter from G.L. Tessitore, Fansteel, to D.M. Gillen, NRC, "Ministerial Changes to Financial Assurance Documents to Reflect Partial Settlement with State of Oklahoma," dated December 24, 2003 (Hearing File Tab 55).

- The date of the FMRI Primary Note,⁷¹ the FMRI Secondary Note,⁷² the Indemnification Letter⁷³ and the Escrow Agreement were changed to reflect the new effective date of January 23, 2004.
- In Section G of the Escrow Agreement, the termination date was changed to February 15, 2004, as a result of the new Effective Date.
- The FMRI Pledge Agreement⁷⁴ required two specific changes: First, the date of the Pledge Agreement was changed to reflect the new effective date. Second, the NRC executed a "Waiver and Consent," providing that the NRC permitted FMRI to grant a security interest in the FMRI Secondary Note to the ODEQ.
- The NRC Staff and State signed the "ODEQ-NRC Intergovernmental Agreement"⁷⁵ with respect to the FMRI Secondary Note.

(Tessitore Aff. ¶ 29.) Fansteel's December 24 letter also appended the Second Amended Plan.

(*Id.*) On December 29, 2003, Fansteel transmitted a minor revision to page 2 of the Pledge Agreement to reflect an NRC Staff comment.⁷⁶ (Tessitore Aff. ¶ 29.) On December 30, 2003, counsel for Fansteel transmitted the signature page of the Intergovernmental Agreement, transmitting the signature of the State's representative.⁷⁷ (Tessitore Aff. ¶ 29.) Finally, on January 23, 2004, counsel for Fansteel transmitted to the NRC revised pages of the FMRI Primary Note, FMRI Secondary Note, FMRI Contingent Note, FMRI Escrow Agreement, and

⁷¹ The Primary Note, as amended on December 24, 2003, appears at Hearing File Tab 60.

⁷² The Secondary Note, as amended on December 24, 2003, appears at Hearing File Tab 61.

⁷³ The Indemnification Letter, as amended on December 24, 2003, appears at Hearing File Tab 59.

⁷⁴ The Pledge Agreement, as amended on December 24, 2003, appears at Hearing File Tab 58.

⁷⁵ The Intergovernmental Agreement appears at Hearing File Tab 57.

⁷⁶ See Letter from M.J. Wetterhahn, Winston & Strawn LLP, to C.M. Craig, NRC, "Administrative Change to Pledge Agreement," dated December 29, 2003 (Hearing File Tab 56).

FMRI Pledge Agreement, to correct the date of the Plan.⁷⁸ (Tessitore Aff. ¶ 29.) In light of the numerous page changes that have occurred since executed originals of the financial assurance documents were first submitted to the NRC, current copies of each of the documents are appended hereto as Exhibits P through W.

In summary, the NRC Staff has the authority to grant the exemption, and the Staff has been provided with executed originals of the financial instruments. The State's request for relief 11 (State Presentation at 49) states, "Assuming the NRC performs its requisite obligations, Fansteel should be required to submit original, signed documents to demonstrate its financial assurance requirements." Because Fansteel has done so, there is no genuine dispute as to this issue. The State's request for relief should be denied. In addition, for the same reasons, the exemption from Section 40.36(d) should be upheld.

D. Fansteel's Cost Estimate Is Reasonable.

The State contends that the cost estimate set forth in the DP should be rejected because (1) as set forth in its concern with respect to site characterization, "it is impossible to accurately determine the total volume of soil and mixed waste⁷⁹ that exists." (State Presentation at 43.) Second, the State argues that the cost estimate in the DP is not consistent with the guidance in NUREG-1727. (*Id.*) As set forth below, the cost estimate is reasonable, the NRC has approved the cost estimate based on its independent judgment, and the State has not demonstrated that any significant deficiency exists with respect to the estimate.

⁷⁷ See Letter from M.J. Wetterhahn, Winston & Strawn LLP, to C.M. Craig, NRC, "Original Signature Page for Intergovernmental Agreement," dated December 30, 2003.

⁷⁸ See Letter from M.J. Wetterhahn, Winston & Strawn LLP, to T.L. Fredrichs, NRC, "Administrative Changes to Financial Documents," dated January 23, 2004 (NRC ADAMS accession number ML040270235).

⁷⁹ See footnote 44, *supra*, regarding the absence of mixed waste on the site.

Fansteel set forth an initial cost estimate in Chapter 15 of the January 2003 DP. (Tessitore Aff. ¶ 30.) That estimate, as stated in Section 15.1, addressed all of the items detailed in NUREG-1727. (*Id.*) See Appendix 15-1 of the DP. As stated above, rigid conformance to the guidance is not required, provided the licensee can demonstrate compliance with NRC regulations. In this case, 10 C.F.R. § 40.42(g)(4)(v) requires “[a]n updated detailed cost estimate for decommissioning.” This has clearly been provided by FMRI.

The January 2003 DP included costs for all items detailed in NUREG-1727, totaling \$26.5 million.⁸⁰ (Tessitore Aff. ¶ 30.) Particular elements that went into this cost estimate were set forth in detail in Section 15.1 of the DP.⁸¹ (*Id.*) Total costs to remediate the site were estimated to be \$41.6 million. (*Id.*) The State has not specifically challenged any of those estimates or the underlying assumptions.

As noted by the State, there is some uncertainty with respect to the amount of contaminated soil beneath the ponds. (Tessitore Aff. ¶ 31.) That contingency is provided for by virtue of the Contingent Note, part of FMRI’s financial assurance mechanism. (*Id.*) After FMRI

⁸⁰ This estimate differed from the earlier \$57.1 million estimate primarily as a result of (1) the use of dose-based cleanup criteria instead of SDMP criteria; (2) a change in groundwater treatment technology from evaporation with no discharge, to the use of a sand bed, with discharge through permitted outfalls; (3) air-drying of excavated WIP and CaF material, rather than using mechanical dryers; and (4) reduced facility oversight.

⁸¹ The \$26.5 million estimate represents the amount of the cost of decommissioning which, in accordance with NRC requirements and Staff guidance, would have to be assured by one of the methods acceptable to the NRC pursuant to 10 C.F.R. § 40.36(e), less the value of the Decommissioning Trust. However, as discussed above, since the cost of decommissioning is being funded by a series of notes, a higher value for the cost estimate was utilized to ensure that costs related to decommissioning, but excluded from NRC requirements, were assured.

completes the schedule for Phase 2 remediation as set forth in the DP,⁸² FMRI shall submit to the NRC for review and approval a Work Plan for the additional site characterization to be performed during Phase 3 of the DP. (*Id.*) The Work Plan shall be consistent with the applicable standards set forth in the DP. (*Id.*) After the NRC approves the Work Plan, FMRI shall perform the additional site characterization. (*Id.*)

Within 60 days of completing additional site characterization during Phase 3 of the DP, Reorganized Fansteel and/or FMRI will submit to the NRC (i) the results of site characterization, analyses, and conclusions as to the volume of additional soils, if any, requiring remediation (*i.e.*, in excess of the amount set forth in the DP); (ii) the incremental cost of remediation of such soils; (iii) proposed modifications, if any to the scope and nature of groundwater treatment and/or monitoring, predicated on applicable standards; and (iv) the proposed terms of any required Contingent Note. (*Id.* ¶ 32.) The terms of the note include:

- A principal amount to be proposed by Reorganized Fansteel and FMRI and determined by agreement of the NRC after completion of additional site characterization (or following dispute resolution, if there is no agreement). This principal amount will reflect, as and to the extent required, additional costs to remediate soils (in excess of costs estimated in the DP) and other additional costs (*i.e.*, costs not in the DP, but not a reserve or contingency factor) required to complete the DP and remediate and monitor groundwater.
- Minimum semi-annual payments, commencing only after the \$30.6 million Primary Note described above is paid in full. The amount of the minimum payments will be proposed by Reorganized Fansteel and determined by agreement with NRC following good faith negotiations (or determined pursuant to dispute resolution, if the parties do not agree).
- Mandatory additional prepayments, to commence only after the Primary Note is paid in full, of up to an amount proposed by Reorganized Fansteel

⁸² See Letter from G.L. Tessitore, Fansteel, to D.M. Gillen, Fansteel, dated May 8, 2003 (and as approved by the letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, dated May 9, 2003) for a description of the activities to be performed in each "phase."

and determined by agreement of NRC in conjunction with the determination of minimum semi-annual payments. These payments are to be funded by (i) 50% of Reorganized Fansteel's "excess available cash" (actual amount to be determined within 90 days of each fiscal year end by outside auditors); and (ii) if the aggregate amount of minimum semi-annual payments plus the amount, if any, paid under clause (i) above, is less than the budgeted amount for the current fiscal year, then up to 50% of prior fiscal year-end cash balance of Reorganized Fansteel (subject to limitations imposed by applicable law), including cash balances at RW (to the extent that such amounts are permitted under applicable law, to be divided or loaned to Reorganized Fansteel) shall be paid so as to satisfy in full the actual remediation costs for the prior year.

- A maturity date reflecting any additional time necessary to remediate soils in excess of the amount set forth in the DP (if required).

(*Id.*)

If Reorganized Fansteel is unable to timely and/or fully fund FMRI's additional remediation obligations (if any) under the Contingent Note in a given year, then FMRI may draw up to \$2 million from the Decommissioning Trust Fund on a revolving basis (*i.e.*, subject to replenishment). (*Id.* ¶ 33.) At no time shall the aggregate amounts outstanding under such draws from the L/C Cash Reserve exceed \$2 million. (*Id.*) Future excess cash or insurance proceeds, if any, will be applied to replenish the Decommissioning Trust Fund before reducing the principal amount of the Contingent Note. *See* License Condition 49. (Tessitore Aff. ¶ 33.)

In its December 4, 2003 Safety Evaluation Report, the NRC Staff found the cost estimate, including the arrangements relative to the Contingent Note, to be acceptable. (*Id.* ¶ 34.) The State has not challenged any specific element of the cost estimate, as set forth in the January 14, 2003 DP, and as amended on July 24, 2003, nor has it taken issue with the terms of the Contingent Note, which is specifically designed to account for remediation of additional soils. Absent any substantive challenge, the State has simply not demonstrated that the cost estimate approved by the NRC is not in compliance with 10 C.F.R. § 40.42(g)(4)(v).

Accordingly, the State's request that the cost estimates be re-evaluated (State Presentation at 48) should be denied.

E. The NRC Properly Reached a Finding of No Significant Impact.

The State argues that the NRC Staff did not "consider the appropriate factors" in preparing its EA/FONSI. Specifically, the State makes two claims: first, the EA is not adequate because, given the "inaccurate and insufficient" data in the DP, the NRC Staff could not have conducted an adequate review; and second, that the NRC should have consulted the State for guidance with respect to remediation of non-radiological contaminants and the potential for the creation of mixed waste. (State Presentation at 44-46.)

First, the State argues that, because the DP "is replete with inaccurate and insufficient data," the NRC Staff could not have conducted an adequate review. (State Presentation at 45.) The State does not specify what "inaccurate and insufficient" data it questions, and, as such, is impermissibly vague. As demonstrated above, however, with respect to the allegations made in its Presentation, FMRI has demonstrated, by the overwhelming weight of the evidence, that the data in the DP and its supplements are sufficient to meet their intended purpose. As such, the same information is sufficient for the NRC to prepare the necessary environmental assessment. Furthermore, the State has failed to point out any specific deficiency in the EA. The State has therefore not set forth an issue on which relief can be granted.

The State takes issue once again with the consideration of non-radiological contamination on the site, arguing that the NRC Staff failed to properly consult with the State with respect to such contamination. Specifically, the State alleges that the NRC "should have consulted the State for guidance in the appropriate remediation of the non-radiological

contaminants as well as the potential for the creation of mixed waste because of the significant [sic] for an increase in disposal costs as well as increased hazards.” (State Presentation at 46.)

As an initial matter, the NRC Staff is not required to consult with the State regarding the preparation of an Environmental Assessment. NEPA regulations pertaining to environmental assessments *do not require* consultation with other agencies. They only require a “list of agencies and persons consulted, and identification of sources used.” 10 C.F.R. § 51.30(a)(2). *See Sacramento Mun. Util. Dist.* (Rancho Seco Nuclear Generating Station), LBP-93-23, 38 NRC 200, 245 (1993). In any event, however, as discussed below, the State had ample opportunity to communicate its views to the NRC Staff.

The State was on notice that the NRC Staff would perform an environmental assessment in connection with the DP as early as May 2003. Moreover, the NRC Staff has been aware of the State’s concerns since June 2003. The State has not explained how, given these facts, it was harmed by the lack of opportunity to comment on a draft EA.

On April 28, 2003, the NRC Staff sent a letter to Fansteel, with a copy to, among others, counsel for the State, in which it made a number of comments regarding the DP.⁸³ The NRC commented at that time that “an [environmental impact statement] may be necessary.” In a subsequent letter dated May 8, 2003, which was also placed on the NRC’s public docket, Fansteel expressed its understanding that an EA would be prepared in connection with approval of the DP.⁸⁴ The State’s June 16, 2003, Request for Hearing acknowledged both of these letters,

⁸³ See Letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, “Results of Preliminary Review of Fansteel’s Decommissioning Plan Dated January 2003,” dated April 28, 2003 (Hearing File Tab 2).

⁸⁴ See Letter, G.L. Tessitore, Fansteel, to D.M. Gillen, NRC, dated May 8, 2003 (Hearing File Tab 3). The Staff’s letter to Fansteel dated May 9, 2003, which copied counsel for the State, also stated the Staff’s intent to prepare an EA. See Letter, D.M. Gillen, NRC,

and the fact that an environmental review was ongoing.⁸⁵ Shortly thereafter, on June 20, 2003, representatives of the State, the ODEQ, Fansteel and the NRC Staff (the latter participating via telephone) met in the context of settlement in Oklahoma City, Oklahoma. At that time, a number of the State's concerns with the DP were discussed, including use of the industrial worker scenario and remediation of non-radiological constituents on the site.

With this background in mind, as stated above, on August 11, 2003, the NRC published in the *Federal Register* a notice of a 30-day period to provide comments "concerning this decommissioning proposal *and its associated environmental impacts*." See 68 Fed. Reg. at 47,622 col.1 (emphasis added).⁸⁶ This notice presented the State with the opportunity to present its issues to the NRC Staff. If this were not sufficient to put the State on notice with regard to the opportunity to raise its concerns at that time, on August 28, 2003, the NRC Staff wrote directly to ODEQ, with a copy to counsel for the State, requesting that ODEQ verify the classification of the groundwater aquifer underlying the site, in connection with the revised DP.⁸⁷ Finally, on October 24, 2003, the NRC Staff contacted counsel for the State by telephone to determine whether the State would exercise jurisdiction over remediation of chemical contamination at the

to G.L. Tessitore, Fansteel, "Results of Preliminary Review of Fansteel's Decommissioning Plan Dated January 2003," dated May 9, 2003 (Hearing File Tab 4).

⁸⁵ See "State of Oklahoma's Request for Hearing," dated June 16, 2003, at 39. Judge Bollwerk dismissed this Request for lack of jurisdiction on August 20, 2003. See *Fansteel Inc. (Muskogee, Oklahoma Facility)*, LBP-03-13, 58 NRC 96 (2003).

⁸⁶ See also *id.* at 47,622 col. 1 ("Before the issuance of the amendment, NRC will have made findings required by the Atomic Energy Act of 1954, as amended, and NRC's regulations. These findings will be documented in a Safety Evaluation Report, *an Environmental Assessment*, and in an amendment to License No. SMB-911.") (emphasis added).

⁸⁷ See Letter from J.C. Shepherd, NRC, to M. Broderick, ODEQ, "Classification of Ground Water Underlying the Fansteel Site Near Muskogee, Oklahoma," dated August 28, 2003 (NRC ADAMS accession number ML032410048).

site following termination of the NRC license.⁸⁸ The State was plainly and undeniably on notice that the NRC was preparing an EA. Given its numerous opportunities, the State does not now even purport to address how its delay in acting could be “excusable.” Indeed, the State’s repeated failure to act in a timely manner, given the repeated opportunities, is inexplicable.

Also with respect to this issue, the State cites to an Oklahoma State statute requiring ODEQ approval of site assessment and remediation plans relating to groundwater, noting that Fansteel has not obtained such an approval. (State Presentation at 46.) For this reason, the State alleges that the NRC’s decision to issue a FONSI “fails to consider relevant agency’s [sic] expertise” and should be rejected. *Id.* This issue must be dismissed as a matter of law.

10 C.F.R. § 20.2007 provides:

Nothing in this subpart relieves the licensee from complying with other applicable Federal, State, and local regulations governing any other toxic or hazardous properties of materials that may be disposed of under this subpart.

The Commission has interpreted this provision in the context of a Subpart L proceeding and dismissed an area of concern presenting a substantively similar issue, on the basis that “[w]hether non-NRC permits are required is the responsibility of bodies that issue such permits, such as . . . state and local authorities. To find otherwise would result in duplicate regulation as both the NRC and the permitting authority would be resolving the same question, *i.e.*, whether a permit is required.” *Hydro Resources, Inc.* (2929 Coors Road, Suite 101, Albuquerque, NM 87120), CLI-98-16, 48 NRC 119, 120 (1998). Rather, the language of Section 20.2007 “suggests only that an applicant may not rely on its license from the NRC as a waiver of its obligation to

⁸⁸ See Nuclear Regulatory Commission, Fansteel Inc., License Number SMB-911, Muskogee, OK, Environmental Assessment, Finding of No Significant Impact, at §§

obtain permits required by other agencies.” *Id.* at 121. Moreover, resolution of the Oklahoma State permitting issue is not necessary for the NRC to meet its statutory responsibilities.⁸⁹ *Id.* at 122. This concern must be dismissed as a matter of law.

The EA prepared by the NRC Staff could have led to an EIS if the NRC had determined that significant impacts would result from the proposed decommissioning plan. However, the Staff identified no such significant impacts, and the State has not demonstrated that any such significant impacts exist. Accordingly, the State has not identified an issue in this regard.

In this vein, the State argues that the NRC Staff predetermined the outcome of the EA. Specifically, the State cites to the April 28 Letter and May 8 Letter. Those letters, on their face, demonstrate that the outcome of the EA was not predetermined. In the April 28 Letter, the NRC Staff stated:

6.1 Chapter 6 states that “Fansteel *will prepare* an . . . [ER]”; no such information is included in this submittal. Because there is radiological ground water contamination at the site, and this contamination is subject to NRC regulatory control, NRC believes that an EIS may be necessary. Fansteel should provide information commensurate with that level of environmental analysis.

April 28 Letter, Att. at 4. Fansteel questioned this determination in conversations with the NRC Staff because the guidance in use at that time, NUREG-1757, advised that licensees such as Fansteel fell into “Group 5,” which required preparation of an EA. If that EA did not conclude

3.1.2, 9.

⁸⁹ Clearly, to the extent the State would seek to control radioactive material regulated by the Nuclear Regulatory Commission pursuant to the Atomic Energy Act of 1954, it is preempted from doing so. *See Pac. Gas & Elec. Co. v. State Energy Resources Conservation & Dev. Comm’n*, 461 U.S. 190 (1983); *Silkwood v. Kerr-McGee Corp.*, 464 U.S. 238 (1984). *See also N. States Power Co. v. Minnesota*, 447 F.2d 1143, 1148-49 (8th Cir. 1971); *Brown v. Kerr McGee Chemical Corp.*, 767 F.2d 1234 (7th Cir. 1985).

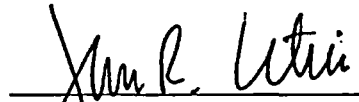
with a FONSI, then the NRC Staff would conduct an EIS.⁹⁰ Accordingly, in response to the April 28 Letter, in its letter to the NRC Staff dated May 8, 2003, Fansteel restated its understanding that the Staff would only be required to prepare an EA in connection with the approval of Fansteel's DP, particularly in light of Fansteel's intent to not seek license termination until site groundwater was remediated satisfactorily. *See* May 8 Letter at 2. As such, Fansteel simply sought clarification of the NRC's existing guidance regarding the preparation of an EA – the outcome of that EA was never predetermined. Accordingly, the State's request that the NRC conduct a "fair and impartial" EA "based on supplemental site characterization" should be denied as unnecessary and unwarranted.

⁹⁰ *See* NUREG-1757, Vol. 1, "Consolidated NMSS Decommissioning Guidance, Decommissioning Process for Materials Licensees," September 2002, at § 12.3.2.

IV. CONCLUSION

For the reasons set forth above, in the challenged areas, FMRI has met its burden of proof that it has met NRC requirements for approval of its decommissioning plan. Accordingly, the State's requests for relief should be denied in their entirety, and the Presiding Officer should find for FMRI in the areas challenged by the State.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "James R. Curtiss", is written over a horizontal line.

James R. Curtiss, Esq.

Mark J. Wetterhahn, Esq.

Brooke D. Poole, Esq.

WINSTON & STRAWN LLP

1400 L Street, NW

Washington, D.C. 20005-3502

ATTORNEYS FOR FMRI, INC.

Dated in Washington, D.C.
this 4th day of March 2004


BEFORE THE PRESIDING OFFICER

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE PRESIDING OFFICER

In the Matter of:

FMRI, Inc.

(Muskogee, Oklahoma Facility)

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Docket No. 40-7580-MLA-3

ASLBP No. 04-816-01-MLA

Affidavit of Gary L. Tessitore

I, Gary L. Tessitore, being duly sworn, state as follows:

1. I am Chairman of the Board, President and Chief Executive Officer of Fansteel Inc. ("Fansteel"). I am responsible for Fansteel's day-to-day operations, as well as all business and financial decision-making for the company. My address is Number One Tantalum Place, North Chicago, Illinois, 60064. Fansteel is the parent of FMRI, Inc. ("FMRI") and, as issuer of certain notes, is responsible for provided the financial assurance described herein. Prior to Fansteel's emergency from bankruptcy and issuance of NRC License Amendment 11 on December 4, 2003, Fansteel was the licensee for NRC license SMB-911.

2. On January 30, 2004, the State of Oklahoma ("State") filed a written presentation setting forth its areas of concern with respect to the Decommissioning Plan ("DP") dated January 14, 2003, as supplemented and approved by the Nuclear Regulatory Commission ("NRC") by license amendment dated December 4, 2003, that is at issue in this proceeding. The purpose of this affidavit is to respond to certain issues raised by the State in its written presentation.

3. In this affidavit I will specifically provide testimony regarding the history of the Muskogee, Oklahoma site, the circumstances leading to and resulting in Fansteel's petition for

Chapter 11 bankruptcy relief, the delivery of the current financial assurance documents to the NRC, and the reasonableness of FMRI's cost estimate for the Muskogee site.

Professional Qualifications

4. I earned a Bachelor of Science degree in economics from Villanova University, and a Master of Business Administration from the University of Maryland.

5. I have been employed by Fansteel since January 26, 1999.

6. Prior to assuming my current position at Fansteel, I served as President of Claricom, Inc., a privately held telecommunications supplier, from May 1997 until July 1998. From April 1995 through December 1996, I served as President, Chief Executive Officer, and a director of Yale International, Inc. From March 1993 until February 1995, I served as President of Breed Technologies, Inc.

History of the Muskogee Site

7. Fansteel, FMRI's predecessor in interest, was licensed by the NRC to possess and use source material at the Muskogee site between January 27, 1967, and December 4, 2003, when the license was transferred to FMRI.¹ Specifically, the licensee was authorized to process ore concentrates and tin slags containing uranium and thorium in the production of refined tantalum products. Licensable quantities of uranium and thorium are present in the slags, ores, concentrates, and process residues, and are contaminants in soil and sediment, on the site.

8. Operations ceased at the Muskogee site in December 1989. From 1989 through August 1996, Fansteel removed processing equipment, conducted limited site remediation, decommissioning of selected site areas, and completed a Remediation Assessment of the site.

¹ See Letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, "NRC Approval for Fansteel to Transfer Its License as License Amendment 12 (Hearing File Tab 50). In its

Fansteel decontaminated approximately 35 acres of the Muskogee site designated as the "Northwest Property," and the NRC released this area for unrestricted use in August 1996.²

9. On January 25, 1995, Fansteel submitted an application to reprocess residues designated as "Work-In-Progress" ("WIP") material, which were generated as a result of the initial hydrofluoric acid digestion of the ore concentrates. The purpose of the reprocessing was to recover tantalum and niobium concentrate, scandium oxide and aluminum trifluoride from the "recycled" material. On March 25, 1997, the NRC granted a license amendment to allow reprocessing of the WIP residues.

10. A groundwater interceptor trench was constructed on the site, beginning in 1997. This system was completed in April 1999, and began operations in August 1999, to mitigate the effects of groundwater contamination at the site pending remediation. It has been successfully operating since.

11. In accordance with the amended license, pilot production from the reprocessing plant began in late 1999; however, Fansteel encountered production problems which required significant additional capital to make improvements to the plant in order to achieve commercially viable production levels. After the additional expenditures were made, however, the market price of tantalum severely declined, and, as a consequence, Fansteel concluded that aggregate projected revenues in the processing operation would be insufficient to recover operating costs and suspended commercial reprocessing efforts. Generally Accepted Accounting

Presentation, the State incorrectly references Fansteel as the current NRC licensee. The relationship between Fansteel and FMRI is discussed further below.

² See Letter from R.C. Pierson, NRC, to J.J. Hunter, Fansteel, "Release of the Northwest Property for Unrestricted Use," dated August 23, 1996 (NRC ADAMS accession number 9608290059). Nineteen acres of the Northwest Property was sold to the Port of Muskogee in 1999.

Principles then mandated that Fansteel take a pre-tax loss, in the third quarter of 2001, of \$83,500,000, representing a charge of \$31.5 million for construction, equipment and pilot production costs of the processing facility and a reserve of \$52 million representing the additional costs (in addition to the reserve of \$4.2 million that Fansteel had on its balance sheet for remediation of the Muskogee site) for offsite decommissioning of all contaminated residues and soils. The loss, charges and reserves resulted in defaults of various provisions of Fansteel's principal credit facility. As a consequence, Fansteel's revolving credit facility was terminated by its principal lender and nearly all the cash being collected by Fansteel was automatically offset against the outstanding loan balance. Unable to obtain outside financing, Fansteel was forced to file for bankruptcy protection under Chapter 11 of the United States Bankruptcy Code in the United States Bankruptcy Court for the District of Delaware on January 15, 2002.

Events Following Fansteel's Bankruptcy Filing and Institution of This Proceeding

12. Fansteel recognized that one of the significant issues facing it in bankruptcy was the environmental remediation of a number of sites, including Muskogee. The company worked closely with the NRC, the Department of Justice ("DOJ"), the Pension Benefit Guaranty Corporation ("PBGC"), and the Environmental Protection Agency ("EPA") to craft a solution that would permit remediation of all environmental sites, while still meeting its obligations to other creditors in accordance with the bankruptcy laws. A liquidation of the company, as demonstrated by financial analyses before the Bankruptcy Court, would have led to an inability to even begin remediation at the environmental sites.

13. On June 25, 2002, Fansteel submitted to the NRC, pursuant to Condition 21 of License SMB-911, an updated decommissioning cost estimate for the Muskogee site, which

reflected the revised estimate of \$57 million for the total cost of remediating the site.³ Due to the bankruptcy, Fansteel at that time requested that the NRC postpone consideration of financial assurance until December 20, 2002. Thereafter, on August 27, 2002, Fansteel filed an application for renewal of license SMB-911.⁴ In response to both the June 25 letter and the license renewal application, on October 22, 2002, the NRC denied the license renewal application, primarily because Fansteel had not provided the financial assurance required by 10 C.F.R. § 40.36. Accordingly, the NRC limited activities at the Muskogee site to those directly related to decommissioning and maintaining control of the site and licensed materials. However, with no approved decommissioning plan, the only expenditures Fansteel was permitted to make related to maintaining control of the site and licensed materials.

14. On December 20, 2002, Fansteel notified the NRC of its intent to submit a decommissioning plan within 12 months.⁵ Fansteel subsequently submitted its Decommissioning Plan ("DP") on January 14, 2003.⁶ In a letter dated April 28, 2003, the NRC

³ See Letter from G.L. Tessitore, Fansteel, to L. Camper, NRC, dated June 25, 2002 (NRC ADAMS accession number ML021780437). It utilized the same preliminary analysis as the pre-bankruptcy cost estimate.

⁴ See Letter from A.F. Dohmann, Fansteel, to J.W. Hickey, NRC, "License Renewal Application," dated August 27, 2002; 10 C.F.R. § 40.42(d).

⁵ See Letter from A.F. Dohmann, Fansteel, to J. Shepherd, NRC, "NRC License Number SMB-911," dated December 20, 2002 (NRC ADAMS accession number ML030080232).

⁶ See Letter from G.L. Tessitore, Fansteel, to J. Shepherd, NRC, dated January 14, 2003 (Hearing File Tab 1). The letter did not include certain sections of Chapter 15 related to decommissioning funding assurance. At that time, the terms and conditions of such financial assurance were still being negotiated in the context of the bankruptcy proceeding. It should also be noted that in 1998 Fansteel submitted a DP contemplating restricted release of a portion of the Muskogee site and construction of an onsite disposal cell for contaminated soils and building materials. Following the State of Oklahoma's objection to the proposed DP, based primarily on the presence of the containment cell, Fansteel withdrew that plan. See *Fansteel Inc. (Muskogee, Oklahoma Facility)*, LBP-01-2, 53 NRC 82 (2001) (terminating proceeding).

indicated that, while it did not object to the proposed approach to decommissioning the Muskogee site, it had concluded that the DP did not contain sufficient information to conduct a detailed review.⁷ Following discussions in the context of settlement with the NRC and DOJ regarding the ongoing bankruptcy case, Fansteel made additional submissions on May 8 and May 9 describing a four-phased approach to decommissioning the site that would advance the schedule set forth in the DP.⁸ In a letter dated May 9, 2003, the NRC accepted the DP for technical review in light of the additional submissions.⁹

15. On June 26, 2003, Fansteel learned, during a telephone call with NRC Staff that the Staff had on that date suspended its review of the DP because Fansteel had not submitted an associated license amendment request that, in the Staff's view, was required by 10 C.F.R. Part 40.¹⁰ Upon learning of the Staff's decision, Fansteel withdrew the DP in order to evaluate its path forward with respect to resolution of issues surrounding the DP in light of the pending bankruptcy proceeding.¹¹ Thereafter, in a letter dated July 8, 2003, the NRC Staff acknowledged

⁷ See Letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, "Results of Preliminary Review of Fansteel's Decommissioning Plan Dated January 2003," dated April 28, 2003 ("April 28 Letter") (Hearing File Tab 2).

⁸ See Letter from G.L. Tessitore, Fansteel, to D.M. Gillen, NRC, dated May 8, 2003 (Hearing File Tab 3); Letter from R.M. McEntee, Fansteel, to NRC Document Control Desk, dated May 9, 2003 (Hearing File Tab 5).

⁹ See Letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, "Results of Preliminary Review of Fansteel's Decommissioning Plan Dated January 2003," dated May 9, 2003 (Hearing File Tab 6).

¹⁰ As noted above, Fansteel previously had been informed by the NRC that the information provided by Fansteel was sufficient for the NRC staff to proceed with a detailed technical review of the DP; on June 26, the NRC Staff apparently changed its position in this regard. See NRC May 9 Letter.

¹¹ See Letter from G.L. Tessitore, Fansteel, to J. Shepherd, NRC, "Fansteel Inc., License No. SMB-911, Docket No. 40-7580," dated June 26, 2003 (Hearing File Tab 7).

Fansteel's withdrawal of the DP, but also indicated its willingness to proceed with its review of the DP "upon receipt of notification in writing that the proposed DP should again be considered for review" including submission of a request to amend License SMB-911.¹²

16. On July 24, 2003, following several months of discussions with numerous entities, including the NRC and DOJ, Fansteel filed with the Bankruptcy Court a proposed "Joint Reorganization Plan of Fansteel Inc. and Subsidiaries," ("Plan") together with the associated "Disclosure Statement With Respect to Joint Reorganization Plan of Fansteel Inc., *et al.*" ("Disclosure Statement"). Among other things, the Plan provided for remediation of the Muskogee facility and transfer of the Muskogee site (including real property, equipment and improvements), the NRC license, and other valuable consideration, including Fansteel's rights under the Decommissioning Trust established as NRC-mandated financial assurance for decommissioning, to a wholly-owned subsidiary of Reorganized Fansteel, now known as FMRI. As the NRC licensee, FMRI's sole purpose is completion of site decommissioning pursuant to NRC regulations and the terms and conditions of the license.

17. On July 24, 2003, contemporaneously with submission of the proposed Plan and Disclosure Statement to the Bankruptcy Court, Fansteel requested that the NRC resume its review of the January 14, 2003 DP. As part of this request, Fansteel supplemented the DP with information concerning financial assurance for decommissioning, as set forth in the proposed Plan.¹³ In conjunction with its review of the DP, as supplemented, Fansteel also requested for

¹² See Letter from J.C. Shepherd, NRC, to G.L. Tessitore, Fansteel, "Response to Fansteel Submittal of June 26, 2003," dated July 8, 2003, at 2 ("NRC July 8 Letter") Hearing File Tab 8).

¹³ This submission attached the cost estimate and statement of cash flow provided to the NRC as proprietary information on May 9, 2003 for inclusion on the public docket.

the first time related approvals, including a request for amendment of the NRC license to reflect approval of the DP.¹⁴

18. On October 31, 2003, the NRC Staff issued an Environmental Assessment ("EA") and Finding of No Significant Impact ("FONSI") in connection with the DP.¹⁵ In addition, in accordance with 10 C.F.R. § 2.1205(m), the NRC Staff issued its approval of the DP.¹⁶ On that same date, the NRC issued its approval of the transfer of the SMB-911 license from Fansteel to FMRI.¹⁷

19. In addition, during the pendency of this proceeding, Fansteel has exited bankruptcy. On December 23, 2003, Fansteel's Second Amended Joint Reorganization Plan

¹⁴ See Letter from G.L. Tessitore, Fansteel, to D.M. Gillen, NRC, "Requests for Licensing Actions in Connection with the Decommissioning Plan for the Muskogee, Oklahoma Site," dated July 24, 2003 (Hearing File Tab 9). In a separate submission, Fansteel also requested NRC consent to transfer the SMB-911 license to FMRI Inc. See Letter from G.L. Tessitore, Fansteel, to D.M. Gillen, NRC, "Request for Consent to License Transfer," dated July 24, 2003. Notice of the proposed license transfer and an opportunity for a hearing thereon was published in the *Federal Register* on August 21, 2003. See 68 Fed. Reg. 50,558 (Aug. 21, 2003). In response to this notice, the State submitted a request for hearing, which was denied by the Commission, for lack of an admissible contention, on October 23, 2003. See *Fansteel Inc.* (Muskogee, Oklahoma Site), CLI-03-13, 58 NRC 195 (2003).

¹⁵ See Nuclear Regulatory Commission, Fansteel Inc., License Number SMB-911, Environmental Assessment, Finding of No Significant Impact, October 31, 2003 (Hearing File Tab 32). On December 8, 2003, the State filed an "Objection to Issuance of the Environmental Assessment and Finding of No Significant Impact." Both Fansteel and the NRC Staff filed oppositions to the Objection, which was dismissed in a Memorandum and Order dated January 14.

¹⁶ See Letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, "NRC Approval of Fansteel's Decommissioning Plan as License Amendment 11," dated December 4, 2003 (Hearing File Tab 51).

¹⁷ See Letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, "NRC Approval for Fansteel to Transfer Its License as License Amendment 12 (Hearing File Tab 50).

("Plan") was confirmed by the Bankruptcy Court.¹⁸ The Second Amended Plan reflected a settlement with the State of Oklahoma of a dispute regarding the transfer of the Oklahoma Pollutant Discharge Elimination System ("OPDES") permit for the Muskogee site issued by the Oklahoma Department of Environmental Quality ("ODEQ"). Specifically, the ODEQ agreed to transfer the OPDES permit from Fansteel to FMRI without modification, in exchange for modification of the Plan to provide ODEQ with *pari passu* indemnity and third-party beneficiary rights to one of the financial assurance documents discussed below, the FMRI Secondary Note. In addition, ODEQ was granted a security interest in the FMRI Secondary Note and the proceeds thereof.

20. From the outset of their Chapter 11 cases, Fansteel (and its affiliated debtors) believed that the confirmation and consummation of a reorganization plan would require a consensus among their most significant creditor constituencies, including the Creditors' Committee, the NRC, EPA, PBGC, and various other state and federal agencies and regulatory authorities. The resulting Plan, which was agreed to only after substantial negotiations with the above-mentioned entities, is structured to provide a Reorganized Fansteel which is a viable entity, capable of fulfilling all its financial duties with regard to remediation and environmental obligations, and will maximize value for creditors while minimizing costs to the debtors' estates. Given the cash flow projections for the debtors, the demands of the unsecured creditors that substantial assets be sold to provide a cash recovery, the claims by the PBGC which were joint and several for all debtors and the substantial environmental liabilities that would not be

¹⁸ See Fansteel Inc., Order Pursuant to 11 U.S.C. §§ 1127(b) Confirming Debtors' Second Amended Joint Reorganization Plan Dated December 18, 2003, Case No. 02-10109 (JJF), December 23, 2003. The Second Amended Plan can be found in the Hearing File, Tab 55.

discharged by bankruptcy proceeding, the Plan represented the only reasonable, confirmable plan.

21. FMRI's operations are to be funded by proceeds of certain insurance claims, use of the Decommissioning Trust, and a series of notes issued by Reorganized Fansteel to FMRI, as follows:

- The FMRI Primary Note, a \$30.6 million unsecured, non-interest bearing note maturing on December 31, 2013, issued by Reorganized Fansteel to FMRI and payable semi-annually, following the initial payment on the Effective Date of \$250,000 from Reorganized Fansteel, in payments of \$700,000, except that the first semi-annual payment following the Effective Date shall be in the amount of \$450,000, taking into account the \$250,000 paid on the Effective Date) and mandatory additional prepayments of up to a maximum of \$4 million funded by (i) 50% of Reorganized Fansteel's "excess available cash" (actual amount to be determined within 90 days of each fiscal year end by Reorganized Fansteel's outside auditors) and (ii) if the aggregate amount of the minimum semi-annual payments plus the amount, if any, paid under clause (i) above, is less than the budgeted amount for the current fiscal year, then up to 50% of prior fiscal year-end cash balance of Reorganized Fansteel (subject to limitations imposed by applicable law), including cash balances at Reorganized Wellman (to extent that such amounts are permitted under applicable law to be dividended or loaned to Reorganized Fansteel), shall be paid so as to satisfy in full the actual remediation costs for the prior year;
- The FMRI Secondary Note, a \$4.2 million unsecured, non-interest bearing note issued by Reorganized Fansteel to FMRI (to cover estimated costs of groundwater treatment and monitoring to be completed to a standard to be agreed upon between FMRI and the NRC consistent with applicable law), maturing December 31, 2023, with annual payments of approximately \$282,000 commencing on or about January 1, 2009, until maturity; and
- An FMRI Contingent Note to be issued by Reorganized Fansteel to FMRI that will be in an amount determined by Reorganized Fansteel, FMRI, and the NRC after completion of additional site characterization during Phase 3 of the DP (or following dispute resolution, if no agreement); the FMRI Contingent Note will reflect, as and to the extent required, additional costs to remediate soils (in excess of costs estimated in the DP), and other additional costs required to complete the DP and remediate and monitor groundwater;
- If Reorganized Fansteel is unable to timely and/or fully fund FMRI's remediation obligations under the DP in any given year,, then FMRI may draw up to \$2 million from the existing Decommissioning Trust on a revolving basis (*i.e.*, subject to replenishment); provided that, at no time shall the aggregate amounts outstanding under such draws from the Decommissioning Trust exceed \$2 million.

22. The NRC is a third party beneficiary of the notes and will be able to enforce them if Reorganized Fansteel defaults on the notes. The NRC has been granted a pledge on the proceeds from any of the FMRI Notes and will receive an indemnification from Reorganized Fansteel with respect to Reorganized Fansteel's obligations under the FMRI Notes. Pursuant to certain license conditions imposed by the NRC, the NRC will be kept apprised of payments on the notes and the application of the proceeds to NRC-approved decommissioning activities, as well as of the status of site remediation efforts. The NRC also retains its right to audit these activities.

23. Among other things, as stated above, the Plan also provides that ODEQ has a security interest in the FMRI Secondary Note. Specifically, the Plan provides that ODEQ has third-party and beneficiary rights equal to those of the NRC with respect to the Secondary Note, related to groundwater remediation, and is granted by FMRI a security interest in the Secondary Note and the proceeds thereof, again equal to the rights of the NRC.

24. The Plan became effective on January 23, 2004. As of that date, Fansteel emerged from bankruptcy. In connection with implementation of the Plan, among other things, NRC license SMB-911, and all equipment, real property, improvements, and all other assets of Fansteel comprising the Muskogee facility were transferred to FMRI, a subsidiary of Reorganized Fansteel.¹⁹

Delivery of Financial Assurance Documents to the NRC

25. The NRC is in possession of original, executed financial instruments for the Muskogee site. A chronology of the events surrounding their submission follows.

¹⁹ See Notification to Presiding Officer from Counsel for FMRI Inc., dated January 29, 2004.

26. On November 5, 2003, counsel for Fansteel submitted to the NRC, by electronic mail, drafts of the following financial assurance instruments for approval as to form and content: the FMRI Primary Note, FMRI Secondary Note, FMRI Contingent Note, Indemnification Letter, Pledge Agreement, Decommissioning Trust Agreement, and Certification of Financial Assurance.²⁰ Later that day, counsel for Fansteel received a response from Thomas Fredrichs of the NRC Staff, responding that these documents would satisfy the NRC.²¹ Thereafter, in a letter dated November 7, 2003, the NRC stated:

Fansteel has submitted its proposed financial instruments that, when executed, will provide the necessary funding. NRC has reviewed these instruments and has concluded that, when executed and in combination with license conditions regarding financial accounting, planning, reporting, payment collection, and Trust Fund replenishment, they are acceptable in form and content to provide funding for decommissioning of the Muskogee site. However, these instruments must be executed and delivered to NRC before the NRC can approve the DP . . .²²

27. Fansteel responded to the NRC Staff's November 7, 2003, letter on November 24, 2003,²³ at which time Fansteel provided the NRC with executed originals of the Decommissioning Trust Agreement, FMRI Primary Note, FMRI Secondary Note, FMRI

²⁰ See E-mail message from J. Curtiss, Winston & Strawn LLP, to M. Schwartz, T. Fredrichs, and J. Shepherd, NRC, "FW: Fansteel Financial Assurance Materials," dated November 5, 2003, 12:48 p.m. (Hearing File Tab 41).

²¹ See E-mail message from T. Fredrichs, NRC, to J. Curtiss, Winston & Strawn LLP, M. Schwartz and J. Shepherd, NRC, "Re: FW: Fansteel Financial Assurance Materials," dated November 5, 2003, 1:55 p.m. (Hearing File Tab 42).

²² See Letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, "NRC Agreement to Fansteel's Proposed License Amendments," dated November 7, 2003 (Hearing File Tab 43).

²³ See Letter from G.L. Tessitore, Fansteel, to D.M. Gillen, NRC, "Response to NRC Letter of November 7, 2003," dated November 24, 2003 (Hearing File Tab 48).

Indemnification Letter, FMRI Pledge Agreement, and Certification of Financial Assurance.²⁴ At the time these executed documents were delivered to the NRC, the NRC Staff supplied a necessary signature for the FMRI Indemnification Letter. Also on November 24, 2003, Fansteel delivered to the NRC an original, executed FMRI Contingent Note and associated Escrow Agreement. The NRC Staff signed the Escrow Agreement at that time.²⁵ The NRC Staff specifically approved these financial instruments as part of its December 4, 2003 approval of the DP. *See* Safety Evaluation, Section 14.3.1.1.

28. Thereafter, in the context of the bankruptcy, Fansteel entered into negotiations with the State regarding the transfer from Fansteel to FMRI of Fansteel's OPDES Permit for the Muskogee site. A settlement was reached with the State that upon approval by the Bankruptcy Court permitted transfer of the OPDES Permit from Fansteel to FMRI without substantive modification or reissuance.²⁶ As part of that settlement, the State became a third party beneficiary to the FMRI Secondary Note, and a secured party under the FMRI Pledge Agreement, with rights under these respective instruments equal to the rights of the NRC. In the Bankruptcy Court, Fansteel filed a motion seeking confirmation of the Plan as modified to reflect the Settlement Agreement. On December 23, 2004, the Bankruptcy Court approved the settlement and confirmed the Second Amended Plan, making the effective date for Fansteel's emergence from bankruptcy January 23, 2004.

²⁴ *See* Attachments to Fansteel letter of November 24, 2003 (Hearing File Tab 49).

²⁵ *See* Escrow Agreement (NRC ADAMS Accession Number ML033350044), dated November 24, 2003, and FMRI Contingent Note (NRC ADAMS Accession Number ML033350053).

²⁶ The only substantive differences between the new permit, issued on December 12, 2003, and transferred to FMRI on December 23, 2003, were to add requirements to monitor gross alpha radiation and to line certain ponds.

29. Fansteel notified the NRC of these developments by letter dated December 24, 2003.²⁷ In that letter, Fansteel described the following changes to the financial instruments, and executed new original financial instruments as follows:

- The date of the FMRI Primary Note,²⁸ the FMRI Secondary Note,²⁹ the Indemnification Letter³⁰ and the Escrow Agreement were changed to reflect the new effective date of January 23, 2004.
- In Section G of the Escrow Agreement, the termination date was changed to February 15, 2004, as a result of the new Effective Date.
- The FMRI Pledge Agreement³¹ required two specific changes: First, the date of the Pledge Agreement was changed to reflect the new effective date. Second, the NRC executed a "Waiver and Consent," providing that the NRC permitted FMRI to grant a security interest in the FMRI Secondary Note to the ODEQ.
- The NRC Staff and State signed the "ODEQ-NRC Intergovernmental Agreement"³² with respect to the FMRI Secondary Note.

Fansteel's December 24 letter also appended the Second Amended Plan. On December 29, 2003, Fansteel transmitted a minor revision to page 2 of the Pledge Agreement to reflect an NRC Staff comment.³³ On December 30, 2003, counsel for Fansteel transmitted the signature page of

²⁷ See Letter from G.L. Tessitore, Fansteel, to D.M. Gillen, NRC, "Ministerial Changes to Financial Assurance Documents to Reflect Partial Settlement with State of Oklahoma," dated December 24, 2003 (Hearing File Tab 55).

²⁸ The Primary Note, as amended on December 24, 2003, appears at Hearing File Tab 60.

²⁹ The Secondary Note, as amended on December 24, 2003, appears at Hearing File Tab 61.

³⁰ The Indemnification Letter, as amended on December 24, 2003, appears at Hearing File Tab 59.

³¹ The Pledge Agreement, as amended on December 24, 2003, appears at Hearing File Tab 58.

³² The Intergovernmental Agreement appears at Hearing File Tab 57.

³³ See Letter from M.J. Wetterhahn, Winston & Strawn LLP, to C.M. Craig, NRC, "Administrative Change to Pledge Agreement," dated December 29, 2003 (Hearing File Tab 56).

the Intergovernmental Agreement, transmitting the signature of the State's representative.³⁴ Finally, on January 23, 2004, counsel for Fansteel transmitted to the NRC revised pages of the FMRI Primary Note, FMRI Secondary Note, FMRI Contingent Note, FMRI Escrow Agreement, and FMRI Pledge Agreement, to correct the date of the Plan.³⁵

FMRI's Cost Estimate

30. Fansteel set forth an initial cost estimate in Chapter 15 of the January 2003 DP. That estimate, as stated in Section 15.1, addressed all of the items detailed in NUREG-1727. (*Id.*) See Appendix 15-1 of the DP. The January 2003 DP included costs for all items detailed in NUREG-1727, totaling \$26.5 million.³⁶ Particular elements that went into this cost estimate were set forth in detail in Section 15.1 of the DP.³⁷ Total costs to remediate the site were estimated to be \$41.6 million.

³⁴ See Letter from M.J. Wetterhahn, Winston & Strawn LLP, to C.M. Craig, NRC, "Original Signature Page for Intergovernmental Agreement," dated December 30, 2003.

³⁵ See Letter from M.J. Wetterhahn, Winston & Strawn LLP, to T.L. Fredrichs, NRC, "Administrative Changes to Financial Documents," dated January 23, 2004 (NRC ADAMS accession Number ML040270235).

³⁶ This estimate differed from the earlier \$57.1 million estimate represented primarily (1) the use of dose-based cleanup criteria instead of SDMP criteria; (2) a change in groundwater treatment technology from evaporation with no discharge, to the use of a sand bed, with discharge through permitted outfalls; (3) air-drying of excavated WIP and CaF material, rather than using mechanical dryers; and (4) reduced facility oversight.

³⁷ The \$26.5 million estimate represents the amount of the cost of decommissioning which, in accordance with NRC requirements and Staff guidance, would have to be assured by one of the methods acceptable to the NRC pursuant to 10 C.F.R. § 40.36(e), less the value of the Decommissioning Trust. However, as discussed above, since the cost of decommissioning is being funded by a series of notes, a higher value for the cost estimate was utilized to ensure that costs related to decommissioning, but excluded from NRC requirements, were assured.

31. There is some uncertainty with respect to the amount of contaminated soil beneath the ponds.³⁸ That contingency is provided for by virtue of the Contingent Note, part of FMRI's financial assurance mechanism. After FMRI completes the schedule for Phase 2 remediation as set forth in the DP,³⁹ FMRI shall submit to the NRC for review and approval a Work Plan for the additional site characterization to be performed during Phase 3 of the DP. The Work Plan shall be consistent with the applicable standards set forth in the DP. After the NRC approves the Work Plan, FMRI shall perform the additional site characterization.

32. Within 60 days of completing additional site characterization during Phase 3 of the DP, Reorganized Fansteel and/or FMRI will submit to the NRC (i) the results of site characterization, analyses, and conclusions as to the volume of additional soils, if any, requiring remediation (*i.e.*, in excess of the amount set forth in the DP); (ii) the incremental cost of remediation of such soils; (iii) proposed modifications, if any to the scope and nature of groundwater treatment and/or monitoring, predicated on applicable standards; and (iv) the proposed terms of any required Contingent Note. The terms of the note include:

- A principal amount to be proposed by Reorganized Fansteel and FMRI and determined by agreement of the NRC after completion of additional site characterization (or following dispute resolution, if there is no agreement). This principal amount will reflect, as and to the extent required, additional costs to remediate soils (in excess of costs estimated in the DP) and other additional costs (*i.e.*, costs not in the DP, but not a reserve

³⁸ Fansteel, FMRI's predecessor in interest, determined some time ago that there is no mixed waste on the Muskogee site. See Letter from J.J. Hunter, Fansteel, to A. Datta, NRC, dated November 10, 1994, Att. at 6 ("Fansteel has not identified any hazardous wastes at the site which would require classification as hazardous materials under RCRA. Since there are no hazardous wastes, the definition of mixed wastes would not be applicable.")

³⁹ See Letter from G.L. Tessitore, Fansteel, to D.M. Gillen, Fansteel, dated May 8, 2003 (and as approved by the letter from D.M. Gillen, NRC, to G.L. Tessitore, Fansteel, dated May 9, 2003) for a description of the activities to be performed in each "phase."


or contingency factor) required to complete the DP and remediate and monitor groundwater.

- Minimum semi-annual payments, commencing only after the \$30.6 million Primary Note described above is paid in full. The amount of the minimum payments will be proposed by Reorganized Fansteel and determined by agreement with NRC following good faith negotiations (or determined pursuant to dispute resolution, if the parties do not agree).
- Mandatory additional prepayments, to commence only after the Primary Note is paid in full, of up to an amount proposed by Reorganized Fansteel and determined by agreement of NRC in conjunction with the determination of minimum semi-annual payments. These payments are to be funded by (i) 50% of Reorganized Fansteel's "excess available cash" (actual amount to be determined within 90 days of each fiscal year end by outside auditors); and (ii) if the aggregate amount of minimum semi-annual payments plus the amount, if any, paid under clause (i) above, is less than the budgeted amount for the current fiscal year, then up to 50% of prior fiscal year-end cash balance of Reorganized Fansteel (subject to limitations imposed by applicable law), including cash balances at RW (to the extent that such amounts are permitted under applicable law, to be dividended or loaned to Reorganized Fansteel) shall be paid so as to satisfy in full the actual remediation costs for the prior year.
- A maturity date reflecting any additional time necessary to remediate soils in excess of the amount set forth in the DP (if required).

33. If Reorganized Fansteel is unable to timely and/or fully fund FMRI's additional remediation obligations (if any) under the Contingent Note in a given year, then FMRI may draw up to \$2 million from the Decommissioning Trust Fund on a revolving basis (*i.e.*, subject to replenishment). At no time shall the aggregate amounts outstanding under such draws from the L/C Cash Reserve exceed \$2 million. Future excess cash or insurance proceeds, if any, will be applied to replenish the Decommissioning Trust Fund before reducing the principal amount of the Contingent Note. *See* License Condition 49.

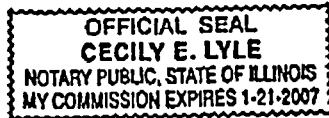
34. In its December 4, 2003 Safety Evaluation Report, the NRC Staff found the cost estimate, including the arrangements relative to the Contingent Note, to be acceptable.

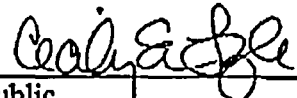
35. The information presented above is true and correct to the best of my knowledge and belief.



Gary L. Tessitore

Sworn and subscribed to before me this 4th day of March 2004.





Notary Public

My Commission expires: 1-21-2007

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE PRESIDING OFFICER

In the Matter of:

FMRI, Inc.

(Muskogee, Oklahoma Facility)

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Docket No. 40-7580-MLA-3

ASLBP No. 04-816-01-MLA

Affidavit of A. Fred Dohmann

I, A. Fred Dohmann, being duly sworn, state as follows:

1. I am employed as President and Chief Executive Officer of FMRI, Inc. ("FMRI"). My business address is Ten Tantalum Place, Muskogee, Oklahoma 74403. I am responsible for implementing and completing the Decommissioning Plan ("DP") dated January 14, 2003, as supplemented and approved by the Nuclear Regulatory Commission ("NRC") by license amendment dated December 4, 2003, that is at issue in this proceeding.

2. On January 30, 2004, the State of Oklahoma ("State") filed a written presentation setting forth its areas of concern with respect to the DP. The purpose of this affidavit is to respond to certain issues raised by the State in its written presentation.

3. In this affidavit I will specifically provide testimony regarding the existence and adequacy of FMRI site programs and procedures, and the appropriateness of the industrial worker exposure scenario for the Muskogee site.

Professional Qualifications

4. I earned a Bachelor of Science degree in chemical engineering from the University of Southwestern Louisiana in May 1980.

5. I have been employed by FMRI, or its predecessor in interest, Fansteel Inc., since May 2000.

6. Prior to joining Fansteel, I was employed from October 1992 to May 2000, in positions of increasing responsibility, by Ausimont USA, Inc. in the area of sales, marketing and application development for wire and cable products. From June 1980 to October 1992 I was employed in positions of increasing responsibility with Chevron Chemical Company in the area of high- and low-density polyethylene production.

7. I joined Fansteel in May 2000 as the general manager of the Specialty Metals Division, located at the facility in Muskogee, Oklahoma (the "Muskogee Site"). In this capacity, and in my current capacity as President and CEO of FMRI, I have been responsible for overall management of the Muskogee Site, including establishing business plans and budgets, developing sales and marketing strategy, and supervising the design and re-engineering of plant processes. In addition to those general responsibilities, I have had significant involvement with state and federal regulatory compliance matters. As a result of these responsibilities, I am personally familiar with the current and former operations at the Muskogee Site.

Adequacy of Site Programs and Procedures

8. FMRI has in place at the Muskogee site, among others, the following programs, procedures and instructions:

- Policy & Program Manual (February 5, 2001). The Policy & Program Manual sets forth the policies and programs maintained by FMRI in the areas of administration, operations, health and safety, emergency response, and environmental monitoring.

- Procedure GG-001, “Operating Procedure System.” The purpose of this procedure is to establish a standardized, uniform method for development, distribution, implementation and maintenance of Standard Operating Procedures at the Muskogee facility.
- Procedure GG-003, “Condition Reports.” This procedure sets forth the process to identify, document, and respond to concerns or adverse conditions in a timely and effective way, commensurate with their level of significance. The procedure ensures that an adequate review is made of the reportability of each identified condition, and provides for management review of issues that might not otherwise be initiated.
- Procedure G-004, Rev. 0 “Radiation Safety Committee.” This procedure establishes the duties and responsibilities of the FMRI Radiation Safety Committee.
- Procedure G-005, Rev. 0, “General Employee Training.” This procedure establishes the requirements for General Employee Training of personnel who are to perform work at the Muskogee site.
- Procedure HS-300, Revision 0, “Selection, Issue and Use of Respiratory Protection Equipment” (February 5, 2001). This procedure provides the requirements for selecting and issuing respiratory protection equipment.
- Procedure HSDI-100, Rev. 0, “Health & Safety Training Follow-Up Program” (February 5, 2002). This instruction provides the requirements for new employee health and safety training follow-up.
- Procedure HSDI-300, Revision 0, “Medical Evaluation for Respirator Wearers” (January 22, 2001). This instruction provides the requirements for completing a medical evaluation to determine an individual’s ability to use a respirator.

- Procedure HSDI-301, “Fit Testing” (October 16, 2001). This instruction provides the requirements for completing a fit test of a respirator wearer for a tight-fitting, face-sealing respirator.
- Procedure HSDI-302, “Cleaning Respirators” (October 16, 2001). This instruction provides the requirements for cleaning respirators.
- Procedure HSDI-402, Revision 3, “Performance of Radiation Surveys.” This instruction describes the requirements for performing radiation surveys.

Each of these programs and procedures currently complies with NRC requirements, and will be updated, as necessary, to reflect decommissioning activities to take place under the DP.

Use of the Industrial Worker Scenario at the Muskogee Site

9. I have had extensive discussions with representatives of the Muskogee City-County Port Authority (“Port”) regarding the future use of the Muskogee site. The Port provides service transloading facilities for barge, rail and truck cargo. The site, which is already zoned light industrial/commercial, is located contiguous to the Port. The FMRI property is bounded by the Arkansas River, State Highway 62, the Muskogee Turnpike, and the Port, and lies on a proposed right-of-way to bring additional access to the Burlington Northern Railroad to the Port. Other industrial businesses, including Koch Pavement Solutions (paving asphalt materials) and Zapata Industries, Inc. (former producer of bottle caps) border or are in close proximity to the FMRI facility.

10. In such circumstances, it is my opinion that the appropriate land use for purposes of establishing risk-based soil or groundwater cleanup levels would be for an industrial worker. This is reinforced by certain actions taken in recent years by the Port. The Port plans, in its Master Plan of Development for the Muskogee Port and Industrial Park, to utilize certain of the

areas to be remediated under the DP. To accomplish this, the Port has amended its Master Plan to change the status of these areas to "Land to be Appraised and Purchased."¹ In addition, the Port has specifically stated its intent to acquire the Muskogee site property, to further develop certain areas of the property for use by the Port. Specifically, the Port has expressed a desire to construct (1) a proposed 50-foot railroad right of way across the Muskogee site, and (2) a proposed Asphalt Terminal Expansion site on the Muskogee site.² Nineteen acres of the Muskogee site were sold to the Port in 1999.

11. The domestic water supply for the site is currently and for the foreseeable future from a municipal source. The municipal source is capable of supplying sufficient water for typical manufacturing industries in the area.

¹ See Letter from S. Robinson, Director, Muskogee City-County Port Authority, to F. Dohmann, Fansteel, dated November 4, 2002.

² See Letter from S. Robinson, Port Director, to S.A. Thompson, ODEQ, dated July 17, 2003.

12. The information presented above is true and correct to the best of my knowledge and belief.


A. Fred Dohmann

Sworn and subscribed to before me this 3 day of March 2004.


Notary Public

My Commission expires:

Jan. 24, 2008
Commission # 00001386

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE PRESIDING OFFICER

In the Matter of:)	
)	
FMRI, Inc.	)	Docket No. 40-7580-MLA-3
)	
(Muskogee, Oklahoma Facility)	)	ASLBP No. 04-816-01-MLA
)	

Affidavit of Marcel David Tourdot

I, Marcel David Tourdot, being duly sworn, state as follows:

1. I am employed as Vice President for Radiological Services for Penn Environmental & Remediation, Inc. ("Penn"). From 1989-2004, I was employed with Earth Sciences Consultants, Inc. ("ESC"). ESC worked with Fansteel, FMRI, Inc.'s ("FMRI") predecessor, for over 14 years on matters such as site characterization, remediation support, site surveys, radiological health and safety, and general radiological engineering.

2. On January 30, 2004, the State of Oklahoma ("State") filed a written presentation setting forth its areas of concern with respect to the Decommissioning Plan ("DP") dated January 14, 2003, as supplemented and approved by the Nuclear Regulatory Commission ("NRC") by license amendment dated December 4, 2003, that is at issue in this proceeding. The purpose of this affidavit is to respond to certain issues raised by the State in its written presentation.

3. In this affidavit I will specifically provide testimony regarding (1) the adequacy of the site characterization performed in connection with preparation of the DP, and (2) the basis for exclusion of the groundwater pathway when calculating remediation levels to demonstrate that the 25 millirem/year dose limit required by 10 C.F.R. § 20.1402 will not be exceeded.

Professional Qualifications

4. I earned a Bachelor of Science degree in Safety Management from Indiana University of Pennsylvania in 1975, and subsequently completed graduate-level courses in business administration.

5. I have been employed by Penn since January 2004.

6. Prior to assuming my current position at Penn, I held positions of increasing responsibility in the areas of site remediation involving both radiological and non-radiological contaminants, and regulatory compliance in the context of health, safety, industrial hygiene and environmental programs. From 1975-1979, I was employed by Townsend & Bottom, Inc. of Ann Arbor, Michigan at the Shippingport Bruce Mansfield Power Station in the safety and health group. In 1979, I joined Union Switch & Signal, then a division of American Standard. During my ten years there, I worked in the area of safety, security, and environmental affairs. In particular, I oversaw the remediation of a 100-acre manufacture and assemble facility located in Swissvale, Pennsylvania. I left the company in 1987 in the position of General Manager of the Swissvale facility. From 1987 to 1989 I was employed by Kaiser Engineers, and was involved during that time in the decommissioning of several large industrial facilities.

7. I joined ESC as a project manager in 1989, and since then have participated in projects involving the decommissioning of complex sites, particularly involving radiological contamination. I have been involved in decommissioning projects pertaining to several sites on the NRC's Site Decommissioning Management Plan ("SDMP"), including Sequoyah Fuels Corporation, in Gore, Oklahoma; Kaiser Aluminum & Chemical Corporation in Tulsa, Oklahoma, and the Fansteel Muskogee Site. I have served in various capacities on Fansteel Inc. (FMRI's predecessor in interest) remediation projects for the past 15 years. For example, I was

project director for the preparation of the 1993 Remedial Assessment for the Muskogee site, and have been involved in the development of several subsequent proposed decommissioning plans for the site. I served as Project Director for the preparation of the current Decommissioning Plan, overseeing the work of the project managers. I have been closely involved with the environmental evaluation and decommissioning aspects of the Muskogee site since 1989. A statement of my professional qualifications is appended hereto as Exhibit 1.

Characterization of the Muskogee Site

8. As a general matter, the site characterization information for the Muskogee site derives from a Remediation Assessment performed by Fansteel in 1993 (as further updated to reflect ongoing activities since that time, such as ongoing surveys of buildings and equipment). The work performed included installation of soil borings, monitoring wells, and test pits; collection and analysis of soil, sediment, surface water, groundwater, air, and pond residue samples; and performance of a radioactivity scoping survey.¹ Borehole, well, and test pit locations were based on information relative to plant history and operations. Sample locations were chosen based on such factors as the potential for the area to have been impacted by material handling and storage, past releases, manufacturing operations, and air emissions. Sample locations were selected with the intent of characterizing areas of the plant that exhibited the potential for being impacted, as well as background conditions. These selections resulted in a comprehensive site evaluation.

¹ The multi-volume Remediation Assessment was submitted to the NRC following its completion, and can be found at NRC ADAMS Accession Numbers 9401240039, 9401240045, 9402030079, 9402030089, 9402030099, 9402030102, 9402030109, 9402030110, 9402030113, 9402030118, 9402030131, 9402030136, 9402030140, 9402030143, 9402030158, 9402030168, 9402030171, 9402030173, 9402030178, 9402030180, and 9402030181.

9. The Remediation Assessment was preceded by a Remedial Work Plan, which was submitted to the NRC, U.S. Environmental Protection Agency, and the State of Oklahoma. Following the review of the Work Plan by these agencies, their comments were incorporated into the final July 1992 Work Plan that was submitted to the NRC for approval. The Work Plan was approved by the NRC and incorporated into License SMB-911 by amendment dated December 21, 1992.²

10. With respect to the Remediation Assessment, borehole, well, and test pit locations were selected based on information relative to plant history and operations. Sample locations were chosen based on such factors as the potential for the area to have been impacted by material handling and storage, past releases, manufacturing operations, and air emissions. The majority of sample locations were selected with the intent of characterizing areas of the plant that exhibited the potential for being impacted. Other sampling locations were chosen to characterize background conditions.

11. The number of samples and their locations were chosen in order to characterize the conditions of the site based on the information available at the time the Work Plan was prepared and implemented. For example, the test pits were dug in one location because historic information suggested that drums of ore may have been buried at this location. Initially, a geophysical survey was conducted over the area in an attempt to identify any anomalies that might suggest the presence of buried metallic objects. Although the geophysical survey did not identify any such anomalies, a conservative decision was made to proceed with the test pit installations to definitively rule out the possibility of buried drums in this area. Of seven surface water/sediment samples, four were collected from or immediately downstream of FMRI's

² The amendment may be found at ADAMS accession number 9301050272. The July

OPDES-permitted outfalls. This was done to assess the potential for impacts to occur as a result of treated discharges to surface water. The other three were collected from along the length of a shallow drainage located to the west of Ponds 8 and 9. These locations were chosen to give a representative sampling along the entire drainage.

12. Moreover, the number of samples chosen was based on the NRC-approved Remedial Assessment Work Plan that was submitted to the EPA and the State. Fansteel and ESC addressed and NRC and State comments to the Work Plan (EPA provided no comments). It is my opinion that all areas of the site investigated to date have been sufficiently characterized and contamination present in these areas has been adequately identified.

13. The Remediation Assessment represents the "worst case" of site contamination, as it was performed only a few years after site operations terminated in 1989. Site operations since 1990 have, as indicated above, consisted only of environmental monitoring, maintenance of buildings, grounds, and equipment remaining at the site, cleanup of operating areas, and a brief period of reprocessing operations which is discussed further below. Given the comprehensive nature of the Remediation Assessment, it is my opinion that FMRI has sufficient knowledge of the site to support the Staff's approval of the decommissioning plan.

14. Additional soil characterization at this time is not feasible and is unnecessary. The principal concern is to gather further information regarding the extent of contamination of soil beneath the ponds. In order to characterize beneath the ponds, vertical borings would be required, which would penetrate pond liners and potentially cause additional contamination of subsurface soil. Any information gained from horizontal borings would be limited, due to the limited areas under the ponds that could actually be sampled using this technique. Accordingly,

horizontal borings would not provide sufficient data to make a statistically significant conclusion on the actual extent of any contamination that may be detected under the ponds. The 1993 Remediation Assessment sufficiently represents the extent of contamination at the site, given the slow movement of radioactive contamination in the soil. In addition, the interceptor trench is in place to divert groundwater that could otherwise cause additional site contamination. Rather than undertake this characterization now, the NRC Staff proposed license conditions regarding characterization, which address this issue. Specifically, License Condition 29 provides:

In accordance with provisions of 10 CFR 40.42(g)(4)(i) Licensee shall, not later than May 31, 2004, provide a physical description – dimensions, types of liners, etc. – of Pond 1, Pond 1S and 1N, and Pond 4, the time during which each of the ponds were used, what process-related materials and how much was placed in each of the ponds, and how and where those materials were disposed when the ponds were closed.³

License Condition 31 provides:

Licensee shall conduct an additional characterization of any additional contaminants at the site, including all soils, buildings, and groundwater on the site, using guidance in NUREG-1757, Vol. 2. Upon agreement by NRC that any additional contamination is adequately characterized, Licensee shall identify the cost to remediate all contamination identified in this study. Work shall be performed according to the following schedule:

³ Ponds 1, 1S, 1N, and 4 were closed at the time the 1993 Remediation Assessment was performed, and the characterization done at that time included those areas. Specifically, the area of former Ponds 1, 1N, and 1S was characterized by monitoring wells 62S, 66S, 65S, 67S, and 167D, as well as test borings B46, B32, B33, B34, B35, B74, B50, B49, B63, B2, B66, B48, B58, B62, B64, B47; B65, B53, B1, B52, B55, B56, B73, B61, and B54. The area of former Pond 4 was characterized by monitoring wells 68S, 55S, 70S, 64S, 73S, 71S, 174D, 74S, 72S, 75S and 69S, and by test borings B13, B14, B15, B36, B60, B38, B59, B71, B72, B70, B39, B20, B21, B67, B69, B22, and B68. See Figure 2 (Site Plan) of the Remediation Assessment. Additionally, these former pond areas were subject to an instrumentation survey to determine the presence of surficial contamination by radioactive materials and to indicate the possible presence of subsurface accumulations of radioactivity. Measurements of alpha, beta, and gamma radioactivity were obtained at the ground surface at designated points over the entire area. These activities and results can be found in the Remediation Assessment technical report.

- a. Submit a site characterization plan not later than February 28, 2011.
- b. Submit a site characterization report (SCR) not later than December 29, 2011.
- c. Develop detailed work plans to be submitted with the SCR, including cost and schedule, for any additional work identified in the SCR.

15. Detailed plans for the groundwater interceptor trench were provided to the NRC in 1997, and the NRC approved those plans in connection with a December 18, 1997 amendment to authorize processing of CaF wastewater treatment residues. Specifically, activities to be conducted under this approval included "(1) processing of the WIP sludges, (2) processing of wastewater treatment residues in [P]onds 6, 7, 8 and 9; (3) *pumping and treating of contaminated groundwater*; and (4) auxiliary activities such as environmental and effluent monitoring and laboratory activities."⁴ Section 2.1.2.2 provided specific details of groundwater collection and treatment, as follows:

A subsurface drain (conduit) will be installed at the base of the shallow groundwater aquifer to intercept and collect groundwater. The conduit will channel groundwater to sumps via gravity flow. To install the conduit, a .61-meter (2-foot) wide trench will be excavated along the eastern and southern down gradient [sic] boundaries of the site (citation omitted). An impermeable barrier (20- to 30-millimeter high-density polyethylene (HDPE) liner or sheet rock) will be installed along the down gradient side of the trenches. A subsurface drain conduit will consist of a 10- to 15-centimeter (4- to 6-inch) diameter HDPE pipe with a nylon sock fitted around the piping. The pipe will be placed directly on the excavated shale surface or on 15 centimeters (6 inches) of filter pack (pea gravel). The piping will be covered with 0.61 to 0.91 meter (2 to 3 feet) of pea gravel as filter pack material. A trenching machine will excavate the trench and position the conduit, impermeable barrier, and filter pack in one step. The excavation will be backfilled with clean soil to the original ground surface elevation.

⁴ See "Environmental Assessment, License Amendment for Material License No. SMB-911," December 1997 (NRC ADAMS Accession number 9712310292), at § 2.1.2 (emphasis added).

The eastern trench will be approximately 640 meters (2100 feet) long,⁵ and the southern trench will be approximately 265 meters (870 feet) long. The slopes of the conduits in the trenches will be between 0.5% and 3% to minimize bacteria growth and plugging. Access to the conduits for clean-out will be provided for each trench. The eastern trench will have three sumps, and the southern trench will have one sump (citation to figure omitted). The sumps will extend 0.9 to 1.5 meters (3 to 5 feet) below the conduits. Each sump will be equipped with pumps to transfer groundwater to the treatment system via double-walled piping with a leak detection system. The combined average yield from the collection trenches is estimated to be approximately 45 liters (12 gallons) per minute (reference omitted).

The effectiveness of groundwater collection will be monitored using existing facility groundwater monitoring wells, located up gradient and down gradient of the trenches, as piezometers. Additional piezometers will be installed in the filter pack the length of the trenches to monitor the water level and to assess trench effectiveness and to ensure that plugging has not occurred (reference omitted).

The existing wastewater treatment system will be modified for treating collected groundwater. . . . Several treatment methods, including aeration, metals precipitation, microfiltration, and air stripping will be used to remove heavy metals, ammonia, fluoride, MIBK, and radionuclides.

Collected groundwater will be pumped at 45 liters (12 gallons) per minute to two equalization tanks to aerate the groundwater for removal of ammonia and MIBK. Calcium hydroxide will be added to remove metals and fluoride by precipitation. Co-precipitating agents such as calcium chloride may be required to remove fluoride and precipitate heavy metals that may not be [] removed with calcium hydroxide The precipitated solids containing calcium fluoride will be dewatered in a filter press and either further processed or stored on-site.

Microfiltration, consisting of multiple tubular units constructed of an inert fluorocarbon-based membrane, with a 0.1-micron pore size, will be used for further removal of heavy metals and radionuclides. Water will be forced through the membrane pores, and the concentrated liquid containing suspended contaminants will be returned to a concentrate tank. Settled solids in the concentrate tank will be stored on site for further processing. Excess liquids will be recycled through the groundwater treatment system.

⁵

As constructed, the trench exceeds 3000 feet in length.

Air stripping will be used for further removal of ammonia and MIBK. Exhausted air will be released to the atmosphere. The liquid effluent will be neutralized and then routed to the existing wastewater treatment sedimentation ponds (ponds 6 through 9) at a rate of approximately 45 to 114 liters (12 to 30 gallons) per minute. Solids will settle out, and supernatant from the ponds will be discharged to the Arkansas River through an NPDES outfall.

Environmental Assessment at § 2.1.2.2.

16. The interceptor trench was constructed pursuant to the NRC approval in 1998 and 1999. Construction was completed the week of April 19, 1999.⁶ Operation of the system began in August 1999,⁷ and has been inspected regularly by the NRC since that time.⁸ As demonstrated by the environmental sampling program, the interceptor trench has been operating successfully to control groundwater flow and discharge of contaminated groundwater. It will continue to do so until necessary groundwater remediation is completed.

⁶ See Letter from D.D. Chamberlain, NRC, to M.J. Mocniak, Fansteel, "NRC Inspection Report 40-7580/99-01, dated July 7, 1999, at § 4.2(b) (NRC ADAMS Accession Number 9907140057). There are minor variations in the design of the interceptor trench, as constructed. However, its function was not affected by these variations.

⁷ See Letter from D.D. Chamberlain, NRC, to M.J. Mocniak, Fansteel, "NRC Inspection Report 40-7580/99-02," dated December 23, 1999, at § 1.3 (NRC ADAMS Accession Number ML993610124).

⁸ See *id.* § 4.2(c)(3); Letter from D.D. Chamberlain, NRC, to M.J. Mocniak, Fansteel, "NRC Inspection Report 040-7580/00-01 and Notice of Violation," dated May 2, 2000, at § 5.2(c)(3) (NRC ADAMS accession number ML003710588); Letter from D.D. Chamberlain, NRC, to M.J. Mocniak, Fansteel, "NRC Inspection Report 40-7580/01-01," dated March 29, 2001, at § 2.1 (NRC ADAMS accession number ML010880451); Letter from D.D. Chamberlain, NRC, to M.J. Mocniak, Fansteel, "NRC Inspection Report 040-7580/01-02 and Notice of Violation," dated August 22, 2001, at § 4.2(a) (NRC ADAMS accession number ML012340479); Letter from D.D. Chamberlain, NRC, to A.F. Dohmann, Fansteel, "NRC Inspection Report 040-07580/01-03, dated December 18, 2001, at § 1.2(e) (NRC ADAMS accession number ML013520619); Letter from D.D. Chamberlain, NRC, to A.F. Dohmann, Fansteel, "NRC Inspection Report 040-07580/2002-01," dated July 18, 2002, at § 4.2 (NRC ADAMS accession number ML021990597); Letter from K.E. Brockman, NRC, to A.F. Dohmann, Fansteel, "NRC Inspection Report 040-07580/2002-02, dated December 13, 2002, at § 4.2 (NRC ADAMS accession number ML023510077).

17. In 1999, a moderate-strength tornado touched down near the Port of Muskogee. The tornado damaged some of the buildings at the Muskogee site, and wind-blown debris tore the liners of Ponds 3, 8, and 9 above the water line and damaged a stored soil cover. Bags containing material that had been excavated from Pond 5 were damaged, allowing low-level radiological material to spread over a 10-foot diameter. Fansteel collected and removed the material.

18. Following the June 1, 1999, tornado, the NRC performed an inspection to assess Fansteel's response to and planned recovery from the damage. In an inspection report dated December 23, 1999, the NRC Staff determined that Fansteel had recovered from the tornado and had adequately addressed facility repairs, including cleanup of spilled material.⁹

19. The current groundwater remediation strategy consists of the interceptor trench around the down gradient perimeter of the site. This interceptor trench was installed in 1998-99, and keyed three feet into the underlying low permeability shale. The trench was designated and operated to capture all shallow groundwater migrating into a west to east direction towards the Arkansas River. The trench is connected to the existing wastewater treatment system by pumps. Groundwater collected in the trench is treated (treatment consists of neutralization/flocculation by adding lime) and ultimately discharged to the Arkansas River pursuant to an OPDES permit issued by the ODEQ. The State receives monitoring data from the outfalls. The operation of the groundwater system, as confirmed by monitoring, has and will prevent any offsite release of

⁹ See NRC Inspection Report 40-7580/99-02 and Notice of Violation, dated December 23, 1999. The NRC issued an NOV to Fansteel in connection with the tornado event with respect to the Fansteel's *reporting* of the event to the NRC, but did not take issue with any cleanup activities. It should be noted that NRC Staff inspectors determined that the spill covered approximately 2,000-3,000 square feet of property. *Id.*, Enc. 1 at 1; Encl. 2 at 17. Nonetheless, it did not determine that Fansteel's actions to clean up the spill were in any way inadequate.

contaminated groundwater until remediation to acceptable levels is complete. These groundwater remediation activities will continue as part of the wastewater treatment system until it is determined that groundwater meets applicable regulatory standards.¹⁰

20. Downstream surface waters and sediments of the Arkansas River were not sampled during the 1993 Remediation Assessment. However, it is noteworthy to mention that the NRC, EPA, and State of Oklahoma reviewed the Remediation Assessment Work Plan in 1990, and eventually approved it in 1992. The Work Plan was incorporated into License SMB-911. Sampling of surface water and sediments in downstream areas of the Arkansas River was not included in the approved Remediation Assessment Work Plan. Additionally, there is no scientific basis to believe that the levels of chemical and radiological constituents identified on site, if released into the river, could be detected by standard analytical methods because of the significant dilution factor and flow (20,600 cfs, on average) of that river.

21. The highest measured gross alpha contamination in an onsite monitoring well is approximately 2600 pCi/liter. Assume the highly unlikely event of 100,000 liters of groundwater discharged directly into the river (unlikely due to the interceptor trench and treatment system on site) at the maximum alpha activity of 2600 pCi/liter (also unlikely due to various other monitoring wells with average alpha activity concentrations approaching background), a total activity of $2.6E8$ pCi would be discharged. Dilution from the flow rate of the Arkansas River (26,000 cubic feet per second or 736,100 liters per second) would quickly render the activity to levels undistinguishable from background (0.1 pCi/liter). If ingestion exposure were calculated from this pathway, the results would be in the E-20 mrem range. This

¹⁰ FMRI revised the DP pursuant to License Condition 40 on December 31, 2003, to describe current groundwater remediation activities. See Letter from A.F. Dohmann,

is not a creditable pathway for analysis. To further extrapolate to fish intake followed by human ingestion through fish would result in comparable doses.

22. The NRC performed periodic inspections during the pilot project activities that occurred from April 1, 1999, through October 2001. Numerous NRC inspections over the course of the pilot project operation did not identify any concerns regarding release of radioactivity which would impact site characterization.¹¹

Appropriateness of the Industrial Worker Scenario

Background – The Industrial Worker Scenario

23. Under the industrial worker scenario, the dose to an individual who works in an industrial setting is modeled. It is assumed that the industrial worker (the average member of the critical group) spends a certain percentage of his time in buildings or outdoors on a site in order to determine the as-remediated state needed to comply with 10 C.F.R. § 20.1402.¹² It is assumed that the individual occupies a commercial facility for most of a typical working day. As stated in Section 5.2.1.2.3 of the DP, external exposure to penetrating radiation, inhalation of soil dust (while outdoors and during building occupancy) and inadvertent ingestion of soil are the exposure pathways that were considered in developing radionuclide-specific Derived

FMRI, to J. Shepherd, NRC, "Current Groundwater Remediation Activities," dated December 31, 2003.

¹¹ See NRC Inspection Report 40-7580/99-01, dated July 7, 1999; NRC Inspection Report 40-7580/99-02 and Notice of Violation, dated December 23, 1999; NRC Inspection Report 040-7580/00-01 and Notice of Violation, dated May 2, 2000; NRC Inspection Report 40-7580/01-01, dated March 29, 2001; NRC Inspection Report 040-7580/01-02 and Notice of Violation, dated August 22, 2001; and NRC Inspection Report 040-07580/01-03, dated December 18, 2001.

¹² Effectively, the scenario "back-calculates" the remediation criteria for soils which would yield 25 millirem or less total effective dose equivalent ("TEDE") to a worker on the site, using specific assumptions as to occupancy, breathing rate, percentage of time onsite spent indoors and outdoors, and ingestion of contaminated soil.

Concentration Guideline Levels ("DCGLs") for residual radioactivity in site soil for the industrial worker dose assessment.

24. Table 5-2 of the DP summarizes the exposure pathways identified for use in the industrial worker scenario. As indicated in Table 5-2, ingestion of water or groundwater from an on-site well has not been included as a pathway for the purpose of calculating industrial worker exposure. Table 5-3 of the DP summarizes key parameters used in the industrial worker scenario. Contaminated zone parameters are presented in DP Table 5-4. Contaminated zone input data is provided in DP Table 5-5. Soil inhalation and external gamma parameters are set forth in Table 5-6, and Table 5-7 presents building occupancy parameters.

Offsite Doses Under the Industrial Worker Scenario

25. For the industrial worker exposure scenario, dose from the primary pathways (shine, ingestion and inhalation) is limited by time and distance. Therefore, any offsite scenario is, by virtue of the distance from the source material and the limited time of exposure, significantly less (by factors of 10) than the exposure scenario for the industrial worker on which the DP is based. For example, external gamma shine is the primary dose pathway for the industrial worker scenario. This pathway is limited by how close to the remaining source material an individual is and how long the individual is close to the material. Any distance greater than a few meters offsite (or at any point beyond the remediated area) reduces exposure to zero. A boat-launch across the river or any offsite activity by virtue of the distance from the site and the time spent on activity has an associated exposure of zero, and is not a creditable pathway. A postulated trespasser's exposure, for example, is limited by the amount of time spent onsite and the proximity to the remaining source material. Thus, it is highly unlikely that the dose to a trespasser will become the critical scenario, compared to an industrial worker.

Exclusion of the Groundwater Pathway

26. As a practical matter, groundwater at the site is not usable. The "Ground Water Atlas of the United States – HA 730-E," prepared by the United States Geological Survey ("USGS"), indicates that the alluvial aquifer of the Arkansas River is not present on the west bank, near Muskogee. This document also indicates that there are no major bedrock aquifers in this region of Oklahoma. USGS Water Supply Paper 1809-T indicates that the bedrock and the terrace aquifers are not capable of being developed for wells of large yield. Groundwater at the Muskogee site is not currently used as a source of drinking water or for irrigation purposes.

27. Overburden groundwater is present in a terrace deposit, which can produce groundwater for domestic purposes. However, the down gradient extent of the terrace aquifer at the site is truncated by the cutbank of the Arkansas River. As explained in the Affidavit of Scott C. Blauvelt, the bedrock is not in hydrogeologic connection with the overburden, and hydraulic conductivities are too low to produce usable quantities of groundwater in the shale underlying the Fansteel site. For this reason, it is my view that the groundwater pathway need not be considered in performing dose modeling for site release, as the groundwater is not usable.

28. Having said this, although the groundwater pathway was not included in the DP because FMRI believed such exclusion to be technically justifiable and in accordance with NRC requirements, guidance, and precedent, the NRC Staff imposed License Condition 35 on FMRI, which provides:

Licensee shall remediate the site to residual radioactive levels to ensure that exposure to residual radiation in all media from applicable pathways will not result in a dose exceeding 25 mrem/y[ear], as specified in 10 CFR 20.1402. Licensee will establish remediation levels (DCGLs) as part of

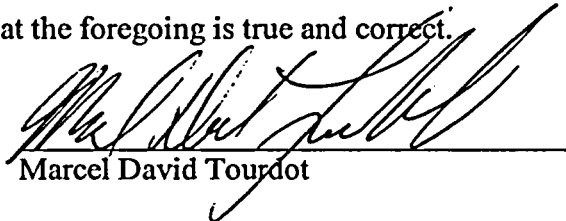
the Phase 3 Workplan, approved by the NRC, that demonstrate the 25 mrem/y dose limit will not be exceeded.

Accordingly, the groundwater pathway is required to be considered, in response to this license condition, in determining the applicable pathways to be used in determining compliance with the 25 millirem limit. Moreover, FMRI already has committed to continue its existing groundwater treatment program until groundwater is satisfactorily remediated.

NRC Staff Requests for Additional Information

29. I oversaw the preparation of FMRI's responses to questions posed by the NRC Staff in the Attachment to the letter from D.M. Gillen to G.L. Tessitore, "Results of Preliminary Review of Fansteel's Decommissioning Plan [DP] Dated January 2003," dated April 28, 2003. These questions have been incorporated into the "State of Oklahoma's Written Presentation," dated January 30, 2004. These responses have been attached as an Exhibit to the "Written Presentation of FMRI Inc. in Opposition to the Written Presentation of the State of Oklahoma." Those responses are incorporated herein by reference.

30. I declare under penalty of perjury that the foregoing is true and correct.


Marcel David Tourdot

PROFESSIONAL PROFILE

MARCEL D. TOURDOT VICE PRESIDENT OF RADIOLOGICAL SERVICES

Fields of Competence

- Decommissioning of Radiological Sites Including SDMP Sites
- Hazardous Materials Management
- Mining Experience Including Permitting, Surveys, and Regulatory Compliance
- Compliance with Federal, State, and Local Safety and Health Regulations
- OSHA Compliance
- Asbestos Abatement and Program Management
- Risk Assessments and Field Audits
- Health and Safety Management
- Site Remediation
- Risk Management & Loss Control

Credentials

- B.S., Safety Management, Indiana University of Pennsylvania
- Occupational Safety and Health Administration 40-hour health and safety course
- Occupational Safety and Health Administration 8-hour retraining health and safety course
- Building Inspector for Asbestos Containing Materials No. 8821
- U.S. EPA Asbestos Abatement Supervisor and Contractor No. ES 222
- Hazard Control Manager- Master Level No. 1230
- Hazardous Materials Manager- Master Level No. 1580
- Certified Environmental Inspector No. 7805
- Member of American Society of Safety Engineers

Experience Summary

Mr. Tourdot has more than 28 years of diversified experience in managing, planning, and implementing site assessments/characterization, remediation, health and safety, and environmental programs at utility and industrial facilities. He is experienced in environmental project management including plant closure and demolition. He has worked extensively with the Nuclear Regulatory Commission (NCR) on several licensed facilities across the nation including a number of SDMP sites.

Mr. Tourdot is also experienced in working with the Occupational Safety and Health Administration (OSHA), U.S. Environmental Protection Agency (USEPA), and various state environmental agencies. He is familiar with numerous regulatory programs including the Clean Air Act (CAA); National Emission Standards for Hazardous Air Pollutants; Clean Water Act (CWA); Safe Drinking Water Act (SDWA); Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); Resource Conservation and Recovery Act (RCRA); and Superfund Amendments and Reauthorization Act (SARA), among many others.

Mr. Tourdot has successfully completed many asbestos, demolition, decommissioning, transportation, hazardous, low-level radioactive waste and mixed waste projects. He also served on the American Society for Testing Materials (ASTM) review committee for Transaction Screen and Phase I Environmental Site Assessment Process Standards.

Key Projects

Mr. Tourdot served as project manager for a specialty metals Remedial Investigation/Feasibility Study project at an NCR licensed facility in Oklahoma. The remedial assessment was performed to determine the types and extent of contamination as well as the appropriate remedial alternatives.

He was also responsible for the successful removal and disposal of 20,000 cubic yards of low-level radioactive contaminated soils from a site. All work was coordinated through the NCR, USEPA, and the local health department and performed under an Order of Consent and subsequent Unilateral Administrative Order.

Mr. Tourdot served as project manager for the decommissioning of a 105-year-old 55-acre manufacturing facility where operations included machining, chemical heat treating, plating, coatings, and resins application. His work included supervision of asbestos and waste quantification and identification, transportation and disposal application of waste streams, and demolition of site buildings to grade. All activities were performed under full regulatory scrutiny.

Mr. Tourdot also acted as site manager and project manager for the decommissioning and demolition of seven coke ovens and chemical byproduct facilities located in Pennsylvania, West Virginia, Ohio, New York, Colorado, and Maryland.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE PRESIDING OFFICER

In the Matter of:)	
)	
FMRI, Inc.	)	Docket No. 40-7580-MLA-3
)	
(Muskogee, Oklahoma Facility)	)	ASLBP No. 04-816-01-MLA
)	

Affidavit of Scott C. Blauvelt

I, Scott C. Blauvelt, being duly sworn, state as follows:

1. I am employed as a Director of Regional Operations for Penn Environmental & Remediation, Inc. ("Penn"). From April 1989 until June 2003, I was the principal hydrogeologist for Earth Sciences Consultants, Inc. ("ESC") at the Fansteel facility located in Muskogee, Oklahoma (the "Muskogee site"). ESC was an environmental consulting firm with expertise in developing and implementing remediation and compliance strategies for facilities regulated by the NRC. ESC also had expertise in geology and hydrogeology. ESC was retained in 1989 to assist Fansteel in responding to the failure of a liner for a retention pond at the Muskogee site. My primary responsibilities were oversight of all technical work performed by ESC at the Muskogee site, including reviewing all geologic and hydrogeologic data that was collected by ESC to characterize the geology and hydrogeology of the site. I have visited the Muskogee site on more than 10 occasions. Personal familiarity with the physical site is important in understanding the hydrogeology and to design an effective system to capture and treat contaminated groundwater. Attached as Exhibit 1 is a chart depicting the hydrology of the Muskogee site. Attached as Exhibit 2 is a site map depicting the ponds, the interceptor trench and the Arkansas River, and showing the relationship of the six surface impoundments (the

"Ponds"), the wastewater treatment system and the wastewater discharge outfall to the Arkansas River.

2. On January 30, 2004, the State of Oklahoma ("State") filed a written presentation setting forth its areas of concern with respect to the Decommissioning Plan ("DP") dated January 14, 2003, as supplemented and approved by the Nuclear Regulatory Commission ("NRC") by license amendment dated December 4, 2003, that is at issue in this proceeding. The purpose of this affidavit is to respond to certain issues raised by the State in its written presentation.

3. In this affidavit I will specifically provide testimony regarding whether there is a hydrogeologic connection between the shallow groundwater on the Muskogee site and the underlying bedrock, such that contaminants in the shallow groundwater could migrate into the bedrock.

Professional Qualifications

4. I earned a Bachelor of Arts degree in Geology from Allegheny College, am a Licensed Professional Geologist in five states, including Pennsylvania and Arkansas, and am a Certified Professional Geologist by the American Institute of Professional Geologists. I have over 24 years planning, implementing, and managing numerous projects involving the investigation and remediation of hazardous and non-hazardous wastes as well as low-level radiological materials in the United States, Canada and Puerto Rico. My curriculum vitae is attached hereto as Exhibit 3.

Relationship Between Shallow and Deep Groundwater at the Muskogee Site

5. In connection with this affidavit, I have reviewed the materials listed as Exhibit 4.

6. These materials provide an understanding of the geology and hydrogeology of the Muskogee site. These disciplines provide the scientific basis for explaining how chemical substances and contaminants behave in subsurface soils and groundwater.

7. Unconsolidated deposits underlying the FMRI site and overlying bedrock range in thickness from approximately 8.75 feet to 34.5 feet. These unconsolidated materials consist of natural soils and heterogeneous fill materials. The natural soils identified at the site are alluvial terrace deposits. Shallow groundwater was generally encountered within the alluvial terrace deposits.

8. Below the shallow groundwater is an approximately 80-foot-thick layer of bedrock, consisting of dark gray shale known as the McCurtain Shale (the "Bedrock Layer"). Groundwater monitoring wells drilled through the uppermost portion of the Bedrock Layer in 1993 (discussed below) did not detect any groundwater. Deeper in the Bedrock Layer, groundwater was detected in a zone of permeable bedrock (the "deep groundwater"). This zone of deep groundwater was separated from the overlying shallow groundwater by approximately a 30-foot-thick Bedrock Layer which has been shown to have extremely low permeability.

9. A review of information published by the Oklahoma Geologic Survey concerning the water resources in the area (*Reconnaissance of the Water Resources of the Fort Smith Quadrangle, 1988*), indicated that the FMRI site is located in a region rated least favorable for groundwater supplies due to the low yield of geologic materials underlying the site (*i.e.*, shallow and deep groundwater) and the generally fair to poor quality of groundwater contained within those geologic materials.

10. In 1982, water levels in the groundwater monitoring wells around Pond 3 began to rise, fluoride was detected in the French drain (installed around Pond 3 when it was constructed

to prevent groundwater from accumulating under the liner), and the pH of the water decreased, indicating increased levels of acidity and suggesting that the liner was leaking. Fansteel reported this information to the NRC, which approved the placement of lime into the pond to seal the leak. The water levels subsequently decreased, as did the other indicators that has suggested the presence of a leak, and NRC advised Fansteel in 1984 that no further action was required.

11. In 1989, the liner of Pond 3 again failed, allowing radiological and non-radiological materials to escape from the pond. Fansteel reported the Pond 3 failure to the NRC, the EPA, the Oklahoma Water Resources Board, and the Oklahoma Department of Health. At the direction of the EPA, Fansteel implemented a series of remedial actions to mitigate the impacts of the Pond 3 leak, and then agreed to design and perform a site-wide Remediation Assessment to evaluate the extent that the Muskogee site had been impacted by past and current operations, and to provide data that could be used for its eventual decommissioning. Fansteel's NRC license was amended in December 1992 to incorporate the Remediation Assessment as a foundation for decommissioning of the site.

12. The Remediation Assessment was performed in 1992 and 1993. Geologic and hydrogeologic work included installing a total of 429 samples, consisting of 322 soil samples, 64 pond samples 6 stream sediment samples, 30 monitoring well groundwater samples, and 7 surface water stream samples. In addition, 25 groundwater monitoring wells were installed in the shallow groundwater, and 4 groundwater monitoring wells were installed in the Bedrock Layer. The timing of the Remediation Assessment represents a review of data demonstrating a likely worst case because it was conducted after site operations had ceased and after two known breaches of the liner in Pond 3.

13. Both soil and groundwater results showed that the contaminated areas of the site were the areas immediately down gradient of the buildings where reprocessing took place, WIP Ponds 2 and 3 located in the northeast corner of the site, and the CaF ponds located in the southeast corner of the site. The portion of the Muskogee site that was most impacted is the area near the WIP ponds that received the commingled waste residues from the processing operation.

14. This pattern of contamination shows that the radiological and non-radiological contaminants are found together. This result is consistent with the areas where the production process commingled radiological and non-radiological constituents, and the WIP ponds where the commingled waste residues were deposited. For example, monitoring well MW-67S exhibited elevated radiological levels in the form of gross alpha particles and also had the highest concentrations of fluoride, arsenic and ammonia. The highest concentration of alpha radiological contaminants was found at MW-74S at the northeast corner, which also had the highest concentrations of cadmium, columbium and tantalum. MW-73S, also located in the northeast corner of the site, had the highest site-wide concentrations of radiological contaminants in the form of gross beta particles and MIBK.

15. The shallow groundwater is still being monitored and collected in the interceptor trench as part of the wastewater treatment system. Monitoring data as recent as April 2003 shows that concentrations of organic compound MIBK in the shallow groundwater have decreased to below detectable levels at all points through degradation and natural attenuation. Concentrations of inorganic chemicals and radiological constituents in the shallow groundwater have remained mostly stable, while some have decreased.

16. Stated simply, the chemical production process at the Muskogee site resulted in the generation of radiological waste (uranium and thorium) and non-radiological byproducts and

waste residues (ammonia, heavy metals and MIBK) that were discharged as one combined waste stream and placed in the on-site ponds.

17. The fate and transport of these radiological and non-radiological materials through the subsurface soil and then into the groundwater are controlled by various factors, such as how the particular constituents may be adsorbed or bound to soil particles, the solubility of the constituents in groundwater, the extent to which they may be degraded by microorganisms, and how quickly they may move in groundwater.

18. Constituents such as uranium, thorium and some heavy metals tend to adsorb to the kinds of soils that are found beneath the Muskogee site, have low solubility in water, which means they do not easily dissolve into groundwater from the soils to which they are bound, and are not highly mobile in water. In contrast, ammonia has a higher solubility and is known as a "leading edge indicator" because it migrates almost at the same rate as the groundwater flow. The absence of ammonia in the deep groundwater monitoring data is significant. Given the length of time that operations were conducted at the Muskogee site, the known releases of radiological and non-radiological materials as early as 1982, and the highly mobile nature of ammonia, one would expect to see evidence of ammonia in the deep groundwater if there were any hydrogeologic connection between the shallow groundwater and deep groundwater. The absence of ammonia in the deep groundwater suggests that the groundwater contamination at the Muskogee site is confined to the shallow groundwater.

19. A review of the geologic and hydrogeologic data for the Muskogee site indicates that the contaminants present in the shallow groundwater are isolated from the underlying deep groundwater by a natural barrier that is effectively blocking the downward migration of the contaminants. The deep groundwater was detected in wells MW-151D, MW-161D, MW-167D

and MW-174D where the shale bedrock exhibits some fracturing (as noted in the DP). The bedrock shale above and below this permeable sequence was determined to be dry. This deep groundwater in the zone of permeable bedrock is separated from the overlying shallow groundwater by approximately 30 feet of bedrock shale which has been demonstrated to have extremely low permeability.

20. Moreover, there was a significant difference in the static groundwater levels in the four sets of nested shallow groundwater and deep groundwater monitoring wells that were installed at the Muskogee site. Monitoring wells MW-51S, MW-61S, MW-67S and MW-74S (designed to communicate with the shallow groundwater) and MW-151D, MW-161D, MW-167D and MW-174D (designed to communicate with the deep groundwater) indicate two distinct and separate zones of groundwater. One would expect to see little difference between the static groundwater elevation level in the shallow and deep wells if there had been a hydrogeologic connection between the shallow groundwater and the deep groundwater. This data establishes that the 30-foot layer of bedrock shale was acting as an effective barrier between the contaminated shallow groundwater and the uncontaminated deep groundwater.

21. As discussed above, the Muskogee site is underlain by extremely low permeability shale which prevents the downward migration of constituents of concern from the site. Constituents of concern migrating laterally within the shallow groundwater flow system are prevented from migrating downgradient beyond the site boundary toward the Arkansas River by an interceptor trench that is keyed three feet into the underlying low permeability shale. Beyond the property boundary and the interceptor trench, the shallow water bearing zone is absent due to erosion by the Arkansas River, preventing the installation of a monitoring network downgradient of the trench itself.

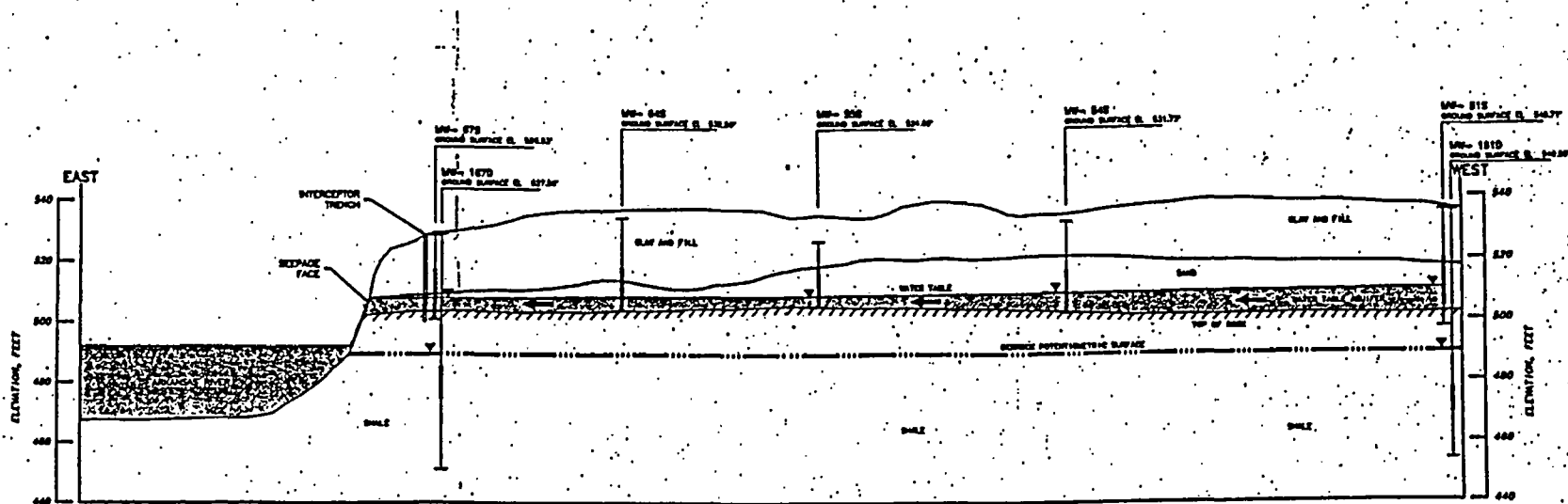
22. Based upon this information, it is my opinion that, while the shallow groundwater may be currently contaminated to some level with radiological and non-radiological materials, it is effectively isolated from the deep groundwater by a thick layer of impermeable bedrock that is acting as an Aquiclude, or natural barrier. As a result, there is no hydrogeologic connection between the contaminated shallow groundwater and the uncontaminated deep groundwater such that contamination could migrate to and impact the deep groundwater. In addition, the contamination in the shallow groundwater is being collected by the groundwater interceptor trench system, which is a barrier to prevent lateral migration offsite.

23. Therefore, it is my opinion that the remediation activities to be performed as part of the DP to address the contaminated shallow groundwater will be effective in preventing further contamination of the groundwater at the Muskogee site.

24. I declare under penalty of perjury that the foregoing is true and correct




Scott C. Blauvelt



NOTES

1. THIS CROSS SECTION DEPICTS GEOLOGIC CONDITIONS AT SPECIFIC LOCATIONS SHOWN BASED UPON OBSERVATIONS OF MATERIALS ENCOUNTERED. GEOLOGIC STRATA AT OTHER LOCATIONS MAY DIFFER FROM CONDITIONS OCCURRING AT THESE SITES.

HORIZONTAL SCALE = FEET
 0 100 200
 VERTICAL SCALE = FEET
 0 20 40
 VERTICAL EXAGGERATION = 5X

NO.	DATE	DESCRIPTION
GROUNDWATER FLOW DIAGRAM		
FANSTEEL, INC. MUSKOGEE, OKLAHOMA		
FANSTEEL, INC. MUSKOGEE, OKLAHOMA		
APPROVED	DATE	 Earth Sciences Consultants, Inc.
DRAWN	DATE	
CHECKED	DATE	
6473431		

SCOTT C. BLAUVELT
DIRECTOR - REGIONAL OPERATIONS
PENN ENVIRONMENTAL & REMEDIATION, INC.

EXPERIENCE SUMMARY

Scott C. Blauvelt has 24 years of diversified experience in planning, implementing, and managing numerous projects under a variety of state and federal regulatory programs involving hazardous and nonhazardous wastes and low-level radioactive materials throughout the United States, Puerto Rico, and Canada. His experience includes the technical direction and management of multi-disciplinary environmental projects involving site characterization and assessment, feasibility studies, remedial design and implementation, regulatory compliance, permitting, waste characterization, water resource and water supply investigations, state and federal agency consent order negotiations, emergency response, and forensic investigations. Mr. Blauvelt's project work has involved the U.S. Environmental Protection Agency (USEPA), the Nuclear Regulatory Commissions (NRC), and various state environmental agencies. Mr. Blauvelt is experienced with numerous federal regulatory programs including the Clean Air Act (CAA), the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Superfund Amendments and Reauthorization Act (SARA), the National Pollution Discharge Elimination System (NPDES), the Resource Conservation and Recovery Act (RCRA), the National Oil and Hazardous Substances Pollution Contingency Plan, and various state regulatory programs. Mr. Blauvelt's project experience includes the banking/real estate/construction industry, the insurance industry, legal industry, heavy manufacturing, mining, military and commercial weapon manufacturing, municipal governments, oil and natural gas, telecommunications; timber/paper, transportation, the utility industry, and waste management industry.

REPRESENTATIVE WORK EXPERIENCE

Banking/Real Estate/Construction

- Performed environmental and liability management assessments.
- Performed environmental compliance audits.
- Conducted waste minimization/reduction assessment.
- Evaluated cleanup levels in various environmental media.
- Prepared environmental management programs.
- Performed emergency planning.
- Prepared environmental remediation cost estimates.
- Served as regulatory liaison and negotiated with regulatory agencies.

Page 2 of 8**Insurance Industry**

- Investigated insurance claims related to oil and natural gas operations, surface and deep mining, timber cutting operations, petroleum storage and distribution, construction industry and agriculture.
- Provided oversight of environmental remediation.
- Provided remediation cost estimates.
- Conducted forensic analysis of insurance claims.
- Conducted independent analysis of environmental damage estimates and costs.

Legal Industry

- Provided expert services in public hearings and civil court proceedings associated with geologic, hydrogeologic, and contaminant fate and transport investigations, waste management practices, environmental assessments, and water resources at numerous industrial sites, surface, underground mining operations, and oil and natural gas exploration and development operations.
- Provided expert services and related support to both the insurance carriers and insureds to settle disputes and provide expert review involving a wide range of issues such as the appropriateness of remedial actions, hazardous and nonhazardous waste management, and water resources.
- Provided expert testimony in the following cases:
 - Expert testimony in deposition regarding the fate and transport of contaminants originating from a manufacturing facility located in eastern Pennsylvania as part of cost recovery action under CERCLA. Cooper Industries, Inc. v. Continental Insurance Company; Superior Court of New Jersey, Law Division, Essex County, Civil Action Docket No. L. 015947-91.
 - Expert testimony in deposition regarding the fate and transport of contaminants originating from a manufacturing facility located in Michigan as part of cost recovery action under CERCLA. Cooper Industries, Inc. v. Liberty Mutual Insurance Company; U.S. District Court of Texas, Houston Division, Civil Action No. H-91-3158 (SL).
 - Expert testimony in hearing regarding the migration of methane in the subsurface. Votodian v. Darcy Production; Allegheny County Court of Common Pleas, GD 91-06395.
 - Expert testimony in deposition regarding the fate and transport of petroleum hydrocarbons from an abandoned natural gas well in West Virginia. Caruana v. Pip Petroleum; West Virginia Circuit Court 93-C-303.
 - Expert testimony in deposition regarding the history of UST releases, remediation and compliance with applicable Pennsylvania UST regulations for a manufacturing facility located in eastern Pennsylvania. Andritz Sprout-Bauer,

Inc. v. Beazer East and Bridon-American Corporation; U.S. District Court for the Middle District of Pennsylvania No. 4:CV-95-1182.

- Expert testimony in trial regarding the fate and transport of petroleum hydrocarbons in the subsurface. First case to be tried in Pennsylvania under the Commonwealth of Pennsylvania's UST Indemnification Fund. Opalinsky v. Coen Oil Company and Exxon; Court of Common Pleas of Washington County, Pennsylvania, Civil Action No. 95-2435.
- Expert testimony in deposition regarding the necessity and consistency of environmental activities with the National Contingency Plan and the Ohio Voluntary Action Program at a former steel mill site located in southern Ohio. Southern Port Authority of Ohio v. Armco Steel Company; U.S. District Court for the Southern District of Ohio, Western Division (Cincinnati), No.: C-1-96-1179.
- Expert testimony in deposition regarding the existence and causes of environmental contamination, timeframe of releases, extent of contamination in environmental media, and the appropriateness of remedial actions performed at nine complex manufacturing facilities located throughout the United States. TRW Inc. v. Underwriters at Lloyd's London, et. al.; Philadelphia County Court of Common Pleas, Trial Division Case No. 1088.
- Expert testimony in deposition regarding the time frame of releases to groundwater of the hazardous substances driving the remediation of the Osborne Superfund site located in Grove City, Pennsylvania. Cooper Industries, Inc. v. Aetna Casualty and Surety Company; The Court of Common Pleas of Allegheny County, Pennsylvania, No. 374CD1985GD.
- Expert testimony in deposition regarding the time frame of releases to groundwater at four former manufactured gas plant facilities located in Pennsylvania. Penn Fuel Gas, Inc., et. al., v. Commonwealth of Pennsylvania, Department of Environmental Protection and Aetna Casualty and Surety Company, et. al.; The Court of Common Pleas of Chester County, Pennsylvania, Civil Division, No. 94-07744.
- Expert testimony in trial regarding the adequacy of well rehabilitation procedures in comparison with industry standards, compliance of well construction and operation with Pennsylvania Oil and Gas Regulations, and evaluation of Plaintiff's damage estimates. Baron Crest Energy Co. vs. Vickers Well Service, Inc.; The Court of Common Pleas of Armstrong County, Pennsylvania, Civil Division, No. 1998-0178.
- Expert testimony in deposition regarding sources and mechanism of methane migration in the subsurface. Calvin McMullin, et. al., v. Mormack Industries, Inc.; Court of Wayne County, Ohio, Case No. 02-CV-0016.
- Expert testimony in trial concerning the sources and mechanisms of contamination of enteric pathogens in a groundwater supply and the adequacy of water well construction procedures in comparison to industry standards. Kelly

Hohmann, et. al., v. Peter Watt et. al., and Jim Leighton Drilling Co., Court of Common Pleas of Butler County, Pennsylvania, Civil Division, No. 00-10823.

Affidavits and Expert Reports Submitted in Court Proceedings

- Confidential Client; Court of Common Pleas of Westmoreland County, Pennsylvania:
 - Expert report submitted to assess whether the client's environmental consulting work directly or indirectly resulted in regulatory agency preclusion of a facility for proposed landfill development and to determine whether the client's work was below accepted industry practice.
- Kleese Development Associates v. Dietrich, et. al.; The United States Bankruptcy Court, Northern District of Ohio - Youngstown Case No. 94-41998:
 - Expert report submitted to assess the potential environmental impacts/damages to environmental media from the processing and disposal of oil and gas industry wastes.
- Enviro Express, Inc. v. Southern Connecticut Gas Company; U.S. District Court, District of Connecticut, Index No. 398CV00226 (CFD):
 - Expert affidavit and report submitted in support of a cost recovery action under CERCLA related to the migration of environmental contamination associated with a former coal gasification facility.
- Jefferson County Commissioners, et. al. v. Commonwealth of Pennsylvania, et. al. EHB Docket No. 2000-0660C:
 - Permit Evaluation Report - Leatherwood Landfill, Jefferson County, Pennsylvania.
- Allegheny Defense Project v. Commonwealth of Pennsylvania Department of Environmental Protection and Pennsylvania General Energy:
 - Expert report submitted to the Pennsylvania Environmental Hearing Board. Evaluation of the cumulative effects of oil and gas development on streams, wetlands, and riparian areas.
- Salisbury Road Associates, LLC v. Gamble Development Company, Civil Action No. 3:01-CV-322J-20HTS:
 - Expert report submitted to evaluate the nature and extent of volatile organic and metals contamination at a former manufacturing facility.
- Kelly Hohmann, et. al. v. Peter Watt and Drenda Gostkowski, et. al., AD No. 99010823:
 - Expert report submitted to evaluate the source of microbiological contamination of a domestic water supply.
- Sechan Limestone Industries, Inc.:
 - Expert report submitted to independently evaluate the Harms/Benefit Analysis for the proposed residual waste landfill in Pottersville, Pennsylvania.

Manufacturing Industry

- Performed intrusive site investigations to determine the nature, extent, rate, and fate of groundwater contamination.
- Performed hydrogeologic investigations in order to develop and permit high capacity groundwater supplies.
- Decommissioned and remediated aboveground storage tank (AST) and underground storage tank (UST) systems.
- Performed industrial decontamination of chemical- and radionuclide-contaminated equipment and plant facilities.
- Conducted environmental assessments of large complex manufacturing facilities.
- Conducted soil and groundwater remediation.

Military and Commercial Weapon Manufacturing Industry

- Performing initial investigations to establish historical record of past manufacturing and disposal practices.
- Performing soil and water sampling for laboratory analysis.
- Installing groundwater monitoring wells.
- Determining the contaminants of concern in soil and groundwater.
- Performing detailed site characterization including receptor and pathway analyses.
- Identifying remedial measures.
- Developing site-wide strategy (i.e., waste isolation and treatment).
- Interacting with various local, state, and federal governmental agencies to ensure compliance with all applicable procedures.
- Preparing Compliance Monitoring System Plans to monitor site environmental conditions.
- Decommissioning UST systems.
- Decommissioning AST systems.
- Excavation and removal of contaminated soils.
- Demolition of site structures.

Mining Industry

- Designed and implemented groundwater monitoring programs for numerous underground mining operations.
- Conducted water resource investigations to evaluate the feasibility of developing high capacity surface and groundwater supplies.
- Prepared mine permit applications for underground and surface mining operations.
- Evaluated water supplies and regional and local hydrogeologic regime predictions for proposed and existing mining operations.
- Performed hydrogeologic investigations for surface and underground mining operations.

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- Performed hydrogeologic investigations associated with waste management disposal units located in areas of past surface and/or underground mining.
- Evaluated groundwater quality/quantity impacts from current and/or past mining operations.
- Investigated acid mine drainage impacts.
- Investigated underground mining subsidence and aquifer dewatering.
- Performed hazardous substance, waste management, and waste minimization evaluations at a variety of operating mining locations.
- Performed siting, feasibility, and permitting for mining waste disposal sites.
- Prepared environmental management plans for surface and underground mining projects in environmentally sensitive areas.
- Investigated the effects of longwall mining on streams, wetlands, and riparian areas.
- Prepared Chapter 105 permit applications for longwall mining under a stream.

Municipal Governments

- Water resource investigations.
- Water well design, construction, and permitting.
- Water well rehabilitation.
- Well field management.

Oil and Natural Gas Industry

- Investigated the cumulative effects of oil and natural gas development activities on streams, wetlands, and riparian areas.
- Investigated the effects of releases of oil and gas field fluids on wetlands.
- Evaluated the mechanisms of natural gas migration through groundwater and subsurface pathways into structures.
- Designed and implemented remediation systems for subsurface methane migration.
- Conducted environmental assessments of large complex multi-state and natural gas development operations.
- Designed and installed lined collection trenches to intercept groundwater contaminated with petroleum hydrocarbons.
- Designed and installed recovery wells and treatment systems for groundwater contaminated with petroleum hydrocarbons.
- Designed and installed landfarming systems for the treatment of soil contaminated with petroleum hydrocarbons.
- Decontaminated, decommissioned, and remediated AST and UST systems.
- Closed surface impoundments through the use of waste volume reduction and solidification techniques.
- Developed remediation cost estimates.
- Prepared erosions and sedimentation control plans.
- Investigated and plugged abandoned wells.

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- Evaluated well construction and rehabilitation techniques and their compliance with various state regulations.
- Prepared oil spill control plans.
- Investigated the effects of oil and natural gas development on groundwater resources.
- Investigated the chemistry of oil and gas field waste fluids and evaluated disposal/beneficial re-use alternatives.

Telecommunications Industry

- Conducted environmental assessments of large complex multi-state telecommunications operations.

Timber/Paper Industry

- Prepared erosion and sedimentation control plans.
- Conducted environmental assessments of paper and pulp facilities.

Transportation Industry

- Prepared spill control plans.
- Conducted subsurface investigations of petroleum releases.
- Decommissioned and remediated tank systems.
- Coordinated emergency response activities for releases from aboveground and below-ground tank systems and pipelines.
- Performed emergency response services for catastrophic releases from mobile storage tank facilities.

Utility Industry

- Conducted environmental assessments of former manufactured gas plant operations.
- Investigated releases from former manufactured gas plant facilities.

Waste Management Industry

- Performed RCRA permit applications for a variety of waste management facilities.
- Performed facility siting investigations for the permitting of hazardous and nonhazardous waste management facilities.
- Prepared Chapter 105 permit applications for stream encroachments.
- Performed remedial investigations (RI) at hazardous waste sites to determine the nature and extent of soil and groundwater contamination.
- Assessed corrective action alternatives for industrial and waste management facilities.
- Performed technical/peer review of RI/feasibility study reports prepared under CERCLA.
- Designed and installed RCRA groundwater monitoring systems.

Page 8 of 8

- Designed and installed groundwater monitoring systems for sanitary landfills and surface impoundments.

EDUCATION

B.A., Geology, Allegheny College

Occupational Safety and Health Administration 40-hour health and safety course

Occupational Safety and Health Administration 8-hour retraining health and safety course

Expert Witness Training - National Water Well Association

Applied Fluvial Geomorphology - Wildland Hydrology, Inc. Research and Education Center for River Studies

REGISTRATIONS

Certified Professional Geologist - American Institute of Professional Geologists

Licensed Professional Geologist - Arkansas, Missouri, Kentucky, North Carolina, and Pennsylvania

PROFESSIONAL AFFILIATION

American Institute of Professional Geologists

Board of Directors - Pennsylvania Council of Professional Geologists

President - Pennsylvania Council of Professional Geologists

Appointed Committee Member - Governor's Sound Land Use Advisory Committee

Appointed Committee Member - Governor's Ohio River Basin Water Resources Committee

PUBLICATIONS

Waite, B. and S. Blauvelt, 1989, Oil and Gas Waste Fluids of Pennsylvania, Northeastern Environmental Science, Vol. 7, No. 2

Waite, B. and S. Blauvelt, 1980, Oil and Gas Well Pollution Abatement, Pennsylvania Department of Environmental Resources

Waite, B. and S. Blauvelt, 1980, Roadspreading Study, Natural Gas and Oil Field Brines Shown as an Effective, Inexpensive Alternative for Dust and Ice Control, Pennsylvania Natural Gas Producer, Winter Issue

Exhibit 4

Materials Reviewed by Scott Blauvelt

1. The "Remediation Assessment, Fansteel Inc., Muskogee, Oklahoma (December 1993)" prepared by Earth Sciences Consultants, Inc.
 2. The "Amended Decommissioning Plan" dated January 15, 2003 prepared by Earth Sciences Consultants, Inc.
 3. The "Review, Environmental Control Program, Muskogee Plant, Fansteel/Metals"
 - "Waste Residues" dated September 24, 1975, prepared by C. L. Brown
 - "An Evaluation of Low Level Radioactive Waste Disposal Alternatives at the Muskogee, Oklahoma Plant" dated February 18, 1983, prepared by NUS Corporation
 - "Fansteel Metals Columbium – Tantalum Facility, Muskogee, Oklahoma, Environmental Information" dated June 1986, prepared by NUS Corporation
 4. The "Changes in Chemical Quality of the Arkansas River in Oklahoma and Texas (1946-52)", USGS Oklahoma District, OFR 53-289 Report, prepared by T.B. Dover and J.W. Geurin
 5. A "Site Hydrology Study" dated May 1983, prepared by Technology Research & Development, Inc.
 6. The "Preliminary Feasibility Study & Proposed Data Acquisition Program for an Interim Waste Retention Storage Basin" dated June 1975, prepared by Crest Engineering, Inc.
 7. A "Site Hydrology Study", October 1982, prepared by Technology Research & Development, Inc.
 8. The "Regional Summary, GROUND WATER ATLAS of the UNITED STATES, Oklahoma, Texas – HA 730-E" prepared by the United States Geological Society
- The "Alluvial Aquifers Along Major Streams, GROUND WATER ATLAS of the UNITED STATES, Oklahoma, Texas – HA 730-E" prepared by the United States Geological Society

March 4, 2004

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE PRESIDING OFFICER

In the Matter of:

FMRI, Inc.

(Muskogee, Oklahoma Facility)

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)
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)
)

Docket No. 40-7580-MLA-3

ASLBP No. 04-816-01-MLA

EXHIBITS TO WRITTEN PRESENTATION OF FMRI, INC. IN OPPOSITION
TO THE WRITTEN PRESENTATION OF THE STATE OF OKLAHOMA

March 4, 2004

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*This Order supersedes Pt 1760
JAJ*

IN THE UNITED STATES BANKRUPTCY COURT
FOR THE DISTRICT OF DELAWARE

In re:	)	Chapter 11
)	
FANSTEEL INC., <u>et al.</u> , ¹	)	Case No. 02-10109 (JIF)
	)	(Jointly Administered)
Debtors.)	
	)	Related Docket No. 1756
	)	12/23/03 Agenda Item #1

**ORDER PURSUANT TO 11 U.S.C §§ 1127(b) CONFIRMING DEBTORS' SECOND
AMENDED JOINT REORGANIZATION PLAN DATED DECEMBER 18, 2003**

Upon the Motion of Fansteel Inc. ("Fansteel" and the "Debtor") and its direct and indirect wholly-owned subsidiaries, Fansteel Holdings, Inc., Custom Technologies Corp., Escast, Inc., Wellman Dynamics Corp., Washington Mfg. Co., Phoenix Aerospace Corp., and American Sintered Technologies, Inc., each as a debtor and debtor-in-possession (collectively, the "Debtors"), by and through their counsel, Schulte Roth & Zabel LLP and Pachulski, Stang, Ziehl, Young, Jones & Weintraub, P.C., for entry of order confirming the Debtors' Second Amended Joint Reorganization Plan dated December 23, 2003, as attached hereto as Exhibit "1" (and including all exhibits thereto) (collectively, the "Second Amended Plan") pursuant to 11 U.S.C. §1127(b), as a post confirmation amendment to the Plan² as confirmed by order of this Court entered on November 17, 2003 and deeming those creditors and equity security holders that previously voted to approve the Plan as accepting the Second Amended Plan without need for a resolicitation; and the Court having found that under the circumstances due and proper

¹ The Debtors are the following entities: Fansteel Inc., Fansteel Holdings, Inc., Custom Technologies Corp., Escast, Inc., Wellman Dynamics Corp., Washington Mfg. Co., Phoenix Aerospace Corp., and American Sintered Technologies, Inc.

² Capitalized terms not expressly defined herein shall have the meanings ascribed in the Motion.

notice having been given; and that the Debtors' Motion as presented constitutes sufficient disclosure of the Plan Modifications; and upon the record of this Court at the Confirmation Hearing on November 17, 2003; and upon the findings of fact and conclusions of law of this Court in respect of the Confirmation Order entered on November 17, 2003 with respect to the Plan; and upon the Court having determined that the Plan Modifications do not impact the findings of fact or conclusions of law of the Court with respect to the Confirmation Hearing and the Confirmation Order; and the Court having determined that such findings of fact and conclusions of law are applicable to the Second Amended Plan; and the Court having found, therefore that the requirements of sections 1122, 1123 and 1129 of the Bankruptcy Code have been satisfied; and the NRC being the only adversely affected party having consented to the terms of the Plan Modifications; and no objections to the Second Amended Plan having been raised; and upon appearing that the relief requested is well taken and will benefit the estates and the Debtors' creditors, it is hereby,


ORDERED that the Plan as modified by the Second Amended Plan is hereby approved and confirmed under section 1129 of the Bankruptcy Code and all parties-in-interest are authorized and empowered, or enjoined, as the case may be, to act in accordance with its terms. All acceptances and rejections previously cast for or against the Plan are hereby deemed to constitute acceptances or rejections of the Second Amended Plan. The terms of the Plan including, without limitation, the exhibits contained in the Plan Supplement (including any non-material amendments, modifications, or supplements to the exhibits comprising the Plan Supplement at any time prior to the Effective Date as may be agreed upon by the Debtors and the Committee), are incorporated by reference into and are an integral part of the Plan and this Confirmation Order; and it is further

ORDERED that the Court's Confirmation Order entered on November 17, 2003 (Docket No. 1622) and the findings of fact and conclusions of law set forth therein and as presented on the record by the Court at the Confirmation Hearing held on November 17, 2003 are hereby incorporated and adopted by reference and shall remain in full force and effect except to the extent expressly modified herein; and it is further

ORDERED that the additional exhibits to Plan as contained in the Plan Modifications are hereby approved and the Debtors and Reorganized Debtors shall be authorized, as the case may be, to execute and give effect to such documents in substantially the same form as presented in the Plan Supplement; and it is further

ORDERED that pursuant to Fed. R. Bankr. P. 2002(f)(7) and 3020(c), the Debtors or the Reorganized Debtors, as applicable, shall be, and are hereby directed to serve a notice of entry of this Confirmation Order for the Second Amended Plan on the United States Trustee and all holders of claims or interests to whom notice of the Confirmation Hearing was made no later than thirty (30) days after the Confirmation Date. The Debtors or the Reorganized Debtors, as applicable, shall be and are hereby directed to serve copies of this Confirmation Order on each party that has filed a notice of appearance in these Chapter 11 Cases and on each party who filed an objection or response to, or statement or comment regarding the Plan, Plan Modifications or Second Amended Plan, no later than thirty (30) days after the Confirmation Date. No further notice of entry of this Confirmation Order shall be required.

Dated: December 23, 2003


THE HONORABLE JOSEPH J. FARNAN, JR.
UNITED STATES DISTRICT COURT JUDGE

1.0 PURPOSE

This instruction describes the requirements for performing radiation surveys.

2.0 REFERENCES

- 2.1 License SMB-911, Condition 27.
- 2.2 Fansteel Policy and Program Manual, Division III, Chapter 3, Section 3.2.4
- 2.3 Operating Procedure G-003, "Condition Report".
- 2.4 Operating Procedure G-014, "Contamination Control".
- 2.5 HSDI- 401, "Daily Operational Check of Portable Radiation Detection Instruments".
- 2.6 HSDI- 412, "Operation Check Canberra Series 5"
- 2.7 Letter from Robert Miller to Keyton Payne, November 1, 2000. Discusses beta-gamma direct measurement to meet Licence Conditon 27. Reference KKP Memo Dated 10/26/01-Memo #-HS00-018.

3.0 INSTRUCTIONS

3.1 Prerequisites

- 3.1.1 Ensure the instrument has satisfactorily completed a daily operational check; refer to sections 2.5 and 2.6.
- 3.1.2 Prior to conduct of survey, provisions should be made to record the survey. The record should include:
 - name of surveyor,
 - date of survey,
 - identification of survey instrument,
 - results of the survey including units, and
 - identification of the survey location(s).

Category : Radiation Safety

Title: Performance of Radiation Surveys

-
- 3.1.3 Prior to release of equipment or material for unrestricted use, an assessment must be made regarding the potential for radioactive contamination of non-accessible surfaces. Surfaces of equipment or material which are inaccessible with respect to a radiation survey shall be presumed to be contaminated in excess of the limits for release for unrestricted use. Exception to this requirement is allowed if it is reasonable to assume from design, usage, or indirect measurements that the inaccessible surfaces are not contaminated.
- 3.1.4 This subsections describing response to survey results are not applicable to release of structures or soils for unrestricted use.
- 3.2 Visual
- 3.2.1 Method
- A. Look for visible signs of process material:
- spilled from process operations or equipment,
 - leaking from process equipment (e.g. at packings, flanges, points of packaging or transfer, ...)
 - leaking from storage vessels, containers, or packagings
- B. Determine whether the visible material is radioactive material. This determination may be conservatively presumed, based on knowledge of process, or confirmed by radiation survey.
- 3.2.2 Response
- A. Record the results of the visual survey on the daily log.
- B. Verbally report any positive finding to the applicable Crew Leader.
- C. Report any positive finding to the PRSO and determine applicability of a Condition Report.
- 3.3 Exposure Rate
- 3.3.1 Method
- A. Hold the instrument at approximately waist level and move around or throughout the area of interest. The instrument may also be held at a particular point of interest.
- B. Record the results of the survey on an appropriate form(s).

3.3.2 Response

Report any result greater than two millirem per hour (2 mrem/h) to the PRSO.

3.4 Scan

3.4.1 Method

== NOTE ==

Scan surveys are performed to locate radiation anomalies indicating residual gross activity that may require further investigation or action.

== NOTE ==

Scan surveys shall not be used to demonstrate compliance with surface radiation limits.

- A. Place the detector as close as possible to and move slowly over the surface. The speed of detector movement should be about one inch per second for the alpha detector, and up to two inches per second for the beta/gamma detector. Nominally, the distance between the detector and the surface is maintained at about 1/8 inch for the alpha detector and about 1/4 inch for the beta/gamma detector.
- B. Note increases in count rate as indicated by the audible meter output. Typically, locations with any audible output of the alpha meter and about three times background for the beta/gamma meter should receive additional attention.
- C. Continue scanning the area at an interval consistent with the portion of the total area to be surveyed.
- D. Record the results of the survey on an appropriate form(s).

3.4.2 Response

- A. Report results as directed by the PRSO.

3.5 Direct

3.5.1 Method

== NOTE ==

Avoid contact of the detector face with a contaminated surface in order to prevent contaminating the detector face.

== NOTE ==

Avoid placing the detector face on surfaces with sharp projections which may puncture the thin detector face.

- A. Place the detector face at the predetermined distance from or in contact with the surface to be surveyed.
- B. Acquire a count for a predetermined period of time without moving the probe.
- C. Convert the count result to dpm/100 cm². The conversion should account for acquisition time, background counts, detector efficiency, and detector/surface geometry.
- D. Record the results of the survey on an appropriate form(s).

3.5.2 Response

== NOTE ==

The radiation limits for release of equipment and material for unrestricted use are provided by Section 2.1.

- A. Process Area
 - i. A survey result greater than 1000 dpm/100cm² direct alpha and/or greater than 5000 dpm/100cm² direct beta, averaged over 1m², shall be reported to the PRSO before the end of the work day.
 - ii. The PRSO shall determine any necessary follow up.
- B. Release for unrestricted use.

== NOTE ==

Section 3.6 contains additional requirements for release surveys.

- i. Equipment and material shall not be released for unrestricted use unless the criteria of Section 2.1 are satisfied; those criteria are repeated in Table 1.
- ii. Equipment and material that do not satisfy the criteria of Table 1 shall not be released from the process area.
- iii. The PRSO shall be notified as soon as possible of those equipment and material that do not satisfy the criteria of Table 1. The PRSO shall determine the necessary corrective action.

3.6 Removable

3.6.1 Method

- A. Mark a smear paper with a location identifier.
- B. Applying moderate pressure, wipe the face side of the paper over approximately 100cm² of the surface.
- C. Place the paper in an envelope or folder.
- D. Analyze the smear in accordance with Section 2.6.
- E. Convert the count result to dpm/100 cm². The conversion should account for analysis time, background counts, detector efficiency, and smear/surface geometry.
- F. Record the results of the survey on an appropriate form(s).

3.6.2 Response

== NOTE ==

The radiation limits for release of equipment and material for unrestricted use are provided by Section 2.1.

- A. Process Area
 - i. A survey result greater than 200 dpm/100cm² removeable alpha and/or greater than 1000 dpm/100cm² removeable beta, averaged over 1m², shall be reported to the PRSO before the end of the work day.
 - ii. The PRSO shall determine any necessary follow up.
- B. Release for unrestricted use.

== NOTE ==

Section 3.5 contains additional requirements for release surveys.

- i. Equipment and material shall not be released for unrestricted use unless the criteria of Section 2.1 are satisfied; those criteria are repeated in Table 1.
- ii. Equipment and material that do not satisfy the criteria of Table 1 shall not be released from the process area.

- iii. The PRSO shall be notified as soon as possible of those equipment and material that do not satisfy the criteria of Table 1. The PRSO shall determine the necessary corrective action.

3.7 Go No-Go Surveys

- 3.7.1 A beta-gamma direct measurement can be used to estimate an alpha measurement. A single beta gamma measurement can be used to evaluate compliance with each of the alpha and beta-gamma limits. The estimated alpha measurement is a function of the concentration ratio of the contaminants and the emission ratios for the contaminant nuclide series.
- 3.7.2 A gross count rate of 85 cpm for the Ludlum Model 44-9, which is approximately twice instrument background, may be used to demonstrate compliance with the total alpha and total beta-gamma release limits for this particular condition (the 85 cpm is calculated and is dependant on the efficiency of the probe – 40%, and the background count rate is 40 cpm).
- 3.7.3 Surveys may be performed as stated in this section. The following surveys may be performed but not limited to; scrap surveys, wooden pallet surveys, trash surveys, visitor vehicle surveys (random vehicle surveys can also be performed), and contractor tool surveys. Surveys performed shall be documented and reviewed.
- 3.7.4 If the item being surveyed is greater than calculated gross count rate or greater than two times the instrument background number than the item shall be surveyed per sections 3.5 and 3.6 of this instruction.
- 3.7.5 The PRSO shall be notified as soon as possible of those equipment and material that do not satisfy the criteria of Table 1. The PRSO shall determine the necessary corrective action.

3.8 Vehicle Surveys

- 3.8.1 Vehicles that enter the site and leave the concrete area shall be surveyed for free release before they will be allowed to leave the facility.
- 3.8.2 Vehicles that enter the site and stay on the concrete pad may randomly be surveyed. Road surveys may be performed to supersede this action.
- 3.8.3 Release surveys may either be performed per sections 3.5 and 3.6 of this instruction or by section 3.7. All surveys shall be documented and reviewed.

==NOTE==

Equipment and material shall not be released for unrestricted use unless the criteria of Section 2.1 are satisfied; those criteria are repeated in Table 1.

- 3.8.4 No free release survey shall be required if that vehicle stays on the concrete pad west of Chem A, between the tank farm and Thermite building.
- 3.8.5 The PRSO shall be notified as soon as possible of those equipment and material that do not satisfy the criteria of Table 1. The PRSO shall determine the necessary corrective action.

Table 1

Surface radioactivity limits for equipment and material released for unrestricted use.
(The content of this table is copied from License Condition 27)

The licensee shall use the following criteria for release for unrestricted use:

Activity on equipment and structure surfaces:

Surfaces are to be cleaned to the release limits for natural thorium:

- 1000 dpm per 100 cm² alpha radioactivity, total;
- 200 dpm per 100 cm² alpha radioactivity, removable;
- 3000 dpm per 100 cm² alpha radioactivity, maximum over 100 cm²;
- 5000 dpm per 100 cm² beta-gamma radioactivity, total;
- 1000 dpm per 100 cm² beta-gamma radioactivity, removable;
- 15000 dpm per 100 cm² beta-gamma radioactivity, maximum over 100 cm²;

For surfaces contaminated with natural uranium and thorium that cannot be cleaned to the thorium release limit, the sum of uranium and thorium activity release fractions may not exceed 1 (as defined by the unity rule in Section 4.2 of the Decommissioning Plan submitted by letter dated June 16, 1999), where uranium activity values are as follows:

- 5000 dpm per 100 cm² alpha radioactivity, total;
- 1000 dpm per 100 cm² alpha radioactivity, removable;
- 15000 dpm per 100 cm² alpha radioactivity, maximum over 100 cm²;
- 5000 dpm per 100 cm² beta-gamma radioactivity, total;
- 1000 dpm per 100 cm² beta-gamma radioactivity, removable;
- 15000 dpm per 100 cm² beta-gamma radioactivity, maximum over 100 cm²;



FANSTEEL, INC.

HSDI-402

REV. 3

11/06/01

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Category : Radiation Safety

Title: Performance of Radiation Surveys

4.0 APPROVAL

4.1 Prepared By: _____

Date: _____

4.2 Approved By: _____

Date: _____

Reviewed and Approved by:

Plant Operations Manager (POM) Mining & Utilities Date

Plant Operations Manager (POM) Process Operations Date

Plant Radiation Safety Officer Date

Plant Safety Director Date

On-Duty Crew Leader Date

Engineering/Laboratory Date

Independent Technical Review Date

Site General Manager Date

Effective Date: _____

Department/Title	Level of Training				
	0	1	2	3	4
Administration					
Health & Safety					
Process Operations					
Mining & Utilities					
Other:RSC Committee		X			

* 0 = None 1 = Read/Review 2 = Supervisor Review With Employee
 3 = Classroom 4 = On the Job Training (OJT)

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1.0 INTRODUCTION

1.1 Purpose

This procedure establishes the duties and responsibilities of the Fansteel Radiation Safety Committee (RSC), and identifies the membership of the RSC.

1.2 Scope

This procedure applies to all activities performed by or at the direction of the RSC.

2.0 REFERENCES

2.1 NRC License SMB-911, Section 2.1.2

2.2 Fansteel Standard Operating Procedure G-003, Condition Reports.

3.0 SAFETY PRECAUTIONS

3.1 None

4.0 PROCEDURE

4.1 Membership

The membership of the committee is comprised of the following individuals.

4.1.1 Site General Manager (Chairman)

4.1.2 Plant Radiation Safety Officer

4.1.3 Plant Safety Director

4.1.4 Plant Operations Manager

4.1.5 Crew Leaders on shift

4.2 Goals

The goals of the RSC include:

4.2.1 To ensure that employee radiation exposures are "As Low As

Reasonably Achievable" (ALARA).

4.2.2 To ensure that effluent releases are "As Low As Reasonably Achievable" (ALARA).

4.2.3 To ensure the requirements of NRC Source Materials License (SMB-911) are being satisfied.

4.3 ALARA Reviews

4.3.1 To support the goal of ALARA, the committee will review the occupational exposure history of all site personnel quarterly to ensure internal and external exposures are being maintained.

4.3.2 The RSC will use trend analysis to monitor the following:

4.3.2.1 Surface contamination

4.3.2.2 Radiation measurement instrument operation

4.3.2.3 Respiratory protection equipment

4.3.2.4 Effluent filtration systems operation

4.3.3 The RSC shall review and evaluate, at least every 12 months, data from the previous 18 months regarding the following:

4.3.3.1 Internal and external exposures

4.3.3.2 Unusual occurrences

4.3.3.3 Airborne radioactivity levels

4.3.3.4 Radiological effluent releases

4.3.3.5 Chemical effluent releases

4.3.3.6 Environmental monitoring

4.3.3.7 National Pollutant Discharge Elimination

4.3.3.8 NRC compliance inspection violations and those actions that must be taken to maintain compliance and to respond to correct action requirements.

RADIATION SAFETY COMMITTEE

4.3.4 The RSC will review and approve Condition Reports after corrective actions have been assigned.

4.4 Meetings

4.4.1 The committee will meet quarterly or more frequently if deemed necessary by the RSC.

4.4.2 Meeting minutes are maintained by the PRSO, and action items are identified and tracked to ensure closure.

4.4.3 Copies of meeting minutes are available to all employees from the PRSO upon request.

4.4.4 Decisions of the RSC are implemented by the PRSO, the PSD, or the POM, as appropriate.

4.4.4.1 It is the PRSO's responsibility to incorporate procedural changes in the Radiation Safety Manual (RSM)

4.4.4.2 It is the POM's responsibility to incorporate procedural changes to the plant SOPs.

4.5 Approvals

4.5.1 Revisions to the RSM shall be evaluated and approved by the RSC prior to implementation.

4.5.2 Revisions to Standard Operating Procedures (SOPs) shall be evaluated and approved by the RSC prior to implementation. Approved procedures must be signed by the RSC members prior to use and distribution.

4.5.3 The following members of the RSC shall review and approve each proposed modification:

4.5.3.1 Site General Manager

4.5.3.2 Plant Radiation Safety Officer

4.5.3.3 Plant Safety Director

- 4.5.3.4 Plant Operations Manager
- 4.5.3.5 Shift Crew Leader
- 4.5.3.6 Additional approvals may be required as directed by the Site General Manager.

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this procedure is to establish the requirements for General Employee Training (GET) of personnel who are to perform work at the facility.

1.2 Scope

This procedure applies to all employees, contractors, and visitors who must receive more than the visitor orientation provided by Section 2.5.

1.3 Responsibilities

It is the responsibility of the Plant Safety Director to:

- A. Arrange for the presentation of GET and testing.
- B. Recommend any abbreviated GET for which an individual may qualify,
- C. Maintain training files for personnel that receive GET, and
- D. Schedule annual refresher GET.

2.0 REFERENCES

- 2.1 License SMB-911, Sections 2.1.1.5, 2.3, and 3.1.
- 2.2 10 CFR Part 19
- 2.3 10 CFR Part 20
- 2.4 Fansteel Policy and Program Manual, Division 1, Section 2.3.
- 2.5 Facility Administrative Procedure FAP-101, "Facility Entrance and Exit."

3.0 SAFETY PRECAUTIONS

- 3.1 Section 2.1 requires that the Crew Leader receive "a minimum of eight hours of radiation Safety Training". Training supplemental to that provided by this procedure is required to satisfy this requirement.

- 3.2 Job specific training on procedures and instructions applicable to assigned tasks is provided in addition to the requirements of this procedure at the direction of the respective department manager.

4.0 PROCEDURE

4.1 General

Personnel training is separated into three different levels corresponding to the access requirements of the individual. These levels are described as:

- 4.1.1 Visitor orientation is provided by Section 2.5.
- 4.1.2 General Employee Training Level I (GET L-I) is for employees, contractors, and visitors who need unescorted access to the facility.
- 4.1.3 General Employee Training Level I (GET L-II) is for employees, contractors, and visitors who need unescorted access to the facility and with a need to work in the process area.

4.2 Restrictions

- 4.2.1 Personnel trained to visitor orientation shall not directly handle or work with licensed material at any time. They are not allowed to enter the process area unless under the direct control of an escort.

==NOTE==

If personnel trained to GET L-I are to touch, handle, or work with licensed material, they may be required to participate in personnel monitoring, as directed by the Plant Radiation Safety Officer.

- 4.2.2 Personnel trained to GET L-I shall not directly handle or work with licensed material unless under the direct control, or constantly in the presence of a qualified GET L-II; and received training on the specific activity. The training shall be commensurate with the potential health and safety protection problems or risks associated with the activity. These activities should be limited to short term projects not covered by operating procedures and should involve little or no risk to the individual. Personnel trained to GET L-I shall not be utilized to fill positions or to perform work on a day-to-day basis normally fulfilled by a GET L-II.

4.3 Training Requirements

4.3.1 The agenda established in Attachment 1 shall be met for training of an individual to GET L-I.

4.3.2 The agenda established in Attachment 2 shall be met for training of an individual to GET L-II.

4.4 Refresher Training

4.4.1 All personnel will receive annual refresher GET. The refresher GET shall be of sufficient content and duration for the individual to maintain competency in all areas of initial training.

4.5 Performance of Training

4.5.1 All GET shall be performed in accordance with Section 2.4.

4.6 Training Waivers

4.6.1 Personnel with previous training and/or experience with facility-related safety, hazard communication, and radiation protection may be eligible for a waiver of some or all training on certain topics either by challenging the topic through testing, or through previous records. The abbreviated form of GET must be approved by the Plant Safety Director.

ATTACHMENT 1

Page 1 of 1

AGENDA

GENERAL EMPLOYEE TRAINING LEVEL I

I. Site Specific Information

- A. Describe status and condition of facility,
- B. Describe role of NRC and License SMB-911,
- C. Describe Policy & Program Manual,
- D. Describe Fansteel organization and functional roles, and
- E. Present the requirements of the following procedures:
 - G-001 "Fansteel Facility Operating Procedure System"
 - G-002 "Temporary Operating Procedures"
 - G-003 "Condition Reports"

II. Rights and Responsibilities

- A. Describe rights and responsibilities of employee and facility as provided by OSHA
- B. Describe rights and responsibilities of employee and facility as provided by NRC (Form 3).
- C. Describe rights and responsibilities of employee as provided by Fansteel.

III. Chemical Safety

- A. Present Fansteel's written Hazard Communication program from the Policy & Program Manual.

IV. Physical Safety

- A. Describe Fansteel hearing protection program.
- B. Present types of physical hazards present at facility associated with process equipment.

V. Biological Safety

- A. Present types of biological hazards present at facility.

VI. Radiation Safety

- A. Present the Employee Handbook and give a copy to each individual.

VII. Emergency Response

- A. Describe the availability of first aid available at the facility.
- B. Describe the evacuation routes at the facility.
- C. Describe the method and procedure of accountability at the facility.
- D. Provide training equivalent to First Responder Awareness.

ATTACHMENT 2

Page 1 of 3

AGENDA

GENERAL EMPLOYEE TRAINING LEVEL II

==NOTE==

Refer to the Limitations of Section 3.0.

I. Site Specific Information

- A. Describe status and condition of facility,
- B. Describe role of NRC and License SMB-911,
- C. Describe Policy & Program Manual,
- D. Describe Fansteel organization and roles:
 - Identify functional roles of Operations personnel from General Manager through Crew Leader,
 - Identify personnel responsible for HS&E and describe their functional roles,
 - Identify functional roles of Administration and Security.
- E. Present the requirements of the following procedures:
 - G-001 "Fansteel Facility Operating Procedure System"
 - G-002 "Temporary Operating Procedures"
 - G-003 "Condition Reports"

II. Rights and Responsibilities

- A. Describe rights and responsibilities of employee and facility as provided by OSHA
- B. Describe rights and responsibilities of employee and facility as provided by NRC:
 - Review NRC Form 3, and
 - Describe requirements of 10 CFR Part 19.
- C. Describe rights and responsibilities of employee as provided by Fansteel.

III. Chemical Safety

- A. Present Fansteel's written Hazard Communication program from the Policy & Program Manual.
- B. Describe the particular parts of the process.
- C. Review MSDSs in conjunction with III. B.

IV. Physical Safety

- A. Describe Fansteel hearing protection program.
- B. Present types of physical hazards present at facility associated with process equipment.
- C. Describe Fansteel's program for management of heat/cold stress.

V. Biological Safety

- A. Present types of biological hazards present at facility.
- B. Describe Fansteel's program for management of biological hazards.

Original

ATTACHMENT 2

Page 2 of 3

AGENDA (continued)

GENERAL EMPLOYEE TRAINING LEVEL II

VI. Radiation Safety

- A. Present the Employee Handbook and give a copy to each individual.
- B. Discuss radiation fundamentals:
 - Types of ionizing radiation,
 - Units of measure.
- C. Present biological effects of radiation:
 - Sources of radiation,
 - Effects of radiation, and
 - Risks in perspective.
- D. Present radiation limits:
 - NRC limits, and
 - Fansteel limits.
- E. Discuss ALARA:
 - Concept, and
 - Worker responsibility.
- F. Describe the methods of personnel monitoring:
 - External,
 - Internal, and
 - Records.
- G. Discuss the types and applications of radiological controls:
 - Engineering,
 - Administrative, and
 - Personal protective equipment.
- H. Discuss contamination control:
 - Concept,
 - Methods,
 - Monitoring, and
 - Decontamination.

VII. General Safety

- A. Present the requirements of the following procedures:
 - Special Work Permit,
 - Lock Out/Tag Out, and
 - Confined Space.
- B. Present the facility requirements for the following:
 - Fall protection,
 - Forktrucks, and
 - Fire.

ATTACHMENT 2

Page 3 of 3

AGENDA (continued)

GENERAL EMPLOYEE TRAINING LEVEL II

VIII. Personal Protective Equipment

- A. Present the facility requirements of the following procedures:
- Personal Protective Equipment, and
 - Selection and Use of Respiratory Protection Equipment.

IX. Emergency Response

- A. Describe the availability of first aid available at the facility.
B. Describe the evacuation routes at the facility.
C. Describe the method and procedure of accountability at the facility.
D. Describe the role of local fire/medical/law enforcement in response to an emergency.
E. Provide training equivalent to First Responder Operations.

1.0 PURPOSE

This instruction provides the requirements for new employee health & safety training follow-up.

2.0 REFERENCES

2.1 29 CFR 1910, Standards regarding required safety and health training.

2.2 Procedure G-005, General Employee Training

3.0 INSTRUCTIONS

3.1 All new employees shall receive training per procedure G-005, General Employee Training.

3.2 All new employees shall receive a follow-up safety and health review. The review may be performed during the 3rd to 6th month of employment or at anytime at the employees supervisor or health and safety departments' discretion. This review may be in the form of, but not limited to, interviews, hands on demonstrations performed by the new employee, by a refresher safety quiz or by all forms listed.

3.3 A record of the refresher shall be documented and kept in the training files located in the health and safety office. It will be the responsibility of the trainer to determine what form of review is to be used.

3.4 This training may be provided by the employee's supervisor, or by the health and safety department. The attached form shall be used to document the review.

4.0 APPROVAL

4.1 Prepared By: _____ Date: _____

4.2 Approved By: _____ Date: _____



FANSTEEL, INC.

HSDI-100

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02/5/02

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Category: Occupational Safety Instructions
Title: Health & Safety Training Follow-Up Program

Attachment 1

Health and Safety Follow-up-Safety Review Form

Employee Name: _____

Date: _____

Trainer Name: _____

Hire

Date: _____

Topic(s): _____

Comments: _____

Refresher Follow-Up Evaluation:

☐ Employee demonstrated and showed excellent knowledge and understanding of the subject matter.

☐ Employee demonstrated and showed some knowledge and understanding of the subject matter.

☐ Employee demonstrated and showed little to no knowledge or understanding of the subject matter.

☐ Recommend retraining of the employee regarding the subject matter only and re-evaluate in 3 months.

☐ Recommend evaluation of employee work and safety performance by PRSO and POM.



Specialty Metals

FANSTEEL, INC.

Category : Occupational Safety Instructions

Title: Health & Safety Training Follow-Up Program

HSDI-100

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Recommendations Performed by: _____

Date: _____

1.0 ENVIRONMENTAL MONITORING

1.1 Policy

It is the policy of Fansteel, Inc. to conduct operations in a safe and controlled manner that protects the health and safety of the public, Fansteel employees, and the environment. This includes development and implementation of plans and procedures that provide for monitoring and detection of releases of process constituents into the environment as a result of operation of the facility.

1.2 Program Description

1.2.1 Purpose

This document establishes the Environmental Monitoring Program (Program) and identifies the controls and actions necessary to meet the objectives of the Program.

1.2.2 Scope

This Program is applicable to environmental monitoring activities conducted at Fansteel, Inc., Muskogee facility.

1.2.3 Objectives

The objectives of the program are:

- 1.2.3.1 Provide adequate monitoring for detection of releases of licensed material and other chemical constituents into the environment resulting from operation of the facility,
- 1.2.3.2 Fulfill environmental monitoring requirements of licenses and permits issued by Federal and State agencies,
- 1.2.3.3 Provide for assessment of monitoring data,
- 1.2.3.4 Establish actions to be taken when specified action levels are exceeded,
- 1.2.3.5 Establish reporting and recordkeeping requirements, and
- 1.2.3.6 Identify administrative controls to assure the Environmental Program achieves its stated objectives.

1.2.4 Administration

The administrative controls and procedures to ensure the Program functions to fulfill its stated objectives are presented below.

1.2.4.1 Changes to the Program

The Program can only be changed if the following conditions are met:

1.2.4.1.1 The change is justified in writing and becomes part of the permanent file of the Program,

1.2.4.1.2 The change does not prevent the Program from meeting its stated objectives, and

1.2.4.1.3 The change is approved by the RSC.

1.2.5 Monitoring Plans

1.2.5.1 Basis

The Program serves to describe the controls, both administrative and technical, and to establish the basis for and the actual monitoring program necessary to satisfy regulatory and license requirements. Also, to assure environmental monitoring continues to be effective, the Program provides criteria and allowances for adjustments to the Program. Finally, the Program establishes that action be taken in the event that monitoring results exceed action levels.

1.2.5.2 Criteria

Monitoring locations and procedures are determined with consideration of the following general monitoring criteria guidelines. The criteria are:

1.2.5.2.1 Monitoring of specific environmental media (e.g. air and water) shall be conducted at locations which represent the areas most likely impacted by facility operations,

1.2.5.2.2 Significant process releases shall be monitored at locations which represent the quality and quantity of materials being released to the environment,

1.2.5.2.3 Monitoring shall be conducted for those constituents and characteristics which are most likely to indicate detrimental environmental impacts from facility operations,

1.2.5.2.4 Monitoring shall be conducted at designated monitoring locations at a frequency necessary to indicate and evaluate detrimental impacts to the environment based on the potential change and magnitude of impact and on historical data wherever available, and

1.2.5.2.5 Sampling and analysis shall be conducted based on accepted industry practices.

1.2.5.3 Parameters

The Decommissioning Plan and supporting documents allow identification of constituents to be considered within the scope of the Program. Federal and State licenses and permits specifically identify constituents to be considered within the scope of the Program.

1.2.5.4 Action Levels

Action levels are established to inform facility personnel when a situation needs to be evaluated so that corrective action can be taken. Action levels are set below regulatory limits so that corrective action can be made before the limit is exceeded.

Exceedance of an action levels requires investigation including evaluation of prevention or corrective action. The investigation, and documentation of such, are completed commensurate with the significance of the condition.

1.2.6 Air Monitoring

1.2.6.1 Airborne Effluent

1.2.6.1.1 Goal

The goal of the airborne effluent monitoring plan is to monitor releases from facility operations via the facility stack.

1.2.6.1.2 Objectives

The objective of the airborne effluent monitoring plan is to operate monitoring systems which accurately sample air quality of the effluent of the facility stack.

1.2.6.1.3 Schedule

Monitoring will be conducted in accordance with Table V-1-1.

Table V-1-1 Airborne Effluent Monitoring Schedule		
Location ID	Location Description	Frequency
AS-313	Main facility stack, north end of Chem A building (WS-311)	*

* Monitoring schedule and parameters are described in the air quality Permit.

n/a = not applicable

1.2.6.1.4 Action Levels

The applicable action levels are described in the air quality Permit.

1.2.6.2 Perimeter Air

1.2.6.2.1 Goal

The goal of the perimeter air monitoring plan is to monitor offsite releases of radioactive material that result from facility operations.

The principal source of emissions and/or releases is the facility stack. Monitoring of the facility stack is described in Section 1.2.6.1. A secondary source of release is during excavation activities involving ponds 2 and 3. The perimeter air monitoring plan has been developed with regard to these sources.

1.2.6.2.2 Objectives

The objectives of the perimeter air monitoring plan are:

1.2.6.2.2.1 Operate monitoring systems which accurately sample ambient air quality on a continuous basis at or near the facility boundary (except for periods of essential equipment maintenance and repair),

1.2.6.2.2.2 Monitor ambient air quality to allow a comparison to the effluent concentration values of 10 CFR 20, and

1.2.6.2.2.3 Monitor ambient air quality near the location where the public may be maximally exposed to airborne emissions from the facility.

1.2.6.2.3 Schedule

Monitoring will be conducted in accordance with Table V-1-2

Table V-1-2 Perimeter Air Monitoring Schedule		
Location ID	Location Description	Frequency*
NE	Northeastern corner of perimeter fence	*
SE	Southeastern corner of perimeter fence	*
SW	Southwestern corner of perimeter fence	*
NW	Northwestern corner of perimeter fence	*
ENV	1400 feet north of Chem C building (Environmental)	*
BKG	Western boundary near main plant entrance (Background)	*

¹Individual analysis for gross alpha activity concentration.

* Monitoring frequency and parameters are described in NRC License SMB-911, Sections 3.5.7, 3.5.8 and 3.5.9.1

1.2.6.2.4 Action Levels

The applicable action levels are described in License SMB-911, Section 3.5.7.

1.2.7 Water Monitoring

1.2.7.1 Liquid Effluent

1.2.7.1.1 Goal

The goal of the liquid effluent monitoring plan is to monitor releases from facility operations via the facility wastewater outfall.

1.2.7.1.2 Objectives

The objective of the liquid effluent monitoring plan is:

1.2.7.1.2.1 Monitor liquid effluent to allow a comparison to the effluent concentration values of SMB-911, Section 3.5.5 and Fansteel's NPDES permit.

1.2.7.1.3 Schedule

Monitoring will be conducted in accordance with Table V-1-3

Table V-1-3 Liquid Effluent Monitoring Schedule		
Location ID	Location Description	Frequency *
001	Facility wastewater	*
004	Not in service (Treated process wastewater from Sodium Reduction)	n/a

n/a = not applicable

* Monitoring frequency and parameters are described in NPDES Permit OK0001643, and NRC License SMB-911, Section 3.5.5.

1.2.7.1.4 Action Levels

The applicable action levels are described in NPDES Permit OK0001643 and NRC License SMB-911, Section 3.5.5.

1.2.7.2 Surface Water

1.2.7.2.1 Goal

The goal of the surface water monitoring plan is to monitor offsite releases that result from facility operations.

The principal sources with potential for impacting surface waters are the facility liquid effluent and storm water runoff. The surface water monitoring plan has been developed with regard to these sources. Monitoring of the facility liquid effluent is described in Section 1.2.7.1.

1.2.7.2.2 Objectives

The objectives of the surface water monitoring plan are:

1.2.7.2.2.1 Operate monitoring systems which accurately sample surface water quality at or near the facility boundary and,

1.2.7.2.2.2 Monitor surface water quality to allow a comparison to the effluent concentration values of NRC License SMB-911, Section 3.5.5 and Fansteel's NPDES permit.

1.2.7.2.3 Schedule

Monitoring will be conducted in accordance with Table V-1-4

Table V-1-4 Surface Water Monitoring Schedule			
Location ID	Location Description	Frequency *	Annually
002	Southeastern portion of facility	*	n/a
003	Northern portion of facility	*	n/a
005	Southwestern portion of facility	*	n/a
999	Arkansas River, upstream of facility	n/a	*

n/a = not applicable

* Monitoring parameters and frequency are described in NPDES Permit OK0001643 and License SMB-911, Section 3.5.5.

1.2.7.2.4 Action Levels

The applicable action levels are described in NPDES Permit OK0001643, and License SMB-911, Section 3.5.5.

1.2.7.3 Groundwater

1.2.7.3.1 Goal

The goal of the groundwater monitoring plan is to monitor impacts to the groundwater beneath the facility and immediate surrounding environment that result from facility operations.

The principal sources of release are the CaF₂ and WIP ponds. The groundwater monitoring plan has been developed with regard to these sources.

1.2.7.3.2 Objectives

The objectives of the groundwater monitoring plan are:

1.2.7.3.2.1 Establish a comprehensive monitoring network that will effectively detect and monitor existing or potential releases of process material to groundwater,

1.2.7.3.2.2 Monitor movement, if any, of existing impacted groundwater to determine potential movement beyond identified boundaries, and

1.2.7.3.2.3 Identify, develop, and monitor corrective action(s).

1.2.7.3.3 Schedule

Monitoring will be conducted in accordance with Table V-1-5

Table V-1-5: Groundwater Monitoring Schedule	
Location ID	Frequency *
51	*
52	*
53	*
54	*
55	*
56	*
57	*
62	*
63	*
64	*
65	*
67	*
68	*
69	*
70	*
71	*
72	*
74	*
75	*

* Monitoring parameters are described in NPDES Permit OK0001643 and License SMB-911.

1.2.7.3.4 Action Levels

The applicable action levels are described in NPDES Permit OK0001643 and License SMB-911, Section 3.5.6.

1.2.7.4 French Drain

1.2.7.4.1 Goal

The goal of the French Drain monitoring plan is to monitor impacted groundwater at the facility.

1.2.7.4.2 Objectives

The objective of the French Drain monitoring plan is:

1.2.7.4.2.1 Monitor the collected groundwater with respect to volume and quality, and

1.2.7.4.2.2 Identify changes in the impacted groundwater at the facility such that timely corrective measures might be instituted.

1.2.7.4.3 Schedule

Monitoring will be conducted in accordance with Table V-1-6

Table V-1-6 French Drain Monitoring Schedule		
Location ID	Location Description	Frequency
Sump House 1	Northeast Property	*
Sump House 2	East of Chem A	*
Sump House 3	East of Pond 9	*
Sump House 4	South property	*
Pond 3	Not in service (east side of Pond 3)	n/a

n/a = not applicable

* Sampled on same schedule as groundwater monitor wells;
Section 1.2.7.3.3.

1.2.7.4.4 Action Levels

The applicable action levels are described in NPDES Permit OK0001643 and License SMB-911, Section 3.5.6.

1.2.7.5 Underdrains

1.2.7.5.1 Goal

The goal of the underdrain monitoring plan is to detect releases from ponded materials to the underlying soils at the facility.

1.2.7.5.2 Objectives

The objective of the underdrain monitoring plan is:

1.2.7.5.2.1 Detect releases from the ponded materials in a manner to allow timely corrective action or adjustment of other monitoring plans.

1.2.7.5.2.2 Allow collection of releases from ponded materials in order to prevent or minimize impacts to underlying soils.

1.2.7.5.3 Schedule

Monitoring will be conducted in accordance with Table V-1-7

Table V-1-7 Underdrain Monitoring Schedule		
Location ID	Location Description	Frequency
Pond 8	Pond 8 leak detection	Quarterly
Pond 9	Pond 9 leak detection	Quarterly

n/a = not applicable

* The parameter monitored is the presence or absence of liquid.

1.2.7.5.4 Action Levels

There are no action levels for this plan.

1.3 Training

1.3.1 Sampling will be performed by personnel trained in sampling techniques and chain of custody requirements.

1.4 Records/Documentation

1.4.1 Fansteel shall provide for recordkeeping or appropriate for compiling information developed by the Program. Records shall be maintained to document the collection, compilation, and analysis of environmental monitoring data.

1.4.2 Reports shall be made in accordance with applicable Federal and State regulations, NPDES Permit OK0001643, and License SMB-911.

1.5 References

1.5.1 Fansteel Facility License SMB-911

1.5.2 NPDES Permit # OK0001643

2.0 RESPIRATORY PROTECTION

2.1 Policy

The Fansteel Facility Respiratory Protection Program Provides guidance regarding protection of employees from occupational injury and illness due to exposure to airborne radioactive and/or chemical hazards, and/or oxygen deficient atmospheres. The program also establishes compliance with Federal requirements for respiratory protection programs.

2.2 Program Description

2.2.1 Purpose

This written program and associated operating procedures are the primary means used to administratively establish safe respiratory protection practices and compliance with the requirements of the Nuclear Regulatory Commission (NRC) and the Occupational Safety and Health Administration (OSHA). This written program also serves as the Respiratory Protection Manual.

2.2.2 Scope

The program covers routine, preventative, and anticipated emergency uses of respiratory protection at the Facility. The program encompasses all Fansteel employees who may be required to select, issue, inspect, use, clean, maintain, or store respiratory protection equipment.

2.2.3 Responsibilities

The Plant Safety Director (PSD) is responsible for administering and ensuring implementation of the Respiratory Protection Program.

All employees for which the scope of the program applies are responsible for complying with the provisions of the program.

2.2.4 Medical Evaluation

Initially, and at least every 12 months thereafter, an evaluation will be made of each employee required to wear respiratory protection as part of the employee's duties as to whether or not the employee can wear the required respirator without physical or psychological risk. An employee will not be allowed to wear a particular type of respirator, if, in the opinion of a physician, the employee might suffer physical or psychological harm due to wearing the respirator. An employee shall not be allowed to use a respirator without a current medical evaluation.

2.2.5 Fit Testing

All employees required to wear respiratory protection shall be required to successfully complete a fit test prior to initial use of the equipment. The fit test shall be repeated at least annually. An employee shall not be allowed to wear a respirator without a current successful fit test.

2.2.6 Selection

The Health and Safety Department shall select respirators. Selection shall be based on the physical, chemical, and physiological properties of the contaminant, the contaminant concentration likely to be encountered, and the likely physical conditions of the environment in which the respirator will be used.

Respirators shall be selected from those approved by the National Institute for Occupational Safety and Health for the contaminant or situation to which the employee is exposed.

2.2.7 Issue

Respirators shall be issued to employees by the Health and Safety Department. Respirators shall only be issued to employees qualified, with respect to the program, to use respiratory protection equipment. A record shall be maintained describing the issued respiratory protection equipment.

2.2.8 Inspection

All respirators shall be inspected with regard to operability before, and routinely after, each use, and after cleaning.

A respirator that is not routinely used, but is kept ready for emergency use, shall be inspected after each use and at least monthly to assure that it is in satisfactory working condition. A record shall be kept of inspection dates and findings for respirators maintained for emergency use.

2.2.9 Cleaning

Routinely used respirators shall be collected, cleaned, and disinfected as frequently as necessary to ensure that proper protection is provided for the wearer. Respirators maintained for emergency use shall be cleaned and disinfected after each use.

2.2.10 Maintenance

Respiratory protection equipment shall be maintained to retain its original effectiveness. Replacement or repairs shall be done only by experienced persons, with parts designed for the respirator. No attempt shall be made to replace components or to make adjustments or repairs beyond the manufacturer's recommendations. Reducing or admission valves on regulators shall be returned to the manufacturer or equivalent for repair.

2.2.11 Storage

After inspection, cleaning, and necessary maintenance, respirators are stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators shall be stored in plastic bags or the original cartons and placed in designated locations.

2.2.12 Surveillance

Appropriate surveillance shall be maintained of the conditions in the work area and of the degree of worker exposure or stress (combination of work rate, environmental conditions, and physiological burdens of wearing a respirator). Air sampling will be performed sufficient to identify the potential hazard, permit proper equipment selection, and estimate exposures. Radiation surveys of equipment and uranium bioassay of personnel will be performed, as appropriate, to evaluate intakes.

2.2.13 Air Quality

Breathing air shall meet at least the requirements of Reference ANSI/CGA-7.1, 1997.

Breathing air may be supplied to respirators from cylinders or air compressors. Containers of breathing air shall be clearly marked.

The compressor for supplying breathing air shall be equipped with necessary safety and standby devices. A breathing air-type compressor shall be used. Compressors shall be constructed and situated so as to avoid entry of contaminated air into the system and suitable in-line air purifying sorbent beds and filters installed to further assure breathing air quality. A receiver of sufficient capacity to enable the respirator wearer to escape from a contaminated atmosphere in the event of a compressor failure, and alarms to indicate compressor failure and overheating shall be installed in the system. If an oil-lubricated

compressor is used, it shall have a high-temperature or carbon monoxide alarm, or both. If only a high temperature alarm is used, the air from the compressor shall be frequently tested for carbon monoxide to ensure that it meets specifications referenced previously.

Air couplings shall be incompatible with outlets for other gas systems.

2.2.14 Program Evaluation

The effectiveness of the program, including associated implementing procedures and instructions shall be evaluated annually.

2.3 Training Requirements

All employees required to use respiratory protection equipment shall be instructed in the content and applicability of the program, and especially in the proper use of the equipment and its limitations. Recertification training shall be conducted annually. An employee shall not be allowed to use a respirator without current successful completion of training.

2.4 Records/Documentation

2.4.1 Records shall be maintained of the physicians certification of each employee who wears a respirator.

2.4.2 Records shall be maintained of the training of each employee who wears a respirator.

2.4.3 Records shall be maintained of the inspection dates and findings for respirators maintained for emergency use.

2.4.4 Records shall be maintained of respiratory protection equipment issued.

2.5 References

2.5.1 Fansteel Facility License SMB-911

2.5.2 10CFR20, Subpart H

2.5.3 29CFR1910.134

2.5.4 ANSI Z88.2-1992

2.5.5 Regulatory Guide 8.15-1999

2.5.6 NUREG-0041



FANSTEEL, INC.
STANDARD OPERATING PROCEDURES
HEALTH AND SAFETY

SELECTION, ISSUE, AND USE OF RESPIRATORY
PROTECTION EQUIPMENT

HS-300
REV. 0
Valid 24 Months
Issued 02/05/01
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Reviewed and Approved by:

Plant Operations Manager (POM) Mining & Utilities

Date

Plant Operations Manager (POM) Process Operations

Date

Plant Radiation Safety Officer

Date

Plant Safety Director

Date

On-Duty Crew Leader

Date

Engineering/Laboratory

Date

Independent Technical Review

Date

Site General Manager

Date

Effective Date: _____

Department/Title	Level of Training				
	0	1	2	3	4
Administration					
Health & Safety					
Process Operations					
Mining & Utilities					
Other:					

* 0 = None 1 = Read/Review 2 = Supervisor Review With Employee
3 = Classroom 4 = On the Job Training (OJT)

Original



FANSTEEL, INC.
STANDARD OPERATING PROCEDURES
HEALTH AND SAFETY
SELECTION, ISSUE, AND USE OF RESPIRATORY
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SELECTION, ISSUE, AND USE OF RESPIRATORY
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1.0 INTRODUCTION

1.1 Purpose

This procedure provides the requirements for selecting and issuing respiratory protection equipment.

1.2 Scope

This procedure is applicable to all personnel who wear respirators at Fansteel's Muskogee facility.

1.3 Responsibilities

- 1.3.1 All personnel using respiratory protection equipment (RPE) shall meet the requirements of the Respiratory Protection Program prior to selecting and issuing RPE.
- 1.3.2 Personnel using RPE are responsible for checking and properly using RPE in accordance with facility operating procedures.
- 1.3.3 Personnel may request use of RPE with a greater protection factor than recommended or required. Personnel may NOT request or use RPE with a protection factor less than recommended or required.

1.4 Definitions

Definitions of Section 2.0 are incorporated here by reference.

2.0 REFERENCE

- 2.1 Fansteel, Inc., NRC License SMB-911, Section 6.0
- 2.2 29 CFR 1910.134 "Respiratory Protection"
- 2.3 10 CFR 20, Subpart H, "Respiratory Protection and Controls to Restrict Internal Exposure in Restricted Areas"

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STANDARD OPERATING PROCEDURES
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2.4 Fansteel Policy & Program Manual, Division III, Chapter 2 "Respiratory Protection"

2.5 Standard Operating Procedure G-005 "General Employee Training"

3.0 SAFETY PRECAUTIONS AND LIMITATIONS

== NOTE ==

Procedure Users must read and understand any Safety Precautions listed which address areas of potential risk to life, limb and/or property.

3.1 Prior to being issued respiratory protection equipment, the individual must have a current medical evaluation, current training, and a current fit test.

3.2 The duration and frequency of respirator usage are as follows. The duration of use will vary from none to six hours per day or shift. The frequency of use will vary from non to five days per regular work week. Usage during weekend may be required on a as needed basis.

3.3 If the wearer becomes fatigued for any reason they may leave the area and remove the respirator for relief.

4.0 PROCEDURE

4.1 Medical Evaluation

A medical evaluation shall be completed in accordance with sections 2.2 and 2.3.

4.2 Training

Training shall be completed in accordance with Section 2.5.

4.3 Fit Test

A fit test shall be completed in accordance with sections 2.2 and 2.3.

4.4 Selection of Respiratory Protection Equipment

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- 4.4.1 Respiratory protection equipment shall be selected so that the concentration inhaled by the wearer will not exceed the applicable limit of the hazard that requires respiratory protection.
- 4.4.2 Protection factors for respirators shall be those provided by Section 2.3, included here as Attachment 1.
- 4.4.3 The following information and requirements should be applied for selection of respiratory protection equipment:
 - A. Except in extreme emergencies when only an SCBA would be used, no attempt to select respiratory protection should be made until an evaluation has been made of the work area, work to be performed, and anticipated, expected, or known hazards.
 - B. Respiratory protection equipment may be used under the following conditions:
 - 1. Engineering controls cannot immediately be put into place or utilized. Circumstances where this may apply are:
 - a. Containment control afforded by plant ventilation systems is lost due to failure or maintenance.
 - b. Short-term operations or maintenance requires opening, purging, or venting a contaminated system or component.
 - c. Leaks, spills, and decontamination of areas or components.
 - 2. Emergencies cause a rapid rise in airborne contaminants.
 - 3. Engineering controls are being evaluated or instituted.
 - 4. As a cautionary measure when there is reason to believe airborne contamination is likely.

5. If requested by an individual and in accordance with the individuals respirator qualifications.
- C. The selection process shall consider a number of important factors pertaining to the environment within which protection must be applied. These factors include:
1. Results of air sampling, either historical or current.
 2. Nature and characteristics of the anticipated hazards.
 3. Anticipated peak concentrations of hazardous materials.
 4. Nature and location of the work including access into and out of the area in event of an emergency.
 5. Comfort or concerns of the wearer.
 6. Potential for creating airborne contamination.
 7. Permissible Exposure Level, Threshold Limit Value, and/or Derived Air Concentration of the hazardous material.
 8. Degree of protection provided by specific types of respiratory protection equipment; e.g. protection factor.
 9. Availability of an adequate supply of breathing air.
 10. Potential for oxygen deprivation.
 11. Urgency of the situation.
 12. Ability to communicate while wearing respiratory protection equipment.
- D. Cartridge respirators with particulate or gas filters are lightweight and usually not too uncomfortable; however, in heavy concentrations of contaminants they load quickly and can cause difficulty breathing.

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1. Cartridge respirators can only be used where there is adequate oxygen and ventilation.
2. Stay time with a cartridge respirator can be as short as ½ -hour in heavy contaminant concentrations or many hours in low contaminant concentrations depending on the size and type of cartridge.

In heavy particulate atmospheres, a pre-filter should be used to maximize the service life of the cartridge.

- E. Supplied air respirators and supplied air hoods offer an advantage in spaces where oxygen is greater than 19.5% and the contaminants are below IDLH levels. Work can continue for extended periods even if contaminant concentrations are high.

4.4.3 In areas or spaces where Immediate Danger to Life or Health, or oxygen deficient atmospheres exist or are anticipated, only self contained breathing apparatuses used in the pressure demand mode may be used.

4.4.4 Respiratory protection equipment for radioactive material shall be used when:

- A. Airborne concentrations exceed 1 DAC for short duration; or,
- B. Airborne concentrations are of such a degree that an individual present in the area without respiratory protection equipment could exceed during the hours present in a week, an intake of 0.6 percent of the annual limit on intake, or 12 DAC-hours.

== NOTE ==

A 12 DAC-hour exposure is equivalent to working in an area with an airborne concentration of 0.3 DAC for 40 hours.

- C. When dry, loose contamination greater than 20,000 dpm/100cm² alpha or 20,000 dpm/100cm² beta-gamma is present on work surfaces or in the immediate work area and has a potential for being mobilized by the activities in the area.

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Contaminants that are wet, oily, or otherwise not readily mobilized may not require use of respiratory protection if the potential for becoming airborne is low. The respiratory protection requirements should be based primarily on air samples in these instances.

4.4.5 Respiratory protection equipment for non-radioactive material shall be required when the concentration of the material exceeds the relevant Permissible Exposure Level or Threshold Limit Value.

4.4.6 The Health and Safety Department shall approve selection of respiratory protection equipment.

4.5 Issue of Respiratory Protection Equipment

4.5.1 Personnel required to use respiratory protection equipment will obtain the required equipment from the inventory of the Control Room or from the Health and Safety department.

4.5.2 Personnel who obtain respiratory protection equipment shall ensure the following:

- A. A medical evaluation was completed within the last twelve months.
- B. Training was completed within the last year.
- C. A fit test was completed within the last year.
- D. There is no interference with the sealing area of the respirator; e.g. stubble, hair, glasses...

4.5.3 Upon issue of the respirator, the user shall complete the Respirator Log Out Sheet except for "Time In".

4.5.4 Upon return of the respirator, the user shall complete the "Time In" of the Respirator Log Out Sheet.

4.6 Use of respirator

== NOTE ==

The duration of respirator usage will vary from none to six hours per day or shift. The frequency of use will vary from non to five days per regular work week. Usage during weekends may be required on an as needed basis.

If the wearer becomes fatigued for any reason they may leave the area and remove the respirator for relief.

4.6.1 Half-mask respirator

== NOTE ==

No objects, materials or substances, such as facial hair, or any conditions that interfere with the face-facepiece seal or valve function, and that are under the control of the respirator wearer, are present between the skin of the wearer's face and the sealing surface of a tight-fitting respirator face piece.

- A. Visually inspect the respirator to ensure that the cartridges, exhalation valve, straps, and seal area are in good condition.
- B. Adjust the straps to the largest size.
- C. Insert chin into the mask and pull the straps over the top of your head.
- D. Push your face into the mask and tighten the straps; bottom strap first, top strap last.
- E. Conduct a user seal check as follows:
 - 1. Positive pressure check
 - a. Close off the exhalation valve and exhale gently into the face piece.

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The face fit is considered satisfactory if a slight positive pressure can be built up inside the face piece without any evidence of outward leakage of air at the seal.

2. Negative pressure check

- a. Close off the inlet opening of the cartridge by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the face piece collapses slightly, and hold the breath for 10 seconds.

The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the face piece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

== NOTE ==

The respirators manufacturer's recommended procedures for performing a user seal check may be used instead of the positive and/or negative pressure check procedures provided that they are equally effective.

4.6.2 Full-mask respirator

== NOTE ==

No objects, materials or substances, such as facial hair, or any conditions that interfere with the face-facepiece seal or valve function, and that are under the control of the respirator wearer, are present between the skin of the wearer's face and the sealing surface of a tight-fitting respirator face piece.

- A. Visually inspect the respirator to ensure that the cartridges or canister, exhalation valve, harness, lens, and seal area are in good condition.
- B. Adjust the straps to the largest size and pull over the front of the mask.

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- C. Insert chin into the mask and pull the harness over the top of your head.
- D. Push your face into the mask and tighten the harness; chin strap first, temple strap second, top strap last. The patch of the harness should be near the crown on the back of the head.
- E. Conduct a user seal check as follows:

- 1. Positive pressure check

- a. Close off the exhalation valve and exhale gently into the face piece.

The face fit is considered satisfactory if a slight positive pressure can be built up inside the face piece without any evidence of outward leakage of air at the seal.

- 2. Negative pressure check

- a. Close off the inlet opening of the cartridge by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the face piece collapses slightly, and hold the breath for 10 seconds.

The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the face piece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

== NOTE ==

The respirators manufacturer's recommended procedures for performing a user seal check may be used instead of the positive and/or negative pressure check procedures provided that they are equally effective.



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4.7 Removal of respirator

4.7.1 Half-mask respirator

- A. Lean backward and remove any hood worn over the respirator by peeling over the back of the shoulders.
- B. Lean forward by bending at the waist.
- C. Grasp the respirator with both hands just above the filter.
- D. Pull the respirator down, then away from the body, then remove to the side.
- E. Place the respirator into the container provided.
- F. Return the respirator to the issue area, and place in the "Used Respirator" box.

4.7.2 Full mask respirator

- A. Lean backward and remove any hood worn over the respirator by peeling over the back of the shoulders.
- B. Lean forward by bending at the waist.
- C. Grasp the respirator with both hands just above the filter.
- D. Pull the respirator down, then away from the body, then remove to the side.
- E. Place the respirator in the container provided.
- F. Return the respirator to the issue area, and place in the "Used Respirator" box.

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5.0 RECORDS

- 5.1 Medical Evaluation
- 5.2 Respiratory Training
- 5.3 Fit Test Training
- 5.4 Respirator Log Out Sheet

6.0 ATTACHMENTS

- 6.1 Attachment 1 – 10 CFR 20, Appendix A, Table of Assigned Protection Factors

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6.1 Attachment 1

Table of APFs

Appendix A to Part 20 – Protection Factors for Respirators^a

	Operating mode	Assigned Protection Factors
I. Air Purifying Respirators [Particulate^b only]^c:		
Filtering facepiece disposable ^d	Negative Pressure	(^d)
Facepiece, half ^e	Negative Pressure	10
Facepiece, full	Negative Pressure	100
Facepiece, half	Powered air-purifying respirators	50
Facepiece, full	Powered air-purifying respirators	1000
Helmet/hood	Powered air-purifying respirators	1000
Facepiece, loose-fitting	Powered air-purifying respirators	25
II. Atmosphere supplying respirators [particulate, gases and vapors]^f:		
1. Air-line respirator:		
Facepiece, half	Demand	10
Facepiece, half	Continuous Flow	50
Facepiece, half	Pressure Demand	50
Facepiece, full	Demand	100
Facepiece, full	Continuous Flow	1000
Facepiece, full	Pressure Demand	1000
Helmet/hood	Continuous Flow	1000
Facepiece, loose-fitting	Continuous Flow	25
Suit	Continuous Flow	(^g)
2. Self-contained breathing Apparatus (SCBA):		
Facepiece, full	Demand	^h 100
Facepiece, full	Pressure Demand	^h 10,000
Facepiece, full	Demand, Re-circulating	^h 100
Facepiece, full	Positive Pressure Re-circulating	^h 10,000
III. Combination Respirators:		
Any combination of air-purifying and atmosphere-supplying respirators	(1) Assigned protection factor for type and mode of operation as listed above.	

^a These assigned protection factors apply only in a respiratory protection program that meets the requirements of this Part. They are applicable only to airborne radiological hazards and may not be appropriate to circumstances when chemical or other respiratory hazards exist instead of, or in addition to, radioactive hazards. Selection and use of respirators for such circumstances must also comply with Department of Labor regulations.

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Radioactive contaminants for which the concentration values in Table 1, Column 3 of Appendix B to Part 20 are based on internal dose due to inhalation may, in addition, present external exposure hazards at higher concentrations. Under these circumstances, limitations on occupancy may have to be governed by external dose limits.

^b Air purifying respirators with $APF < 100$ must be equipped with particulate filters that are at least 95 percent efficient. Air purifying respirators with $APF = 100$ must be equipped with particulate filters that are at least 99 percent efficient. Air purifying respirators with $APFs > 100$ must be equipped with particulate filters that are at least 99.97 percent efficient.

^c The licensee may apply to the Commission for the use of an APF greater than 1 for sorbent cartridges as protection against airborne radioactive gases and vapors (e.g., radioiodine).

^d Licensees may permit individuals to use this type of respirator who have not been medically screened or fit tested on the device provided that no credit be taken for their use in estimating intake or dose. It is also recognized that it is difficult to perform an effective positive or negative pressure pre-use user seal check on this type of device. All other respiratory protection program requirements listed in §20.1703 apply. An assigned protection factor has not been assigned for these devices. However, an APF equal to 10 may be used if the licensee can demonstrate a fit factor of at least 100 by use of a validated or evaluated, qualitative or quantitative fit test.

^e Under-chin type only. No distinction is made in this Appendix between elastomeric half-masks with replaceable cartridges and those designed with the filter medium as an integral part of the facepiece (e.g., disposable or reusable disposable). Both types are acceptable so long as the seal area of the latter contains some substantial type of seal-enhancing material such as rubber or plastic, the two or more suspension straps are adjustable, the filter medium is at least 95 percent efficient and all other requirements of this Part are met.

^f The assigned protection factors for gases and vapors are not applicable to radioactive contaminants that present an absorption or submersion hazard. For tritium oxide vapor, approximately one-third of the intake occurs by absorption through the skin so that an overall protection factor of 3 is appropriate when atmosphere-supplying respirators are used to protect against tritium oxide. Exposure to radioactive noble gases is not considered a significant respiratory hazard, and protective actions for these contaminants should be based on external (submersion) dose considerations.

^g No NIOSH approval schedule is currently available for atmosphere supplying suits. This equipment may be used in an acceptable respiratory protection program as long as all the other minimum program requirements, with the exception of fit testing, are met (i.e., §20.1703).

^h The licensee should implement institutional controls to assure that these devices are not used in areas immediately dangerous to life or health (IDLH).

ⁱ This type of respirator may be used as an emergency device in unknown concentrations for protection against inhalation hazards. External radiation hazards and other limitations to permitted exposure such as skin absorption shall be taken into account in these circumstances. This device may not be used by any individual who experiences perceptible outward leakage of breathing gas while wearing the device.

Original

1.0 PURPOSE

This instruction provides the requirements for completing a medical evaluation to determine an individual's ability to use a respirator.

2.0 REFERENCES

- 2.1 29 CFR 1910.134 (e)
- 2.2 10 CFR 20.1703 (c)(5)
- 2.3 Fansteel Policy and Program Manual, Division III, Chapter 2, Section 2.2.4

3.0 INSTRUCTIONS

- 3.1 The Health and Safety Department shall schedule a medical evaluation prior to initial use of a respirator.

The initial medical evaluation shall be completed using a medical questionnaire or examination that obtains the same information as the questionnaire as provided by Section 2.2.

- 3.2 The Health and Safety Department shall obtain a written recommendation regarding the ability to use a respirator. The recommendation should be documented on Attachment 1.
- 3.3 Fansteel shall provide for additional medical evaluations as required by sections 2.1 and 2.2.

4.0 APPROVAL

4.1 Prepared By: _____ Date: _____

4.2 Approved By: _____ Date: _____



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Category : Respiratory Protection
Title: Medical Evaluation For Respirator Wearers

ATTACHMENT 1

Fansteel, Inc.
Recommendation for Respirator Use

_____ was examined by a physician on _____ for
(First and Last name) (Date)

ability to use a respirator. The recommendation for this person is:

(check one)

- ☐ No limitation on respirator use.
- ☐ Specific limitation(s) on respirator use.
(Describe below.)
- ☐ No respirator use permitted.

Limitations: _____

Is a follow-up medical evaluation necessary? _____

This written recommendation was provided to this person.

Physician

1.0 PURPOSE

This instruction provides the requirements for completing a fit test of a respirator wearer for a tight-fitting, face-sealing respirator.

2.0 REFERENCES

- 2.1 29 CFR 1910.134 (f)
- 2.2 10 CFR 20.1703 (c)(6)
- 2.3 G-005 "General Employee Training"
- 2.4 HSDI-300 "Medical Evaluation of Respirator Wearers"
- 2.5 Fansteel Policy and Program Manual, Division III, Chapter 2, Section 2.2.5

3.0 INSTRUCTIONS

- 3.1 A respirator wearer must have a current acceptable medical evaluation before participating in a fit test (see Section 2.3).
- 3.2 A fit test subject must have current GET L-II training before participating in a fit test.
- 3.3 The fit test shall be conducted using the procedures described in Section 2.1 at Appendix A, Part I. The procedure for use of irritant smoke is included here as Attachment 1.
 - 3.3.1 No objects, materials or substances, such as facial hair, or any conditions that interfere with the face-facepiece seal or valve function, and that are under the control of the respirator wearer, are present between the skin of the wearer's face and the sealing surface of a tight-fitting respirator face piece.
- 3.4 A record of the fit test should be retained, including failed tests. A reasonable attempt should be made to determine the cause of a failed fit test and explanation provided to the employee.

4.0 APPROVAL

4.1 Prepared By: _____ Date: _____

4.2 Approved By: _____ Date: _____

Attachment 1**Appendix A to Sec. 1910.134--Fit Testing Procedures (Mandatory)****Part I. OSHA-Accepted Fit Test Protocols****A. Fit Testing Procedures--General Requirements**

The employer shall conduct fit testing using the following procedures. The requirements in this appendix apply to all OSHA-accepted fit test methods, both QLFT and QNFT.

1. The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.
2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.
3. The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.
4. The test subject shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit.
5. The more acceptable facepieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in the following item A.6. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.
6. Assessment of comfort shall include a review of the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:
 - (a) Position of the mask on the nose
 - (b) Room for eye protection
 - (c) Room to talk
 - (d) Position of mask on face and cheeks
7. The following criteria shall be used to help determine the adequacy of the respirator fit:
 - (a) Chin properly placed;
 - (b) Adequate strap tension, not overly tightened;
 - (c) Fit across nose bridge;
 - (d) Respirator of proper size to span distance from nose to chin;
 - (e) Tendency of respirator to slip;
 - (f) Self-observation in mirror to evaluate fit and respirator position.
8. The test subject shall conduct a user seal check, either the negative and positive pressure seal checks described in Appendix B-1 of this section or those recommended by the respirator manufacturer which provide equivalent protection to the procedures in Appendix B-1. Before conducting the negative and positive pressure checks, the

subject shall be told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the test subject fails the user seal check tests.

9. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.
10. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing her or his duties.
11. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.
12. Exercise regimen. Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.
13. The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.
14. Test Exercises. (a) The following test exercises are to be performed for all fit testing methods prescribed in this appendix, except for the CNP method. A separate fit testing exercise regimen is contained in the CNP protocol. The test subject shall perform exercises, in the test environment, in the following manner:
 - (1) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.
 - (2) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.
 - (3) Turning head side to side. Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.
 - (4) Moving head up and down. Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
 - (5) Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

- (6) Grimace. The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT)
- (7) Bending over. The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place

shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.

(8) Normal breathing. Same as exercise (1).

- (b) Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

B. Qualitative Fit Test (QLFT) Protocols

1. General

- (a) The employer shall ensure that persons administering QLFT are able to prepare test solutions, calibrate equipment and perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.
- (b) The employer shall ensure that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

5. Irritant Smoke (Stannic Chloride) Protocol

This qualitative fit test uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

(a) General Requirements and Precautions

- (1) The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).
- (2) Only stannic chloride smoke tubes shall be used for this protocol.
- (3) No form of test enclosure or hood for the test subject shall be used.
- (4) The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor shall take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.
- (5) The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

(b) Sensitivity Screening Check

The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke.

- (1) The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.
- (2) The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.

- (3) The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.

(c) Irritant Smoke Fit Test Procedure

- (1) The person being fit tested shall don the respirator without assistance, and perform the required user seal check(s).
- (2) The test subject shall be instructed to keep his/her eyes closed.
- (3) The test operator shall direct the stream of irritant smoke from the smoke tube toward the face seal area of the test subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within six inches of the respirator.
- (4) If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.
- (5) The exercises identified in section I.A. 14. of this appendix shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.
- (6) If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.
- (7) Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.
- (8) If a response is produced during this second sensitivity check, then the fit test is passed.

1.0 PURPOSE

This instruction provides the requirements for cleaning respirators.

2.0 REFERENCES

- 2.1 29 CFR 1910.134 (h)(1)
- 2.2 10 CFR 20.1703 (c)(4)(vi)
- 2.3 Fansteel Policy and Program Manual, Division II, Chapter 2, Section 2.2.9

3.0 INSTRUCTIONS

- 3.1 Respirators issued to more than one employee shall be cleaned and disinfected before being worn by different individuals.
- 3.2 Respirators used in fit testing and training shall be cleaned and disinfected after each use.
- 3.3 Respirators maintained for emergency use shall be cleaned and disinfected after each use.
- 3.4 Respirators issued for the exclusive use of an employee shall be cleaned and disinfected as often as necessary to be maintained in a sanitary condition.
- 3.5 Respirators shall be cleaned using the procedures in section 2.1 at appendix B-2.

The procedure for cleaning and disinfecting respirators is included here as Attachment 1.

4.0 APPROVAL

4.1 Prepared By: _____ Date: _____

4.2 Approved By: _____ Date: _____

Maintenance Report			
Date	Resp. #	Maintenance Performed or Required	Performed

Attachment 1

Appendix B-2 to Sec. 1910.134: Respirator Cleaning Procedures (Mandatory)

I. Procedures for Cleaning Respirators

- A. Remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
- B. Wash components in warm (43 deg. C [110 deg. F] maximum), water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
- C. Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain.
- D. When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:
 - 1. Hypochlorite solution (50 ppm chlorine) made by adding approximately 0.8 milliliter of laundry bleach to one liter of water at 43 deg. C [110 deg. F]; or,
 - 2. Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 43 deg. C [110 deg. F]; or,
 - 3. Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.
- E. Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on the facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts of not completely removed.
- F. Components should be hand-dried with a clean lint-free cloth or air-dried.
- G. Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.
- H. Test the respirator to ensure that all components work properly. Log who cleaned and inspected respirators prior to going back into service. Log and segregate any respirator that may need maintenance.

3.0 RADIATION SAFETY

3.1 Policy

Fansteel is committed to ensuring that occupational dose and dose to members of the public are as low as is reasonably achievable. To this end, Fansteel has established a radiation safety program (Program) commensurate with the scope and extent of licensed activities at the facility. This program provides a description of the primary elements used to realize this commitment. The elements are based upon sound radiation safety principles.

3.2 Program Description

3.2.1 Radiation Safety Program

3.2.1.1 Purpose

This written program and associated operating procedures are the primary means used to administratively establish safe radiation work practices and ensure compliance with the requirements of the Nuclear Regulatory Commission (NRC). This written program also serves as the Radiation Safety Manual.

3.2.1.2 Scope

This program is applicable to the performance of licensed activities at the Fansteel Muskogee facility (facility).

3.2.1.3 Responsibilities

A single individual shall be identified as the Plant Radiation Safety Officer (PRSO). This individual will be directly responsible for the radiation safety program.

All personnel are responsible for complying with the requirements of this program.

3.2.1.4 Changes

The program can only be changed if:

- The change has approval of the RSC;
- The change does not prevent the Program's stated purpose from being realized;
- The change is justified in writing and becomes part of the permanent file of the Program.

3.2.1.5 Assessment

The program shall be reviewed annually. Review of the program shall encompass content and implementation. The results of the review, including corrective actions, will be documented and presented to the RSC.

3.2.1.6 Definitions

Definitions of terms in this document are the same as described in 10 CFR 20.

3.2.2 Occupational Dose

It is not likely that an individual engaged in or observing activities conducted at the facility will receive in excess of 10 percent of any applicable dose limit described in 10 CFR 20.1502; therefore no monitoring, recordkeeping, or reporting will be conducted pursuant to 10 CFR 20 sections 1502, 2106, and 2206. However, voluntary monitoring will be conducted to demonstrate compliance with this condition. Also, monitoring will be conducted to satisfy license requirements.

3.2.2.1 Determination of external dose

External dose will be determined by use of individual thermoluminescent dosimeters (TLD). The TLD's will be processed by a dosimetry processor holding a current personnel dosimetry accreditation from the National Voluntary Laboratory Accreditation Program.

3.2.2.2 Determination of internal dose

Internal dose will typically be determined using concentrations of radioactive material in air in the workplace. In special cases, internal dose may be determined using quantities of radionuclides in the body, quantities of radionuclides excreted from the body, or a combination of available data.

Internal dose will be calculated in accordance with Regulatory Guide 8.34 "Monitoring Criteria and Methods to Calculate Occupational Doses", July 1992.

3.2.2.3 Dose limits

The occupational dose to individual adults, individual minors, and the embryo/fetus shall be controlled to less than 10 percent of the respective occupational dose limits specified in 10 CFR 20.

3.2.3 Public Dose

3.2.3.1 Determination of dose for individual members of the public

Dose to individual members of the public shall be determined by continuous collection of an air sample at the location of the individual likely to receive the highest dose from the licensed operation; i.e. the nearest routinely occupied location.

3.2.3.2 Dose limits for individual members of the public

Dose limits to individual members of the public shall be controlled to less than the dose limits specified in 10 CFR 20 and 40 CFR 190.

3.2.4 Radiation Surveys

3.2.4.1 General

Radiation surveys will be performed to describe the radiation types and levels in an area or during a task, to identify or quantify radioactive material, and to evaluate potential and known radiological hazards. The surveys will be comprised of direct (i.e. in situ) and laboratory measurements.

3.2.4.2 Type and Frequency

The types of radiation surveys and their frequency are described in the following subsections.

3.2.4.2.1 Surface

Measurements of direct and removable radiation will be made of surfaces of objects and areas. These measurements will be performed weekly in areas where activities occur regularly, and monthly in other areas in and around the process area.

Direct

Direct measurements will be made of alpha and beta-gamma levels. These measurements will be performed with handheld instruments designed for the particular type of radiation of interest.

Removable

Measurements will be made of removable alpha and beta-gamma radiation. These measurements will be made by wiping an area with cloth, paper, or tape. The alpha and/or beta-gamma levels will be measured on the wipe. In most cases, the wipe will be analyzed with a gas-flow proportional counter.

3.2.4.2.2 Area

Radiation levels in a localized area will be evaluated by one or more of surface radiation measurements, exposure rate measurements, or air samples.

Surface

Surface radiation levels will be determined or monitored as described in Section 3.2.1.

Exposure rate

Exposure rate measurements shall be performed using an ion chamber or equivalent. Measurements will be performed quarterly in areas where radioactive material is processed or stored. Measurements will be made at 30 centimeters.

Air sampling

Concentrations of radioactive material in air will be determined by sampling the air at, or as near as possible to, the worker's breathing zone. Air samples will be collected at locations where generation of airborne radioactive material is most likely. The samples will be collected under known physical conditions (e.g. filter paper, sample time, flow rate). The samples will be analyzed for gross alpha activity using a gas-flow proportional counter.

Visual

An inspection for visible contamination will be conducted each day of the process area where work is being performed.

3.2.4.2.3 Personnel

Used uniforms will be surveyed for contamination prior to being collected by a laundry service. These measurements will be performed with handheld alpha and beta-gamma detection instruments.

3.2.4.3 Action Levels

Action levels are established to inform facility personnel when a situation needs to be evaluated so that corrective action can be taken. Action levels are set so that corrective actions can be made before a regulatory limit is exceeded.

Exceedance of action levels requires investigation including evaluation of preventative and/or corrective action. The investigation, and documentation of such, is completed commensurate with the significance of the condition.

Radiation levels exceeding the values described in the following subsections will be reduced below the respective levels as soon as practicable.

3.2.4.3.1 Surface

Direct

The action level for direct alpha or beta-gamma radiation on a surface is 5000 disintegrations per minute per 100 square centimeters (dpm/100 cm²).

Removable

The action level for removable alpha or beta-gamma radiation on a surface is 1000 dpm/100 cm².

3.2.4.3.2 Area

Exposure rate

The action level for exposure rate is two mrem per hour at 30 cm.

Air samples

The action level for concentration of radioactive material in air is one derived air (DAC) concentration for the respective radionuclide.

3.2.4.3.3 Personnel

The action level for used uniforms is three times the background count rate of the survey instrument.

3.2.4.4 Limits

Fansteel's license provides specific radiation level limits. The limits are administered such that when exceeded, action must be taken to reduce the levels or

additional controls must be applied. Limits are provided for each of the aforementioned types of survey.

Items or areas will not be released for unrestricted use until the relevant limits in the license are met.

All accessible surfaces and areas which exceed the respective limits shall be decontaminated on a timely basis. In no case shall the delay to initiate decontamination exceed one normal work week. In the case of visible contamination, the delay to initiate decontamination shall not exceed one normal work day.

3.2.5 Monitoring

3.2.5.1 Personnel

Personnel monitoring will be performed as described in sections 3.2.2 and 3.2.4.

3.2.5.2 Effluent

Effluent monitoring is described in Division V of this manual.

3.2.6 Exposure Control

3.2.6.1 General

Personnel exposure to radioactive material will be controlled to limit exposure to less than 10 percent of the limits of 10 CFR 20. Personnel exposure to radioactive material will be controlled by application of engineering, administrative, and personnel protection provisions.

3.2.6.2 Engineering

Engineering controls will be used, as practicable, to minimize or prevent the presence of uncontained radioactive material. Engineering controls will predominantly be comprised of containment, isolation, ventilation, and decontamination. The plant is designed and constructed as a closed process system, therefore these engineering controls are inherent in the design.

3.2.6.3 Administrative

Administrative controls will be used to control work conditions and work practices. Administrative controls will predominantly be comprised of the following:

III-3-6

3.2.6.3.1 Access control

Routine access to work areas will be limited to personnel necessary to accomplish tasks or work. Access will also be controlled with respect to training and use of specified personnel protection equipment.

3.2.6.3.2 Postings and barriers

Postings will be used to inform personnel of relevant hazards or conditions and associated access requirements. Barriers may be used to prevent unauthorized access.

3.2.6.3.3 Procedures

Written procedures will be used to describe specific radiation protection requirements necessary for tasks that involve radioactive material.

3.2.6.3.4 Special Work Permits

The requirement for a Special Work Permit (SWP) is described by Fansteel's license. SWP's will be used to describe specific or special worker protection requirements for activities involving radioactive material and not covered by a procedure. SWP's may also be used in conjunction with a procedure.

3.2.6.3.5 Contamination control

The action levels provided in Section 3.2.4.3 will be used to control the levels of radioactivity on equipment and in areas. Additionally, practices such as confinement, containment, isolation, decontamination, and housekeeping will be used to control spread of contamination.

3.2.6.4 Personal Protective Equipment

Personal protective equipment will be used to control personnel exposure to radioactive material when administrative controls are not sufficient and engineering controls are not practicable. Personal protective equipment may include head covering, safety glasses or goggles, respiratory protection, impervious outer wear, gloves, and/or shoe covers.

The respiratory protection program is described in Division III, Chapter 2.0 of this document.

3.2.7 Control of Licensed Material

3.2.7.1 Stored material

Fansteel shall secure from unauthorized removal or access licensed material in storage.

3.2.7.1.1 Posting and Labeling

All radioactive material storage areas and devices will be posted or labeled in accordance with 10 CFR 20 Subpart J, Precautionary Procedures.

3.2.7.1.2 Administrative controls

Use or handling of radioactive materials will be limited to personnel with radiation training and a demonstrated need.

3.2.7.2 Shipments and Receipts

3.2.7.2.1 Shipments

Shipments of radioactive material will be made in accordance with 10 CFR 71.5 Transportation of licensed material.

3.2.7.2.2 Receipts

Packages of radioactive material will be received in accordance with the requirements of 10 CFR 20.1906, Procedures for receiving and opening packages. The PRSO will be notified upon receipt of a radioactive materials shipment or package.

3.2.8 Waste Management

Radioactive wastes may be stored on site and/or disposed off site at a licensed facility. General waste management practices will include minimization, segregation, decontamination, and stabilization.

3.2.9 Radiation Detection Instruments

3.2.9.1 Specification

3.2.9.1.1 Radiation Detection Instruments

Radiation detection instrumentation provides direct readout of or readout relatable to dose or dose equivalent, or activity per unit area. Included are portable rate and integrating devices for measurement of surface contamination and photon exposure.

3.2.9.1.2 Particulate Radioactivity Monitors

Particulate radioactivity monitors (air samplers) measure the radioactivity present in or on particulates suspended in the ambient air, ordinarily by filtering the particulates from a measured volume of air and periodically measuring the radioactivity in the material removed.

3.2.9.2 Calibration

This section covers all radiation protection instrumentation and monitors including portable instruments, laboratory counters, installed air samplers, and portable air samplers.

3.2.9.2.1 Frequency

Instruments and monitors in use shall be calibrated annually and after any maintenance that could affect the calibration.

3.2.9.2.2 Radiation Energy

Calibration shall be performed with a source or sources providing radiation fields similar to those in which the instrument will be used.

3.2.9.2.3 Label

Each instrument or air sampler shall be labeled with the following information as applicable:

- a. Date of the most recent calibration.
- b. Initials or specific identifying mark of calibrator.
- c. Energy correction factors, where required.
- d. Graph or table of calibration factors, where necessary, for each type of radiation for which the instrument may be used; this should relate the scale reading to units required if units are not provided on the scale.
- e. Instrument response to an identified check source.
- f. Unusual or special use conditions or limitations.
- g. Date that calibration is again required.
- h. Special condition identification label, if applicable.

3.2.9.2.4 Standards

Instruments and air samplers will be calibrated either against national standards or with derived standards.

3.2.9.3 Verification

3.2.9.3.1 Radiation Detection Instruments

Instruments will be verified (checked) daily when in use to ensure that the instrument is in proper working condition.

3.2.9.3.2 Particulate Radioactivity Monitors

Fixed location air samplers in use will be checked on a weekly basis to ensure proper operation.

Portable air samplers will be checked daily when in use to ensure that the instrument is in proper working condition.

3.2.9.4 Use

Any individual who uses an instrument or air sampler shall have training or equivalent experience in the performance and operation of the instrument or air sampler. After successful completion of the training the individual shall receive on the job training in the use of each item and demonstrate satisfactory knowledge and operation prior to unsupervised use or operation.

3.3 Training

3.3.1 Purpose

Training and orientation is provided for all employees, and contract personnel. This training is intended to provide personnel with the information and guidance needed to help maintain a safe work environment.

3.3.2 Scope

The level of training is provided commensurate with the individuals work or function. Training is conducted in accordance with the requirements described in Division I, Chapter 2 of this manual.

3.3.3 Requirements

3.3.3.1 Personnel

All personnel will be provided basic radiation safety training. This training will address risk, concepts, policies and procedures, responsibilities, and emergency procedures.

Operations personnel will be provided additional radiation safety training covering contamination control and dose minimization.

3.3.3.2 Refresher Training

Refresher training will be conducted annually for all personnel.

3.4 Records/Documentation

3.4.1 Processing

Radiation survey and monitoring data shall be processed as soon as practical after collection so that the results can be evaluated in a timely manner. Sampling results may be stored in a hardcopy and/or electronic format.

3.4.2 Review

Records of surveys and workplace monitoring will be reviewed by the PRSO for completeness and appropriate follow-up or response actions. Reports generated pursuant to regulatory requirements will be reviewed by the PRSO. In each case, reviews will be documented by signature or initial, and date.

3.4.3 Retention

Records will be retained in accordance with Division I, Chapter 2, applicable regulatory requirements, and internal records retention schedules.

3.4.4 Records

3.4.4.1 Personnel Monitoring Records

Records of radiation exposure monitoring shall be maintained for operations personnel. The records will document internal and external exposure. Specific records maintained will include external exposure, and Derived Air Concentration

(DAC)-hours.

3.4.4.2 Radiation Monitoring, Surveys, and Sampling Records

Radiation monitoring, survey, and sampling results shall be documented. The records shall include the name of the surveyor, survey date, location, instrument(s) used, calibration due date of instrument(s), and details of measurement locations and conditions. The type of monitoring, survey and sampling records addressed here include air sampling, routine radiation surveys, radioactive material shipment and receipt surveys, workplace monitoring, and effluent monitoring.

3.4.4.3 Calibration Records

A record shall be maintained of all calibration data for each instrument and air monitor. The record shall be dated and shall identify the individual performing the calibration. The record shall be filed with previous records on the same instrument or air monitor.

3.4.4.4 Training Records

Training records will be maintained for all personnel. The records will describe the type and topic of training, and the date of training.

3.4.4.5 Radioactive Waste Records

Records of the disposition of radioactive waste shall be maintained in accordance with applicable regulatory requirements.

3.5 References

3.5.1 Fansteel Facility License SMB-911

3.5.2 10CFR20

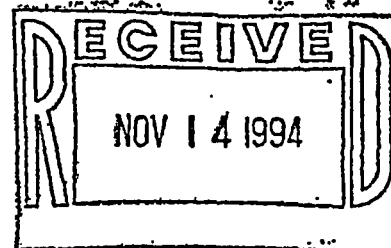
3.5.3 40CFR190

3.5.4 Regulatory Guide 8.34

#18 FNL-NRC

Fansteel
Metals

number ten tantulum place muskogee, oklahoma 74401



November 10, 1994

Mr. Amar Datta
Licensing Section 2
Licensing Branch
Div. of Fuel Cycle Safety &
Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

REF: Docket 40-7580
License SMB-911

Dear Mr. Datta:

Fansteel is in receipt of your letter of October 10
referencing "Preliminary Review of Fansteel's Decommission-
ing Plan and Decommissioning Funding Plan (TAC No. L30705)".
The comments are addressed categorically herein.

Should you have any questions, please feel free to contact
me at any time.

Sincerely,

A handwritten signature in cursive script that reads "John J. Hunter".

JOHN J. HUNTER
Corp. Mgr., Process Eng. &
Facilities Construction

JJH/bsm

attach.

cc: D. Orlando, NRC
K. R. Garrity
M. J. Mocniak
R. M. McEntee✓

NUCLEAR REGULATORY COMMISSION STAFF COMMENTS
REGARDING FANSTEEL'S DECOMMISSIONING AND
DECOMMISSIONING FUNDING PLAN

NRC COMMENT 1: The Decommissioning Plan states that Fansteel intends to dispose of radioactively contaminated soil in an engineered on-site disposal facility developed in accordance with NRC's 1981 Branch Technical Position entitled, "Disposal or On-site Storage of Thorium or Uranium Wastes From Past Operations" (1981 BTP). The 1981 BTP contemplated only limited circumstances in which on-site disposal of uranium or thorium would be approved by the Nuclear Regulatory Commission. Currently NRC is only considering those applications for on-site disposal made in accordance with Option 1 or 2 of the uranium or thorium in the site soil to less than 10 pCi/gm. Soil meeting this concentration would be considered acceptable for unrestricted use without restrictions on the method of burial. Option 2 of the 1981 BTP limits the concentration of thorium in the waste, which would be buried under prescribed conditions, to 50 pCi/gm. These conditions include, but are not limited to stabilization of the waste and a minimum burial depth of 4 feet below the surface. However, because of the relatively high exposures associated with the human intrusion scenario involving Option 2 for thorium, the proposed use of that Option would require the preparation of an Environmental Impact Statement. Further, because of the potential for ^{222}Rn emanations, burial of natural uranium greater than 10 pCi/gm is not allowed under Option 2. Because the pond residues contain natural uranium, it is not clear how Fansteel plans to develop an engineered on-site disposal facility that would meet the 1981 BTP Option 2 criteria. The Decommissioning Plan states that an application for the development of the on-site disposal facility in accordance with 10 CFR 20.302 will be submitted in the future. If Fansteel wants to continue to propose to dispose of waste containing thorium or uranium in excess of 10 pCi/gm in an on-site disposal facility, it will have to submit an Environmental Report (ER) in accordance with 10 CFR Part 51 in addition to the requirements of 10 CFR Part 20.2002 (Please note that 10 CFR 20.2002 replaced 10 CFR Part 20.302 on January 1, 1994). NRC staff will use the ER as the basis for preparing an Environmental Impact Statement.

Because the on-site disposal of natural uranium is not currently contemplated under Option 2, the Decommissioning Plan and Decommissioning Funding

Plan will need to be revised to reflect that on-site burial of contaminated material may not be considered as part of the decommissioning of the facility. If the on-site disposal facility is approved by NRC in the future the Decommissioning Plan and Decommissioning Funding Plan may be revised to reflect the lower cost at that time.

FANSTEEL
RESPONSE 1:

Fansteel, Inc. (Fansteel) has expended significant resources to characterize the extent of radiological and chemical contamination at its Muskogee, Oklahoma facility. The radiological and chemical characterization are documented in our Remedial Assessment Report dated December 1993. Based on this information, Fansteel identified and evaluated potential decommissioning alternatives for cost, effectiveness, and practicality. The results of this evaluation provided the basis for our proposed approach documented in the decommissioning Plan. As stated in the Decommissioning Plan, Fansteel has concluded that decommissioning the Muskogee, Oklahoma facility to meet local, state and federal guidelines for achieving unrestricted use is neither practical nor possible given the extent of radiological and chemical contamination and the cost associated with taking contaminated material off site. Therefore, an on-site remedy that includes deed restrictions appears to be the only financially viable and practical alternative. It is our understanding that the U.S. Environmental Protection Agency (USEPA) previously has approved site remediation plans utilizing on-site stabilization of radioactive contaminated soil with continuing land use restriction and that associated risk analyses found this remediation strategy to be protective of the public health and the environment.

Fansteel appreciates that the Nuclear Regulatory Commission (NRC) Site Decommissioning Management Plan (SDMP) current policy only considers on-site disposal alternatives for soils containing uranium and thorium if the conditions of Options 1 or 2 of the NRC's 1981 Branch Technical Position (BTP) entitled "Disposal or On-site Storage of Thorium or Uranium Waste from Past Operations" are met. However, based on the natural uranium concentrations found in soils at the Muskogee, Oklahoma facility, it does not appear Fansteel can meet the conditions of BTP Options 1 or 2 for on-site disposal to achieve unrestricted use. Although BTP Options 1 or 2 are currently the only on-site disposal options under consideration by the NRC, it is Fansteel's understanding that Options 3, 4 and 5 can be

acceptable options for a licensee if the only financially viable alternative is an on-site remedy and the NRC approves a licensee's request for exemption from the NRC's unrestricted use requirement. It is also our understanding that the proposed revisions to 10 CFR 20 would offer another alternative to off-site disposal by designating a portion of the site for restricted access with attendant long-term surveillance provisions.

Fansteel is in the process of developing an exemption request from NRC regulations in accordance with 10 Code of Federal Regulations (CFR) 40.14(a) and applying to the NRC for approval of procedures to dispose of licensed material on site in accordance with 10 CFR Part 20.2002. The exemption request pertains to NRC regulations requiring that residual radiological contamination be reduced to levels that allow the site to be released for unrestricted use. A supplement to our existing environmental report will also be submitted with our application. Fansteel estimates completion of these documents by May 1, 1995.

In summary, the cost estimates for off-site disposal of contaminated soil documented in Appendix A of the Decommissioning Plan makes the possibility of achieving unrestricted use of the Fansteel site, using current decommissioning standards, unrealistic. Fansteel does not expect this situation to change in the foreseeable future since additional facilities are not expected to be licensed to accept low-level radioactive material before the end of the decade; however, if NRC recently proposed standards are adopted and if additional LLW disposal sites become available, cleanup to the new standards may be feasible by the time Fansteel completes processing. Therefore, Fansteel requests that revisions to the Decommissioning Plan and Decommissioning Funding Plan to eliminate the proposed on-site disposal option be deferred until Fansteel has had the opportunity to submit the above referenced exemption request and the NRC has had the opportunity to review that request.

NRC COMMENT 2: The Decommissioning Plan states that the criteria that will be used to determine if radiologically contaminated soil has been remediated to levels that are acceptable for unrestricted use are 10 pCi/gm of any combination of uranium or thorium in the first 6 inches of soil and 30 pCi/gm of any combination of uranium or thorium six inches or greater below the

soil surface. NRC's decommissioning criteria for naturally occurring uranium and thorium are 10 pCi/gm, regardless of the depth of the contaminated soil layer. The Decommissioning Plan and Decommissioning Funding Plan will need to be revised to reflect that NRC does not currently approve fractionating residual radioactive material levels in soil.

FANSTEEL

RESPONSE 2:

The surface contamination criterion of 10 picocuries per gram proposed by Fansteel is taken verbatim from the Option 1 standards of the BTP of the NRC and is equal to that set by the USEPA for Radium-226 and its decay products (5 picocuries per gram). The proposed subsurface criterion for radioactive contamination of 30 picocuries per gram is also based on the USEPA criterion for Radium-226 in soil or residual materials from uranium mill sites (15 picocuries per gram). The USEPA criterion (40 CFR 192) stipulates not more than 5 picocuries per gram of radium shall remain in surface materials and that not more than 15 picocuries per gram of radium shall remain in subsurface materials. These concentrations are assumed by the UPEPA to be sufficiently low such that postulated exposure scenarios pose no significant risk to the public. Based on radionuclide distribution of approximately 1 to 1 for uranium and thorium in residual material and unprocessed ores at the Fansteel facility, and assumptions that decay products are in equilibrium with the parent radionuclides and that both Radon-220 and Radon-222 are equivalent health risks, the USEPA limit of 15 picocuries per gram for subsurface materials corresponds to a total uranium plus thorium concentration of 30 picocuries per gram. The USEPA has approved site remediation plans utilizing the higher subsurface concentration levels and has found it to be protective of the public health and the environment.

In the event that subsurface soils containing no more than 30 picocuries per gram fail to achieve the other standards required by 40 CFR 192, the materials will be excavated and the areas remediated without regard to the stated limit of 30 picocuries per gram total uranium and thorium. The Fansteel Decommissioning Funding Plan has allocated additional funds as "contingency costs" to address the potential impact of having to excavate and treat additional contaminated material.

NRC COMMENT 3: The decommissioning Plan states that Fansteel intends to mix radioactively contaminated soil with uncontaminated soil in order to dilute the radionuclide concentrations in the contaminated soil to levels that are acceptable for unrestricted use. NRC does not permit NRC licensees to mix contaminated and uncontaminated soils in order to reach NRC's limits for unrestricted use. The Decommissioning Plan and Decommissioning Funding Plan will need to be revised to reflect the requirement to dispose of soil exhibiting radioactive material contamination in excess of NRC's unrestricted use criteria in a licensed low-level radioactive waste disposal facility.

FANSTEEL
RESPONSE #3:

Fansteel does not intend to intentionally mix radioactively contaminated soil with uncontaminated soil to dilute radionuclide concentrations. Fansteel understands that the intentional blending of contaminated soils to reach the NRC limits for unrestricted use is not permitted. References in the Decommissioning Plan to soil mixing refer to unavoidable incorporation of uncontaminated soils with contaminated soils during the excavation process to remove isolated pockets of subsurface contamination.

NRC COMMENT 4: The Decommissioning Plan states that chemical contamination at the Muskogee, OK facility will not need to be remediated because NRC does not have unrestricted use criteria for chemically contaminated soil. While NRC does not have regulatory responsibility for remediation of chemical contamination at NRC-licensed sites, NRC does require that all licensed operations, including decommissioning, be conducted in accordance with all other applicable local, State or Federal requirements. As such, while NRC is not responsible for ensuring that Fansteel remediates the chemically contaminated soil or groundwater, NRC does expect that Fansteel will remediate chemical contamination to those levels specified by the appropriate regulatory authority for those contaminants. NRC staff has contacted the Oklahoma Department of Environmental Quality (ODEQ) to discuss with them the remediation of your facility and to determine what criteria ODEQ will use to determine whether chemical contamination at the site has been sufficiently remediated. Further, the Decommissioning Plan must identify which wastes are mixed wastes. The Decommissioning Funding Plan will need to be revised to reflect these changes.

FANSTEEL
RESPONSE 4:

It was not Fansteel's intention for the Decommissioning Plan to imply that chemical contamination at the Muskogee, Oklahoma facility will not need to be remediated because the NRC does not have unrestricted use criteria for chemically contaminated soil. Fansteel fully recognizes and expects to address chemical contamination concerns in accordance with all applicable local, state and federal requirements.

Fansteel has been in contact with the Oklahoma Department of Environmental Quality (OKDEQ) to discuss the status of activities at the Muskogee, Oklahoma facility. It is clear that the OKDEQ will be involved in determining whether chemical contamination at the site has been sufficiently remediated. Fansteel will continue to work with the OKDEQ to assure their acceptance of any proposals for on-site disposal of radioactive materials or establishment of a permanently restricted area on site.

Fansteel has not identified any hazardous wastes at the site which would require classification as hazardous materials under RCRA. Since there are no hazardous wastes, the definition of mixed wastes would not be applicable.

NRC COMMENT 5: Fansteel indicated that they plan to provide financial assurance for the decommissioning of their Muskogee, OK facility by self guaranteeing the costs of the decommissioning. To use the self guarantee financial assurance mechanism, Fansteel must provide the information indicated in Appendix C to 10 CFR Part 30 "Criteria Relating to the Use of Financial Tests and Self Guarantees for Providing Reasonable Assurance of Funds for Decommissioning." A submittal for self guarantee should include all of the financial documents discussed in Appendix C. In addition, Fansteel must demonstrate a bond rating of at least "A". Inquiries to Standard and Poors, and Moodys, did not reveal any bond rating for Fansteel. Fansteel must clarify and demonstrate that it has satisfied all of the criteria outlined in Appendix C to Part 30. If Fansteel cannot satisfy the Appendix C criteria, an alternative financial assurance mechanism must be provided.

FANSTEEL
RESPONSE 5:

There are two issues relating to the Decommissioning Funding Plan. First is the decommissioning cost

estimate, which is directly related to the amount of money to be assured. Second is the type of financial mechanism employed to assure the availability of sufficient funds to decommission the licensed facility. These issues are discussed in the following sections.

Decommissioning Cost Estimate - The amount of funds to be assured for decommissioning is a function of the decommissioning alternative. As described in the Decommissioning Plan, Fansteel proposes on-site disposal of some soils contaminated with low levels of natural uranium and thorium.

Fansteel acknowledges that the proposed levels of contamination to be disposed on-site exceed those of options 1 or 2 in the NRC's 1981 Branch Technical Position ("BTP"), but we believe that on-site disposal is the only viable alternative at this time. There is no available technology capable of decontaminating soils to option 1 or 2 levels, so the only way to achieve these residual radioactivity levels is to remove the contaminated soils and dispose of them at a licensed facility. Presently, there is only one disposal facility licensed to receive this type of material and the cost associated with transportation and disposal of the projected volumes of contaminated soil is extremely high. Accordingly, Fansteel considers it appropriate at this time to base decommissioning on our selected approach.

It is important to note that total facility decommissioning will not occur until the existing inventory of residues have been processed. This is expected to require 11 years, during which time the facility will be operating under NRC license. Projecting the costs for removal of radioactive contamination to unrestricted release levels using present decommissioning standards, off-site disposal costs and availability of off-site disposal capacity results in an artificially high cost estimate for decommissioning. Providing assurances for such costs would unduly burden Fansteel and jeopardize its ability to finance the WIP residue processing operation--the proceeds from which Fansteel plans to use to aid in defraying decommissioning costs.

During the period when WIP residues are being processed, several key regulatory issues which will influence the scope of decommissioning should be resolved. One of these is the establishment of decommissioning standards. In August, 1994, NRC proposed radiological criterion for decommissioning.

If these criteria are adopted, the acceptable levels of residual contamination correlating to the standard of 15 mrem/yr TEDE may be higher than the 10 pci/gm standard in the 1981 BTP. While the residue processing is occurring, the availability of off-site disposal facilities may also improve, and disposal costs may decrease as availability increases. These factors would reduce the volume of contaminated material requiring off-site disposal and/or the unit costs for off-site disposal, such that future implementation of an off-site disposal option might be economically feasible.

Fansteel believes it is reasonable and prudent to plan and fund a decommissioning program providing for on-site disposal of some contaminated materials. As the regulatory issues associated with facility decommissioning are resolved and actual site conditions remaining after WIP residue processing are determined, Fansteel will revise and update its decommissioning plan and funding plan accordingly.

Financial Assurance Mechanisms - Fansteel believes that its self-guarantee provides adequate assurance to the NRC that funds will be available to decommission the facility. Other than the bond rating criterion, Fansteel has satisfied all the elements for a self-guarantee as identified in Appendix C to 10 CFR 30. NRC regulations for self-guarantees require that the company's most recent bond rating by Moodys or Standard and Poors be rated "A" or higher. Fansteel has never issued bonds; thus, it has no bond rating. Accordingly, we believe that application of this criterion unfairly discriminates against companies, such as Fansteel, which are financially sound but which do not raise capital by issuing bonds.

Fansteel's self-guarantee demonstration exceeds NRC's criteria for parent-company guarantees. Because Fansteel's financial assurance demonstration provides greater assurance than a parent-company guarantee, we believe it is appropriate for NRC to accept this demonstration directly or under a specific exemption as provided for by 10 CFR 40.14(a).

As evidence that Fansteel's self-guarantee provides adequate assurance to the NRC, it is important to note that Fansteel's self-guarantee exceeds the standards for a parent-company guarantee. Fansteel has a Tangible Net Worth ("TNW") greater than \$10 million and greater than 10 times the decommissioning cost estimate; its assets in the

United States are greater than 10 times the decommissioning cost estimate; and it satisfies the financial ratios identified in 10 CFR 30 Appendix A. These criteria are more stringent than the criteria for a parent-company guarantee, which requires TNW and U.S. assets only six times greater than the decommissioning cost estimate.

It seems wholly incongruous that a level of financial assurance greater than that imposed on a parent guarantee would be inadequate because the company providing the assurance is the licensee, an entity subject to greater scrutiny and control by the NRC, and not the parent company. In either case, the amount of money being assured is the same and both mechanisms are otherwise acceptable means of providing adequate assurance of the availability of these funds. For these reasons, Fansteel believes the NRC should grant an exemption from the bond requirement and accept Fansteel's self-guarantee.

Reviewed and Approved by:

Plant Operations Manager (POM) Mining & Utilities	Date
---	------

Plant Operations Manager (POM) Process Operations Date

Plant Radiation Safety Officer _____ Date _____

Plant Safety Director : Date

On-Duty Crew Leader _____ Date _____

Engineering/Laboratory
Date

Independent Technical Review _____ Date _____

Site General Manager _____ Date _____

Effective Date: _____

Department/Title	Level of Training				
	0	1	2	3	4
Administration					
Health & Safety					
Process Operations					
Mining & Utilities					
Other:					

* 0 = None 1 = Read/Review 2 = Supervisor Review With Employee
 3 = Classroom 4 = On the Job Training (OJT)

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1.0 INTRODUCTION

1.1 Purpose

To establish a standardized, uniform method for development, distribution, implementation and maintenance of Standard Operating Procedures (SOPs) at the Fansteel Inc., Muskogee Facility (Fansteel).

1.2 Scope

This procedure is applicable to all Standard Operating Procedures utilized at Fansteel.

1.3 Background

Operating Procedures are the foundation of every successful organization. All systems which employ a varied mix of skilled workers and technical equipment require a common plan or blueprint to function safely and efficiently as an operating unit.

Operating procedures are also the foundation upon which a strong training program is built.

For these reasons, it is essential that all Fansteel employees strive to ensure that our operating procedures clearly and accurately reflect the safe and efficient ways to conduct business.

CAUTION

SANCTION - Failure to follow written and approved procedures: 1) increases the risk of adverse effect on employee's health and safety, and 2) may result in a violation of conditions under which Fansteel is licensed. Consequently, a failure to follow procedures may result in serious consequences.

WARNING

WILLFUL AND KNOWING VIOLATION OF FANSTEEL FACILITY OPERATING PROCEDURES MAY SUBJECT THE VIOLATOR TO DISCIPLINARY ACTION INCLUDING TERMINATION OF EMPLOYMENT.

1.4 Objectives

1.4.1 Assure facility management and operation in accordance with management objectives.

In this context, management objectives include quality program objectives, compliance with safety and environmental programs and regulatory requirements, and production levels.

1.4.2 Assure facility operations within its design parameters.

Procedures provide physical parameters which define operating boundaries. These include temperature, pressure, flowrate, density and almost any physical characteristic which can be measured. These parameters define operational limits which are well within safety margins of equipment design or authorizing licenses or permits.

1.4.3 Minimize the potential for human error.

The purpose of this objective is to minimize the risk of damage or injury to the employees, the public, and the plant itself.

1.4.4 Maximize personnel efficiency.

Well written procedures maximize the effectiveness of personnel reviews and training prior to undertaking the various tasks governed by procedure, especially those that are complex and/or are performed on a non-routine basis.

1.4.5 Accumulate experience.

It is typical for plant personnel to formulate improved methods of completing various tasks as experience with the facility is gained. Procedures provide a vehicle for adopting and documenting these improvements consistent with applicable requirements and assuring that, once adopted, they are utilized by the entire plant staff.

1.4.6 Provide a vehicle for documenting plant processes.

Procedures document the methods used to operate and administer the facility. They are therefore, a vital element of any evaluation or review performed internally, or by an outside agency to assess or improve facility operations, safety, or efficiency.

1.5 Responsibilities

1.5.1 It is the responsibility of Document Control to perform the following:

- A. Publish, distribute, update, maintain and account for controlled copies of Fansteel Standard Operating Procedures (SOPs).
- B. Establish the criteria for format, style and content of procedures to be utilized throughout the facility.
- C. Develop and maintain a current master list of all site procedures with the latest revision date of each procedure.
- D. Schedule and monitor SOP review cycles to ensure timely completion of procedure review within the permissible review cycle.

1.5.2 It is the responsibility of the Site General Manager to act as Chairman of the Radiation Safety Committee (RSC).

1.5.3 It is the responsibility of the procedure proponents to ensure that Fansteel Standard Operating Procedures are developed in accordance with the guidance provided in this procedure.

1.5.4 It is the responsibility of the procedure proponents to ensure that Fansteel Standard Operating Procedures are reviewed in a timely manner.

1.5.5 It is the responsibility of all employees to utilize Controlled copies of procedures for any actual conduct of activities described by a procedure.

1.6 Definitions

Approving Authority - Individual empowered to rescind, reclassify, incorporate or approve Fansteel Standard Operating Procedures. The Approving Authority is the Radiation Safety Committee.

Holder - Individual who is issued a controlled copy of the Fansteel Standard Operating Procedures and is responsible to Document Control for its control.

Departmental Instructions – Instructions or procedures published only within a given department under the authority of the Department Manager. These instructions do not have the force and effect of Operating Procedures. Departmental Instructions are not a license requirement. In the event of a conflict, Operating Procedures take precedence. Departmental instructions are intended to address routine matters and business practices that have impact only within the subject department.

Page Corrections - Single page "corrections" may be made to SOPs in order to reflect administrative changes that have no impact on safety; and, to change typing, printing, or compilation errors (e.g., spelling errors, misprints, pagination or photocopy problems). "Corrected" pages do not require RSC review/approval.

Radiation Safety Committee (RSC) - Reviews and approves Fansteel Standard Operating Procedures. For each new or changed procedure, determines what the training requirements are for designated facility employees.

Proponent - Manager with responsibility for the accuracy, completeness and currency of assigned Fansteel Standard Operating Procedures. (See Table 1).

Rescind - To eliminate a Fansteel Standard Operating Procedure because the activity or function is no longer performed or is adequately documented elsewhere.

Fansteel Standard Operating Procedure - Written guidance that establishes required actions by employees and is published under the authority of the Radiation Safety Committee. Maintaining and following Operating Procedures is an NRC license requirement. The short title is Standard Operating Procedure, or SOP.

Fansteel Facility Administrative Procedure - Written administrative guidance which establishes required actions by employees and is published under the authority of the Site General Manager. The short title is Facility Administrative Procedure, or FAP.

Series - A subset of Fansteel Standard Operating Procedures which relate to a given functional area. See paragraph 4.4)

User - Facility employee or contractor who refers to Fansteel Standard Operating Procedures for information and guidance in order to properly perform his duties.

Verify - To confirm, check or substantiate. Unless otherwise indicated, this action does not require documentation.

2.0 REFERENCES

2.1 Fansteel Inc., NRC License SMB 911.

2.2 Standard Operating Procedure G-002, "Temporary Operating Procedures".

3.0 SAFETY PRECAUTIONS AND LIMITATIONS

None

4.0 PROCEDURE

==NOTE==

Willful and knowing violation of Fansteel Standard Operating Procedures may subject the violator to disciplinary action including termination of employment.

4.1 Organization of the Procedure System

4.1.1 The levels of procedures are as follows:

- A. Standard Operating Procedures (SOPs)
- B. Facility Administrative Procedures (FAPs)
- C. Departmental Instructions (DIs)
- D. Temporary Operating Procedures (TOPs)

4.2 Use and Control of Procedures

- 4.2.1 To ensure that operations are conducted in a safe and controlled manner, written procedures that are clear, concise and technically correct shall be utilized to direct routine activities at Fansteel.
- 4.2.2 For non-routine activities, activities performed on an occasional basis, and/or activities deviating normal operating procedures, control of activities shall be ensured through the "Temporary Operating Procedure" mechanism particularly those activities involved in configuration of plant equipment and/or systems.
- 4.2.3 Procedures will be kept current and controlled in Controlled Copy binders.
- 4.2.4 Employees are to utilize Controlled Copies of procedures for any actual performance of the activity described by the procedure.
- 4.2.5 Procedures utilized for information or review which are not Controlled Copies will be clearly marked "For Information Only".
- 4.2.6 A field copy of a procedure may be produced by copying a Controlled Copy, and verifying that it is the most recent revision against the Controlled Copy. A field copy should be verified against the Controlled Copy prior to beginning work each shift. Initial and date each verification at the top of the field copy.
- 4.2.7 Document Control will also develop a master list of all site procedures and maintain it current with the latest revision date of each procedure.

4.2.8 Employees will utilize procedures in the performance of their duties. Full conformance with the procedure is expected and includes the following aspects:

- A. The procedure will be reviewed prior to performing the activity and utilized during the performance of the activity. It is not necessary for the employee to have the procedure in hand to perform the activity, but the procedure must be available for reference. The employee will refer to the procedure with enough frequency to assure full conformance with the procedure.
- B. The steps in the procedure will be performed in order, one at a time, unless the procedure specifically allows steps to be done concurrently or out of order.
- C. If an employee encounters a step in the procedure that cannot be performed as required by the procedure, the employee is to put the equipment/process in a safe condition, stop and contact his supervisor IMMEDIATELY. Supervisory personnel will take prompt action to resolve procedure problems, such as have a TOP written, or initiate other management action to resolve the problem. Minor typographical errors that do not affect the understanding of the procedure should be noted and routed for correction, but should not stop the activity from continuing.
- D. A supervisor, or higher level manager or officer, may authorize a deviation from a procedure if in his or her judgement, he/she is in an emergency situation and a deviation is required to prevent employee injury, to protect the public health and safety or to protect the environment from a severe and acute impact. In this case, the supervisor will clearly announce that he/she is authorizing a procedure deviation, log it in the appropriate log, and as soon as the situation is stabilized, notify his/her department manager or Site General Manager.

4.2.9 Non-routine activities, as defined below, shall be procedurally controlled. These controls will be developed, reviewed, and approved in accordance with existing administrative requirements.

Non-routine activities are defined as activities not covered by existing Fansteel Standard Operating Procedures which:

- A. Have the potential of exposing plant personnel or members of the general public to radioactive materials or hazardous chemicals.
- B. Have the potential to release radioactive materials or hazardous chemicals to the environment.
- C. Increase the potential for spilling radioactive material or spreading contamination within the facility.

4.2.10 Fansteel's procedures are intended for use by Fansteel employees and contractors who have achieved the minimum level of qualification, training and experience established by their department for the task(s) assigned.

4.2.11 When a procedure or departmental instruction is deleted or rescinded, a justification for the deletion will be prepared by the proponent or department manager. The rescission of an operating procedure must also be approved by the Radiation Safety Committee. The justification shall be filed in the procedure file or placed in each controlled set of departmental instructions.

4.3 Instructions for Writing Procedures

4.3.1 Procedures will be developed in accordance with Appendix A

4.3.2 All procedures that affect radiation safety should receive a procedural walkdown prior to submittal to RSC for approval. Refer to Exhibit A "Desktop Review Check List" and Exhibit B "Walkdown Review Check List".

4.4 FANSTEEL STANDARD OPERATING PROCEDURES are organized into the following subject areas or series with symbols and proponency as indicated in Table 1.

TABLE 1

AREA/SERIES	SYMBOL	PROPONENT	REVIEW PERIOD
Process Operations	OPS	POM-Process Operations	12 Mos.
Mining and Utilities	MU	POM-Mining and Utilities	12 Mos.
General	G	SGM	24 Mos.
Health and Safety	HS	PRSO	24 Mos.
Emergency Procedures	EP	PSD	24 Mos.
Maintenance	MAINT	POM-Mining and Utilities	24 Mos.

In order to enhance usability, the procedures are to be grouped by series in numbered volumes, each with a table of contents posted inside the front cover.

4.5 Facility Administrative Procedures

4.5.1 FAPs are organized into a single volume entitled "Facility Administrative Procedures".

4.5.2 FAPs shall be maintained as controlled copies by procedure holders.

4.5.3 FAPs are the administrative arm of Fansteel under the auspices of the Site General Manager.

4.5.4 To obtain approval, a draft FAP shall be submitted to Document Control.

4.5.5 Document Control shall submit the draft to the Site General Manager for review.

4.5.6 If the procedure is endorsed by the Site General Manager the FAP shall be signed and dated.

4.5.7 Publication and distribution of the approved FAP shall be the responsibility of Document Control.

4.5.8 Distribution and control shall be in accordance with the instructions presented in 4.7.4.

4.6 Review and Approval

4.6.1 Procedure proponents are responsible for ensuring that their assigned procedures are reviewed as required. All Fansteel Standard Operating Procedures must be reviewed, approved and issued periodically, as defined in Table 1. Document Control is responsible for scheduling and monitoring reviews to insure timely completion.

All reviews are documented on the Cover Page.

- A. If upon completion of the review there are no changes to the procedure, the Document Control Coordinator (DCC) shall post the Cover Page in all controlled procedure manuals.
- B. If a procedure is changed for any reason, other than a page correction, the revised procedure will be published and posted in all controlled manuals by the DCC. At this time all outstanding TOPs requiring a SOP revision should be incorporated in the new revision. The revised procedure has a Cover Page documenting the revision's review and approval by the RSC.
- C. The Proponent is responsible for conducting the procedure review in a timely fashion Table 1). To assist the Proponent, Document Control should issue a reminder before the due date.
- D. The Site General Manager may request an independent technical review of a new or revised procedure. If the independent technical review is not requested, the Site General Manager will note that this review is not applicable.

4.6.2 There may be occasions when the procedures are reviewed more often than required by the periodic review schedule (Table 1). Changes to equipment, process and/or manpower may require more frequent review of procedures. The need for changes may surface as the result of audits, job safety analyses, process hazard reviews and/or incident investigations.

4.6.3 The following actions are required for the proper development, review and approval of new operating procedures and revisions to existing procedures:

- A. Document Control reminds Proponent of procedure review requirements at least 30 days before it is due.
- B. For major revisions, the proponent shall provide Document Control with a concise statement of the purpose of the revision. This statement will be entered into the procedure history file.
- C. Document Control distributes to RSC members the final copy of the procedure submitted by the proponent.
- D. Chairman of the Radiation Safety Committee (RSC). Schedules and conducts RSC review in compliance with the procedural requirements.

4.7 Format, Publication and Distribution

4.7.1 Format

To obtain consistency, the format shown in Appendix A will be used. The effective date shall be entered on the Cover Page of the revision.

4.7.2 Publication

Document Control is responsible for proper publication of SOPs. Single page "corrections" may be made to SOPs in order to reflect administrative changes that have no impact on safety; and, to change typing, printing, or compilation errors (e.g., spelling errors, misprints, pagination or photocopy problems). "Corrected" pages do not require RSC review/approval.

4.7.3 Effective Date

Procedure revision to incorporate TOPs shall be effective on the date of distribution of the revision by Document Control. RSC shall specify effective dates on all other revisions.

4.7.4 Distribution

Distribution shall be made prior to the end of the effective day. Complete sets of approved procedures shall be distributed to the locations defined by Document Control.

4.8 Training and Records Keeping

4.8.1 Radiation Safety Committee - As part of the review and approval process, identifies the implementing action (if any) required by each employee for each procedure approved.

4.8.2 Employee/Contractors - Are responsible for reviewing procedure changes that affect their duties.

4.8.3 Department Managers - Ensure that their subordinates sign-off that they have reviewed procedure changes affecting their duties. The completed sign-off sheets are forwarded to Document Control.

4.8.4 Document Control - Maintains records of employee reviews of applicable procedures, and maintains record of all required training given to employees and contractors.

4.9 Implementation

4.9.1 Any SOPs issued or revised after the effective date of this procedure must comply with the provisions set forth herein. Standard Operating Procedures approved prior to the effective date of Revision 0 of this procedure do not require revision.

5.0 RECORDS

6.0 ATTACHMENTS

APPENDIX A
Page 1 of 3

FORMAT

1.0 INTRODUCTION*

1.1 Purpose*

1.2 Scope*

1.3 Background

1.4 Responsibilities

1.5 Definitions

1.6 Materials

2.0 REFERENCES*

2.1 Applicable Source Material License Requirements*

2.2 Applicable Federal or State Regulations

2.3 Material Safety Data Sheets*

2.4 Performance References

2.5 Applicable Fansteel Standard Operating Procedures

2.6 Developmental References (optional)

3.0 SAFETY PRECAUTIONS AND LIMITATIONS*

The following Safety Precautions block will be used with all procedures which have process parameter sheets; procedures without parameter sheets will have only the first sentence included in the Safety Precaution block.

Procedure Users must read and understand any Safety Precautions listed which address areas of potential risk to life, limb and/or property.

These operating conditions, temperature, pressure, flow rates, etc. included in the body of the procedure are guidelines only.

The specific operating parameters as listed on the Process Parameter Sheet are to be followed.

3.1 Hazardous Chemicals/Equipment

3.2 Radiological Hazards

3.3 Industrial Hygiene

3.4 Industrial Hygiene

3.5 General Safety

4.0 PROCEDURE*

4.1 Prerequisite Actions

4.2 Startup (or Standby Readiness)

4.3 Normal Operation

4.4 Shutdown

4.5 Infrequent Operations (if needed)

APPENDIX A
Page 2 of 3

FORMAT

5.0 SPECIAL PERFORMANCE SECTION (optional)

ADDENDA (as applicable)

Attachments
Appendices
Exhibits
Figures
Process Parameter Sheets (last)**

*Required for all procedures.

**Required for OPS-series and MU-series procedures.

The following devices are employed to alert the user to important matters:

==NOTE==

Safety considerations are addressed in paragraph 3.0 and again in the narrative section of the procedure (paragraph 4.0).

Use the following hierarchical system to flag important safety consideration in the narrative description section of the procedure:

WARNING

CAUTION

==NOTE==

WARNING

THE WARNING BLOCK IS USED TO ALERT THE USER OF INFORMATION DIRECTLY IMPACTING UPON THE SAFETY OF PERSONNEL. IT IS EMPLOYED WHEN THE ACTIVITY CREATES A POTENTIAL RISK TO LIFE OR LIMB.

==NOTE==

A note block is used to alert the user to material of above average importance and which could be overlooked if not highlighted.

APPENDIX A
Page 3 of 3

FORMAT

The following device is used to highlight changes in subsequent revisions:

==NOTE==

To highlight and bring to the attention of procedure users material which is new or changed, a flagging device consisting of a vertical bar □ (revision bar) will be placed in the right-hand margin opposite the sentence in which the new or changed material first appears. The vertical line will extend the length of the new or changed material.

The revision bar will remain until a subsequent revision to the procedure is made and approved.

EXHIBIT A**Page 1 of 2****Desktop Review Check List**

This Desktop Review Checklist is designed so that:

1. A "Yes" answer to a checklist question means that the procedure adequately meets the intent of the checklist question.
2. A "No" answer to a checklist question requires explanation on the comment sheet attached to the checklist and, if necessary for resolution, a statement outlining the procedure revision that will be necessary to meet the intent of the checklist question.
3. A "N/A" response to a checklist question means that the subject of the question does not apply to the procedure.

<u>Question</u>	<u>YES</u>	<u>NO</u>	<u>N/A</u>
1. Task clearly identified?	___	___	___
2. Position(s) performing task identified?	___	___	___
a. Position assignments consistent with current organization titles and responsibilities?	___	___	___
b. Positions performing each step clearly understood?	___	___	___
3. All necessary precautions identified?	___	___	___
4. All appropriate references identified; e.g., source material license section, federal regulation, material safety data sheets, etc.?	___	___	___
5. Procedure steps clearly stated using action verbs?	___	___	___
6. Procedure steps in sequence? (Note: Procedure walk down checklist should be used to complete this question.)	___	___	___
7. Do conditional (If-Then) steps clearly specify the conditions and actions to be taken?	___	___	___
8. Is each equipment item requiring action identified clearly?	___	___	___
9. Are line-ups and positions or settings correct?	___	___	___
10. Is procedure consistent with license technical requirements?	___	___	___
11. Notes, cautions, and warnings given before steps to which they apply?	___	___	___
12. Notes, cautions, and warnings easily identifiable in the procedure?	___	___	___

EXHIBIT A
Page 2 of 2

Desktop Review Check List

<u>Question</u>	<u>YES</u>	<u>NO</u>	<u>N/A</u>
13. Notes, cautions, & warnings free of action steps	___	___	___
14. Hold points specified as needed?	___	___	___
15. Method of communication and coordination recommended?	___	___	___
16. Notification of appropriate operations and Health and Safety personnel specified?	___	___	___
17. Process parameters specified:			
a. As a range with minimum, maximum, and target values?	___	___	___
b. In procedure step (In parameter sheet recommended)?	___	___	___
c. In parameter sheet or attached checklist?	___	___	___
18. Appropriate requirements for measuring and test equipment and other tools specified?	___	___	___
19. Figures, sketches, and charts current and consistent with current plant configuration and procedures?	___	___	___
20. Valves, pressure indicators, temperature indicators, and level indicators all identified by their current number?	___	___	___

**FANSTEEL FACILITY OPERATING
PROCEDURE SYSTEM**
**EXHIBIT B
Page 1 of 2**
Walk Down Review Check List .....	21

This Walk Down Review Checklist is designed so that:

1. A "Yes" answer to a checklist question means that the procedure adequately meets the intent of the checklist question.
2. A "No" answer to a checklist question requires explanation on the comment sheet attached to the checklist and, if necessary for resolution, a statement outlining the procedure revision that will be necessary to meet the intent of the checklist question.
3. A "N/A" response to a checklist question means that the subject of the question does not apply to the procedure.

<u>Question</u>	<u>YES</u>	<u>NO</u>	<u>N/A</u>
1. Can the procedure be correctly performed in the sequence it is written?	___	___	___
2. Is the procedure sufficiently detailed to perform satisfactorily and consistently?	___	___	___
3. If the procedure is general, or has general steps, can the user explain in detail how to perform the general procedure?	___	___	___
4. Are the individual steps sufficiently concise and clear, and performed in the same general location so that the user has uninterrupted control of the individual steps?	___	___	___
5. Can the procedure be performed by the user without obtaining additional information from persons or documents not specified in the procedure?	___	___	___
6. Does the procedure include the prerequisites and precautions necessary to perform the procedure (i.e., plant, protective gear, contamination, control equipment, permits, approvals, or equipment conditions)?	___	___	___
7. Are process instruments and equipment numbers, units of measure, nomenclature used in the procedure the same as those which are displayed on the equipment? Are limits consistent with sensitivity and readability of all instruments?	___	___	___
8. Graphs, Charts, Tables, and Figures:			
a. Are they adequate for readability and interpolation or extraction of values to meet the accuracy required by the procedure?	___	___	___

EXHIBIT B
Page 2 of 2**Walk Down Review Check List**

<u>Question</u>	<u>YES</u>	<u>NO</u>	<u>N/A</u>
b. Are they the most current revision, and do they match the installed equipment?	_____	_____	_____
9. Can all equipment identified in the procedure be easily located by a trained individual? Specified location should be complete & accurate.)	_____	_____	_____
10. Is plant equipment/system configuration the same as used in the procedure?	_____	_____	_____
11. Are other documents referenced for use by the procedure sufficiently referenced (i.e., section in procedure correctly tied to section in reference document) usable and available?	_____	_____	_____
12. If items (such as valves, breakers, relays, solenoids, jumpers, fuses, and switches) require alignment to perform the procedures, do the alignment steps in the procedure meet the following criteria?	_____	_____	_____
a. Is each item requiring alignment individually specified?	_____	_____	_____
b. Is each item identified with a unique number or nomenclature that exactly agrees with the label plate identifier?	_____	_____	_____
c. Is the position or configuration in which the item is to be placed specified and in accordance with the design requirements?	_____	_____	_____
d. Is the position or configuration in which the item is placed verified by check-off, initials, or sign-off when applicable?	_____	_____	_____
e. Are line-ups, as given in the procedure, adequate? Are valve/switch positions correct?	_____	_____	_____
f. Are valve checklists complete?	_____	_____	_____
g. Are test jacks and/or bypass switches installed at appropriate points in actuation circuitry to eliminate the need for jumpers, wire lifts, and inhibits?	_____	_____	_____
h. If a test equipment list or tool list is provided, is it complete?	_____	_____	_____

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1.0 INTRODUCTION

1.1 Purpose

The Condition Report is the process to identify, document, and respond to concerns or adverse conditions (also referred to simply as "conditions") in a timely and effective way, commensurate with their level of significance. This procedure ensures that an adequate review is made of the reportability of each condition identified. In addition, it provides a broader management review of departmental issues that might not otherwise be initiated.

1.2 Scope

This procedure provides a mechanism by which:

- A. Any Employee or contractor can document an observed condition;
- B. Conditions identified are reviewed by management, and are evaluated for reportability;
- C. The cause of conditions are determined and corrective action(s) assigned;
- D. Condition(s) can be tracked and trended to ensure corrective actions are completed and to preclude serious incidents;
- E. Provide feed-back to the Originator.

1.2.1 Some issues or concerns do not meet the definition for "Condition" or "Significant Condition" as defined in 1.3.1 and 1.3.2. Such issues should be dispositioned through other systems (e.g., the Work Order system, etc.). Examples of such issues include:

- A. Industrial safety concerns of minor consequence (e.g., burned out lights, and other such items that could readily be handled with a work order).
- B. Personnel issues not involving failure to follow procedures.
- C. Normal wear and tear of equipment not resulting in safety concerns.
- D. Employee concerns in which confidentiality is desired.

=NOTE=

This procedure does not replace or preclude the employee rights and responsibilities to contact the NRC, as described in NRC Form 3.

Definitions

1.3.1 Condition – A situation or incident which:

- A. Causes or potentially causes property damage to mission critical equipment or a personnel safety hazard.
- B. Indicates a departure from a specified procedure, license requirement or permit, including Health and Safety Work Practice violations.
- C. Indicates a potential or actual environmental release has occurred.
- D. Actual or attempted sabotage is suspected which results in loss of licensed material.
- E. Is a recurring problem for which previous corrective actions have been ineffective, or is deemed by Fansteel Management to warrant a higher level of attention that a Condition Report would provide.
- F. Requires reporting to regulatory agencies.

1.3.2 Significant Condition – A significant condition is a condition for which the root cause must be determined and corrective actions taken to prevent recurrence to satisfy License conditions or regulatory requirements. Significant conditions include:

- 1.3.2.1 Conditions or events resulting in, or having a high potential for resulting in, exposure greater than the administrative or regulatory limits.
- 1.3.2.2 Conditions or events resulting in, or having a high potential for resulting in, radioactive release in excess of regulatory limits.
- 1.3.2.3 Plant evolutions or events that proceeded in an unexpected manner (i.e., not in accordance with approved safety analysis or that required extraordinary actions to manage or mitigate).
- 1.3.2.4 Events or conditions reportable to the NRC, EPA, OKDEQ, or OSHA.
- 1.3.2.5 Events or conditions resulting in a cited NRC violation or

- considered for escalated enforcement.
- 1.3.2.6 Trends or similar programmatic breakdowns or equipment failures that resulted in (or could result in) a significant impact on personnel safety.
 - 1.3.2.7 Any work-related accident (not illness) that resulted in hospitalization (overnight or longer), fatality, or a permanently disabling injury.
 - 1.3.2.8 Conditions of significance as determined by management.

1.3.3 Accident – An accident is an undesired event that results in physical harm and/or property damage. It usually results from a contact with a source of energy above the threshold limit of the body or structure. The responsible supervisor who is either told of, or finds an undesirable event shall be the person who shall be responsible to fill out the Accident Investigation report.

1.3.4 Near-Miss – A near-miss is an accident that could have resulted in an injury, loss of material, equipment or property damage.

1.3.5 Root Cause – The root cause of a problem is the most basic reason or cause of the problem which can reasonably be identified, and which, if corrected or precluded, will prevent the problem from recurring.

1.3.6 Apparent Cause – An apparent cause is the most probably cause of a problem, as determined through a review of the factors related to the problems that are revealed during identification of the problem, initial screening, and some minimal level of subsequent investigation.

1.3.7 Root Cause Analysis – A management tool for identifying the basic and contributory causes of problems, using either an informal or structured formal approach, for the purpose of implementing corrective action and preventing recurrence of a problem.

2.0 REFERENCES

4.6 NRC License SMB-911, Section 2.6

3.0 SAFETY PRECAUTIONS

- 3.1 Events or conditions which impact personnel safety or the safe conduct of production activities should be immediately reported to the Plant Safety Director.

4.0 PROCEDURE

4.1 Initiation of a Condition Report

==NOTE==

In some cases, immediate corrective action and/or oral reporting may be needed to ensure safety of personnel and to prevent further damage to equipment or the environment. This action may be taken before completing a Condition Report.

- 4.1.1 When a potential condition has been observed, it should be discussed with the observer's Crew Leader to determine whether a Condition Report should be initiated.
- 4.1.2 If it is determined that a condition exists, as defined in paragraph 1.3.1, the employee or contractor shall obtain a Condition Report Form (Attachment 1), complete Part 1, and submit the original to the Compliance Manager for Regulatory Affairs.
- 4.1.3 A Condition Report should be submitted as soon as possible after observing a condition as defined in this procedure.

4.2 Crew Leader Actions

- 4.2.1 For events involving an accident or a near miss, the Crew Leader will initiate a Condition Report before the end of the shift, and if warranted, an Accident Investigation as soon as practical, but within 24 hours of the occurrence.
- 4.2.2 Accident investigations are to be documented on the Accident Investigation Report Form, Attachment 2, and forwarded to the PSD.

4.3 Compliance Manager for Regulatory Affairs Initial Actions in Handling Condition Reports.

- 4.3.1 Upon receipt of a Condition Report, determine whether the criteria for a Condition Report, as defined in paragraph 1.3.1, have been met by the reported condition. If the criteria are not met, the unnumbered Condition Report shall be sent back to the responsible manager for resolution.

- A. Assign a Condition Report number for each valid Condition Report

received and enter it into a log.

- B. Determine whether a regulatory agency must be notified. If notification is required, but has not been made, contact the appropriate personnel to ensure that the notification process has been initiated.
- C. Assign a classification for the Condition Report. The classifications include:
 - 1. Closed Based on Actions Taken (CBOAT) – This classification includes items with minor safety significance that are corrected prior to the processing of the Condition Report. Records of the closed Condition Report are maintained for trending purposes.
 - 2. Work Item (WI) – This classification includes items with minor safety significance that can be corrected by routine work practices.
 - 3. Resolve Condition Report (RCR) – This classification includes items with safety significance or potential safety significance that do not meet the conditions for a Significant Condition. This classification also includes recurring issues for which past corrective action has not been effective. An apparent cause is required for conditions in this classification, and corrective action(s) identified.
 - 4. Significant Condition Report (SCR) – This classification is for conditions that meet one or more of the criteria identified in the definition of Significant Condition. A Root Cause evaluation is required for this classification, and corrective action(s) identified.
- D. Assign a due date with respect to the significance of the Condition and the need for an answer.

- 4.3.2 Send the original numbered Condition Report to the responsible manager for determination of apparent cause and assignment of corrective action.

4.4 Responsible Manager's Initial Actions in Handling Condition Reports.

4.4.1 Upon receipt of the original numbered Condition Report, the manager shall review Part 2 of the Condition Report to determine the actions specified. The manager shall complete Part 3 of the Condition Report within 30 days of being assigned responsibility. Which Requires:

- A. That any necessary immediate corrective actions have been taken.
- B. That Incident Investigation Forms have been completed, if necessary.
- C. Initiation of Work Items, as required.
- D. That apparent cause of the condition, or root cause, if assigned, be identified (this may involve reliance on others doing the Root Cause Analysis).
- E. If a Root Cause Analysis has been assigned, the Recommended Corrective Actions from the analysis shall be included in the Condition Report Corrective Actions. An explanation shall be provided for any Recommended Corrective Action not incorporated into the Condition Report.
- F. Corrective actions, with target dates for completion, be assigned, if applicable.
- G. Signature and date, to show that the Condition Report has been reviewed and corrective actions assigned.
- H. The original Condition Report, including the Root Cause Analysis and applicable justifications (Refer to 4.3.1.F) be sent to the Radiation Safety Committee (RSC) for review and approval after corrective actions have been assigned.

4.5 Tracking of Actions Resulting from Condition Reports

4.5.1 After the approval of a Condition Report, pursuant to the requirements of 4.3.1, the corrective actions will be entered into the Corrective Action Tracking Log. The Condition Report will then be formally closed to the specific commitments in the Tracking Log.

- 4.5.2 If the Condition Report requires no follow-up corrective actions, the Condition Report will be closed in the Log, and a copy provided to the originator. No Corrective Action Tracking Log entry will be made.
- 4.5.3 A monthly report will be prepared on the status of open Condition Reports and distributed to management. No report is required if there are no open Condition Reports or corrective actions.
- 4.5.4 The responsible manager shall ensure that corrective actions are completed on schedule.
- 4.5.5 When corrective actions are complete, the manager shall forward the completed items to the Compliance Manager for Regulatory Affairs for processing. A copy of the completed items will be forwarded to the originator of the Condition Report.

5.0 RECORDS

None.

6.0 ATTACHMENTS

- 6.1 Condition Reports
- 6.2 Accident Report



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ATTACHMENT 1

CONDITION REPORT

Part 1 (To be completed by Originator)

DATE:

EMPLOYEE: _____

DEPARTMENT:

CONDITION: (Attach pages if needed)

ACTIONS TAKEN:

SUGGESTED RESOLUTION:

Part 2 (Regulatory Affairs)

CONDITION REPORT NO.

REGULATORY AGENCY CONTACT REQUIRED?

YES ____ NO ____

Basis:

REGULATORY AGENCY CONTACTED?

YES ____ NO ____

CLASSIFICATION: CBOAT ____

Work Item ____

RCR ____

SCR ____

Signature/Date:

Issued to: DEPT _____

NAME _____

DUE DATE _____

Part 3 (Manager)

CAUSE:

CORRECTIVE ACTIONS (Attach sheet if necessary)

TASK	DEPARTMENT	DUE DATE	DATE COMPLETE

Original



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Attachment 2

ACCIDENT INVESTIGATION REPORT

This report is to be completed by the immediate supervisor of an employee reported to have incurred a job-related injury. It is to be completed within 24 hours after the incident. ALL INFORMATION REQUESTED BELOW MUST BE COMPLETE.

Job Title: _____ Department: _____ Reg. Schedule or Overtime when injured? R OT

SSN: _____ Name (First, M.I., Last): _____ Sex: M F

Home address : _____ Home Phone : _____ Birthdate: _____

City: _____ State: _____ ZIP: _____ Hourly Pay Rate: _____

Fansteel Service Date: _____ How long on this Job? _____ Body Part Affected or Injured:: _____

Date Injured: (mm/dd/yy) _____ Time Injured: _____ AM/PM Date Reported: _____ Time Reported: _____

Describe apparent nature and extent of injury in detail (include part of body affected) and medical treatment provided. State all factual circumstances including a description of any machine, tool, process, method, or any activity involved. Use the back of this form if necessary.

Information source (give date) and full name of persons who actually witnessed the incident. If none, write "none" supplying information.
If an employee, show his/her name:

EXAMPLE

Supervisor Notified by _____ at _____ AM/PM Date _____

ONLY

RECOMMENDATIONS:

Action Plan To Prevent Recurrence (Modification Of Machine, Mechanical Guarding, Environment, Training):

Plant Safety Director	Keyton Payne	Extension #260	(Home Phone 473-1812) (Cell Phone 231-1627)
Plant Operating Manager	James Burgess	Extension #269	(Home Phone 458-0031) (Cell Phone 231-1867)

Original



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ACCIDENT INVESTIGATION REPORT-continues

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COMPANY PHYSICIAN	Dr. S. Box	Muskogee Immediate Care	682-0721	Hours	M-F 8:30am - 5:00pm
		1805 North York			
		Muskogee, Ok 74403			
ALTERNATE TREATMENT		Muskogee Regional Medical Center	682-5501	Hours	24 Hours
		300 Rockefeller Dr.			
		Muskogee, OK 74401			

FOLLOW UP

Actions Taken on Recommendations (Include Date Completed) _____

Was Notification Made? Yes No Who was notified? _____

If the Plant Safety Director was not notified state why notification was not made. _____

ANALYSIS: What in your opinion was a contributing cause? Check appropriate box(s).

Physical Causes:

☐ Defective Equipment ☐ Improper Guarding ☐ Improper Dress
☐ Hazardous Environment ☐ Improper Ventilation ☐ Other: _____

Unsafe Acts:

☐ Operating without Authority ☐ Made Safety Device Inoperative ☐ Unsafe Equipment
Operation
☐ Failure to Wear PPE ☐ Took Unsafe Position ☐ Worked on Moving Equipment
☐ Horseplay ☐ Failure to Secure or Lock ☐ Unsafe Loading or Unloading
☐ Used unsafe Equipment ☐ Lack of Skill or Knowledge ☐ Improper
Attitude
Used Hands Instead of Equipment

DISCIPLINARY ACTION:

The following are recommendations for disciplinary action. Disciplinary action can either be issued by the injured employees Supervisor, Plant Safety Director or from the Radiation Safety Committee review of the Accident Report.

Employee Signature _____ Date _____

Supervisors Signature _____ Date _____

Original to Plant Safety Director

CC: Site General Manager, Responsible Supervisor, Accident File

Original

Exhibit L

FMRI RESPONSE TO NRC STAFF APRIL 28, 2003 REQUESTS FOR ADDITIONAL INFORMATION

As indicated in Section III.A.1 of the "Written Presentation of FMRI, Inc. in Opposition to the Written Presentation of the State of Oklahoma," for purposes of responding to the State, set forth below are FMRI, Inc.'s ("FMRI") responses to those RAIs posed by the NRC Staff in the Attachment to the letter from D.M. Gillen to G.L. Tessitore, "Results of Preliminary Review of Fansteel's Decommissioning Plan [DP] Dated January 2003," dated April 28, 2003. These RAIs were incorporated into the "State of Oklahoma's Written Presentation," dated January 30, 2004.

- 3.1 Values for hydrologic parameters are stated, but there is no mention of numerical techniques to obtain them. A discussion of techniques should be provided.

The hydrogeologic values determined through aquifer characterization activities were fully derived in the 1993 Remediation Assessment. A comprehensive discussion of numerical techniques used to obtain hydrologic parameters is contained in Chapter 3 of the Remediation Assessment. The calculation sheets from which the hydrologic parameters were computed are also contained in Appendix C of the Remediation Assessment. The site hydrogeology section (Section 3.7.2) presented in the DP was summarized from the 1993 Remediation Assessment.

Hydraulic conductivity at the site was determined through the performance of slug tests, which were conducted at a majority of overburden monitoring wells and all four bedrock monitoring wells. Slug test data from the bedrock monitoring wells were evaluated using the Cooper-Bredehoft method, and slug test data from the overburden monitoring wells were evaluated using the Bouwer and Rice method. These techniques are widely used and result in appropriate hydrologic parameters for the Muskogee site.

- 3.2 Potential for Vertical migration of radiological material to the bedrock aquifer is not discussed. Fansteel should provide the additional information or explain why it is not necessary.

The geologic and hydrogeologic data for the Muskogee facility indicate that the contaminants present in the shallow groundwater are isolated from the underlying deep groundwater by a natural barrier that is effectively blocking the downward migration of the contaminants. The deep groundwater was detected in Wells MW-151D, MW-161 D, MW-167D, and MW-174D where the shale bedrock exhibits some fracturing. The bedrock shale above and below this permeable sequence was determined to be dry. This deep groundwater in the zone of permeable bedrock is separated from the overlying shallow groundwater by approximately 30 feet of bedrock shale which has been demonstrated to have extremely low permeability. Moreover, there was a significant difference in the static groundwater levels in the four sets of nested shallow groundwater and deep groundwater monitoring wells that were installed at the Muskogee facility. Monitoring Wells MW-51S, MW-61S, MW-67S, and MW-74S (designed to communicate with the shallow groundwater) and MW-151D, MW-161D, MW-167D, and MW-174D (designed to communicate with the deep groundwater) indicate two distinct and separate zones of groundwater. Little difference between the static groundwater elevation level in the shallow and deep wells would be expected if there had been a hydrogeologic connection between the shallow groundwater and the deep groundwater. These data establish that the 30-foot layer of bedrock shale was acting as an effective barrier between the contaminated shallow groundwater and the uncontaminated deep groundwater.

In addition, the contamination in the shallow groundwater is being removed by the groundwater interceptor trench system which acts as a path of least resistance. As a result, there is no hydrogeologic connection between the contaminated shallow groundwater and the uncontaminated deep groundwater such that contamination could migrate to and impact the deep groundwater.

- 3.3 There is not sufficient data to support the potentiometric contours of the bedrock aquifer in Figure 3-8. A detailed description of vertical migration should be provided. If it demonstrates that migration of isotopes of interest are not reasonably expected to reach this aquifer, additional characterization may not be necessary.

Groundwater movement within the near-surface bedrock horizon monitored beneath the facility has been adequately defined for the purpose of the Remediation Assessment. The bedrock encountered was comprised primarily of shale and directly underlayed the surficial unconsolidated deposits. Four monitoring wells intercepted the shale (MS-151D, MW-161D, MW-167D, and MW-174D) and formed a sufficient network for determining groundwater flow within this horizon because of the probable absence of hydrogeologic complexities associated with the subdued bedrock structure. Groundwater movement within the shale occurs mainly within limited fracture zones and, to a lesser extent, along bedding (lamination) planes.

Currently, the groundwater flow interpretation for the bedrock horizon indicates a groundwater divide positioned beneath the eastern portion of the site with groundwater flow toward the east-southeast within the eastern portion of the site toward the Arkansas River, as would be expected. Within the western portion of the site beyond the influence of the river valley, west-northwest groundwater movement is likely controlled by bedrock structure which dips at a shallow angle in a westerly direction away from the river. Although the exact position of the groundwater divide can only be approximated based on data provided from the four existing monitoring wells, groundwater flow directions should remain consistent with the current interpretation regardless of the location of the divide beneath the site. Although other interpretations of the groundwater elevation data are possible, the resulting flow directions would be similar. Additionally, groundwater quality data indicate that groundwater within the bedrock horizon has not been affected and, therefore, further refinement of groundwater movement within this horizon is inconsequential.

See the response to RAI 3.2 for information on vertical contaminant migration.

- 3.4 Values for distribution coefficients are given in the RESRAD output provided in Chapter 5; however no basis is given for the chosen values. These parameters may be important if the groundwater pathway is applicable.

The distribution coefficients used were taken from NUREG/CR-5512, Volume 3 "Residual Radioactive Contamination from Decommissioning" for each radionuclide as listed and noted in Table 5-5 of the DP.

- 4.3 There is insufficient data surrounding the ponds to characterize possible leakage. These areas should be characterized.

A Remediation Assessment was performed during the winter of 1992 and 1993. Geologic and hydrogeologic work conducted during the Remediation Assessment included the collection of 429 samples consisting of 322 soil samples, 64 pond samples, six stream sediment samples, 30 monitoring well groundwater samples, and seven surface water stream samples. In addition, 25 groundwater monitoring wells were installed in the shallow groundwater and four groundwater monitoring wells were installed in the bedrock layer. The timing of the Remediation Assessment represents a review of data demonstrating a likely "worst case" because it was conducted after operations had ceased and after the two known breaches of the liner in Pond 3. In addition, site monitoring has continued regularly since the 1993 Remediation Assessment. Moreover, further characterization will take place during and subsequent to the remediation of the ponds, per License Conditions 30¹ and 31.² Therefore, the extent of

¹ License Condition 30 states, "At the time Ponds 2 and 3 are emptied, Licensee shall undertake to excavate and dispose of any identified WIP material that migrated from the ponds. For the purpose of this paragraph, WIP that migrated from Ponds 2 and 3 shall be defined as material that exhibits the same physical characteristics as the sludge-like material contained in the ponds.

² License Condition 31 states, "Licensee shall conduct an additional characterization of any additional contaminants at the site, including all soils, buildings and groundwater on the site, using guidance in NUREG-1757, Vol. 2. Upon agreement by NRC that any

characterization is sufficient to proceed with implementation of the DP, recognizing that additional characterization will take place at a later time.

- 4.4 There are no data for process equipment or piping, either above or below grade. These areas and components should be characterized.

Condition 31 to License Amendment No. 11 requires characterization of any additional contaminants at the site including all soils, buildings, and groundwater on site. By design, there is minimal below-grade process-related piping at the site. All equipment and structures will be surveyed for unrestricted release from the site, in accordance with the license, or for unrestricted release to remain in place at the time of final decommissioning, in accordance with the DP.

FMRI has remediated contaminated systems and equipment in the past, and has procedures in place for doing so. With respect to large equipment, the licensee recently released a kinetic phosphorous analyzer for use by another company. In addition, the licensee has released a portable filter press that had been used in licensed operations to test CaF material. Both pieces of equipment were released following radiation surveys conducted pursuant to Procedure HSDI-402, Revision 3, "Performance of Radiation Surveys." FMRI also routinely conducts other free release surveys pursuant to HSDI-402 – 83 in 2003, a majority of which were vehicle surveys. Similar tasks will not present difficulty for FMRI under the DP, given the relatively low levels of contamination present in contaminated systems and equipment.

additional contamination is adequately characterized, Licensee shall identify the cost to remediate all contamination identified in this study. Work shall be performed according to the following schedule: a. Submit a site characterization plan not later than February 28, 2011. b. Submit a site characterization report (SCR) not later than December 29, 2011. c. Develop detailed work plans to be submitted with the SCR, including cost and schedule, for any additional work identified in the SCR."

- 4.5 There are no data under building floors or around footings (contamination was found in these types of areas in other parts of the facility, *e.g.*, Northwest property). These areas and components should be characterized.

License Condition 31 requires characterization of any additional contaminants at the site including all soils, buildings and groundwater on site. Based upon the known activities at the site and the records of operation, such contamination is not expected to be significant. There is minimal below-grade process-related piping and therefore little potential for significant contamination. *See also* Response to RAI 4.6.

- 4.6 Depth of penetration of contamination into structures is not defined; this affects the method of removal and total radioactive waste volume. Depth of penetration of contamination should be defined.

License Condition 31 requires characterization of any additional contaminants at the site including all soils, buildings and groundwater on site. Waterborne contamination, the usual pathway of at-depth contamination in porous material such as untreated concrete, is not applicable to the site structures. Minimal surface contamination has been identified, supporting the assumption of no or limited at-depth contamination. Final surveys for total and removable contamination are planned on structure surfaces. There is minimal below-grade process-related piping. All equipment and structures will be surveyed for unrestricted release from the site, in accordance with the license, or for unrestricted release to remain in place at the time of final decommissioning, in accordance with the DP.

- 4.7 The historic site assessment does not support the classification of areas, especially those identified as nonimpacted. Additional information, including characterization, should be provided to support the classification.

The current DP states that all licensed land areas of the Eastern Property have been designated as impacted for the purposes of classification of survey. There are no non-impacted areas of the site.

License Condition 31 requires characterization of any additional contaminants at the site including all soils, buildings and groundwater on site. The results of characterization of both soil and groundwater showed that the contaminated areas were the areas immediately downgradient of the buildings where reprocessing took place, WIP Ponds 2 and 3 located in the northeast corner of the site, and the CAF ponds located in the southeast corner of the site. The portion of the Muskogee facility that was most impacted is the area near the WIP ponds that received the commingled waste residues from the processing operation.

The pattern of contamination shows that the radiological and nonradiological contaminants are found together. This result is consistent with the areas where the production process commingled radiological and nonradiological materials, and the WIP Ponds where the commingled waste residues were deposited. For example, Monitoring Well MW-67S exhibited elevated radiological levels in the form of gross alpha particles and also had the highest concentrations of fluoride, arsenic, and ammonia. The highest concentration of alpha radiological contaminants was found at MW-74S at the northeast corner, which also had the highest concentrations of cadmium, columbium, and tantalum. MW-73S, also located in the northeast corner of the Muskogee facility, had the highest site-wide concentrations of radiological contaminants in the form of gross beta particles and methyl isobutyl ketone.

- 4.8 Section 2.1 of the November 1993 report states that “. . . radiological analyses were secured from [three] depth intervals . . . 0'-6' [at the saturation] zone and an intermediate interval . . .” In fact, less than ten percent of the data in the DP have samples at more than one depth in a location, and only one has all three analyses. The distribution of contamination at depth throughout the site should be well defined.

During the Remediation Assessment, three soil samples were selected for laboratory analysis from each of the borings, with the exception of the deep monitoring wells. For radiological analyses, samples were secured for the depth interval of 0 to 6 inches, the

interval immediately above the zone of saturation, and an intermediate interval displaying the highest beta/gamma reading. Section 4.3.2.2 states that each of the 0- to 6-inch interval of the 67 soil borings and 25 monitoring wells (not including the four deep well locations) were analyzed for radioactivity. The total number of samples equaled 96 for gross alpha and gross beta analysis and 29 of the 96 samples underwent isotopic analysis for uranium and thorium. Section 4.3.2.3 states that each of the 67 soil borings and 25 monitoring wells had at least one subsurface segment analyzed for radioactivity. The total number of samples equaled 162 for gross alpha and gross beta analysis and 25 of the 96 samples underwent isotopic analysis for uranium and thorium.

License Condition 31 requires characterization of any additional contaminants at the site including all soils, buildings, and groundwater on site.

4.9 The number of borings is not consistent in the report; § 3.5.2 states there are 96; § 4.3.2 states 92, and Table 4.1 has 81 unique locations. Fansteel should provide a consistent statement of sampling locations.

These numbers can be explained as follows: a total of 96 soil borings were advanced:

- 67 for soil sampling only, named B-1 through B-74;
- 25 for soil sampling and installation of shallow groundwater monitoring wells, named MW-51S through MW-75S; and
- 4 for installation of deep (shale bedrock zone) monitoring wells named MW-151D through MW-173-D.

This accounts for the total that is mentioned in both Sections 3.5.2 and 4.3.2. Section 3.5.2 stated that 96 borings were advanced – 67 for soil sampling, 25 for soil samples

and shallow monitoring wells, and four for deep monitoring wells. Section 4.3.2 also states the total number of borings as 96.

Table 4-1 is a table of surface soil samples. The 96 samples mentioned on that table include some field duplicates, and some borings were both 1 foot to 0.5 feet samples were collected. Surface soil samples were collected from only 81 borings. Not every soil boring had a surficial sample. No soil samples were collected from the four deep monitoring wells. Only subsurface soil samples were collected from 11 of the 92 soil borings and shallow monitoring well borings. A total of 322 surface and subsurface soil samples were analyzed.

Soil and groundwater samples were analyzed for inorganic chemical, organic chemical, and radiological constituents. The Remediation Assessment program was designed to sample for priority pollutants commonly associated with industrial sites, as well as contaminants specifically known to have been used at the Muskogee facility. Samples were analyzed at a laboratory approved by the Oklahoma Water Resources Board. Quality assurance/quality control and chain of custody were documented and maintained.

4.11 Data from only two groundwater sampling events is presented. Fansteel should provide all available data.

The current DP provides groundwater quality data as initially characterized during the 1993 Remediation Assessment, as compared to the sampling event data available at the time of DP submittal. The timing of the Remediation Assessment represents a review of data demonstrating a likely “worst case” because it was conducted after operations had ceased and after the two known breaches of the liner in Pond 3. Routine groundwater monitoring data are submitted to the Oklahoma Department of Environmental Quality and are also inspected by the NRC during routine inspections.

The shallow groundwater is still being monitored and collected in the interceptor trench system as part of the wastewater treatment system. Data from as late as April 2003 show that concentrations of the organic compound methyl-isobutyl ketone in the shallow groundwater have decreased to below detectable levels at all points through degradation and natural attenuation. Concentrations of inorganic chemicals and radiological constituents in the shallow groundwater have remained mostly stable, while some have decreased. Details of ongoing groundwater monitoring are available at the Muskogee site.

- 4.12 The elevation and location data for bore holes reported on Figure 4-11 is different from the data on Drawing OMF-GRNDS-011 (11/25/02). One example is that the reported low points on the OMF are higher than the surface topography shown, e.g., Pond 3 low point is listed as 531.3', and the topographic isopleth for the berm is 530'. Additionally, the elevations of the wells are approximately six feet higher on the OMF than that reported in the bore logs. Also, the locations of wells and topography is somewhat different between the two drawings. For example, on Figure 4-11, MW-71S is on the 534' isopleth, and south of the south berm of Pond 3; on the OMF, the well is inside (less than) the 530' isopleth and north of the Pond 3 south berm. This raises questions on what values were used to calculate waste volumes. These differences should be resolved and a consistent data set provided.

Volume estimates used in the DP for ponds and soils are based on surface areas and surface to bottom of contaminated zone depth and did not rely on topographic elevations. The details of volume estimates are provided in Chapter 15 of the DP. In addition, License Condition 31 requires characterization of any additional contaminants at the site including all soils, buildings, and groundwater on site.

- 8.2 Remediation techniques for the several types of contamination are not specified: "Specific remediation techniques will be developed . . ." (§ 8.1.2, 8.2.2, etc.)

Detailed work plans ("second tier" documents) specifying remediation techniques to be performed at the site will be provided to the NRC, pursuant to License Condition 37.³

³ License Condition 37 states, "In accordance with 10 CFR 40.42(g)(4)(ii), Licensee shall provide to NRC the following detailed plans, including work to be performed by

These plans will be prepared in accordance with existing guidance. There is a range of remediation techniques that can be practically applied at the Muskogee site. Based upon successful development of these techniques in other, similar, cases, these remediation techniques are not expected to be an impediment to successful implementation of the DP.

- 8.3 Depth of excavation in Ponds 2 and 3 as stated in § 8.3.2.2 is different from that shown in Figure 8-1 by about 10 feet; this affects the volume calculations. These differences should be resolved.

Figure 8-1 presents elevations for the expected depth to bedrock, and not the projected depth of excavation. Volume estimates of contaminated materials for Ponds 2 and 3 are presented in Chapter 15 of the DP. Volume estimates used in the DP for ponds and soils are based on surface areas and surface to bottom of contaminated zone depth and did not rely on topographic elevations. In addition, License Condition 31 requires additional characterization of any additional contaminants at the site including all soils, buildings and groundwater.

- 8.4 It is not clear whether the soils volumes include that under Ponds 2 and 3, or just adjacent to them. This should be clarified.

The soil volume estimates presented in Chapter 15 of the DP include 6 inches of soil beneath Ponds 2 and 3, as calculated based on the aerial extent of the ponds. Volume estimates used in the DP for ponds and soils are based on surface areas and surface to bottom of contaminated zone depth and did not rely on topographic elevations. The details of volume estimates are provided in chapter 15 of the DP. In addition, License Condition 31 requires additional characterization of any additional contaminants at the site including all soils, buildings and groundwater.

contractors and the qualifications of all contractors, for remediating contamination at the site identified in the July 24, 2003, DP: a. WIP (Phase 1) not later than August 2, 2004. b. CaF (Phase 2) not later than January 2, 2007. c. all contaminated soil, buildings and

- 8.5 The method and configuration for gamma scanning material to determine compliance with release criteria is not specified. These should be defined.

The method and configuration for gamma scans of soil are provided in Chapter 14, Section 14.3.2 of the DP. In addition, a Final Status Survey Plan will be prepared based on the commitments of the DP and the guidance in NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual ("MARSSIM")" prior to the performance of final status surveys on site.⁴

- 8.6 The information in this chapter and in Chapter 4 is not sufficient to verify the volume that may require disposal at a licensed facility, such as Envirocare; the volume [that] can go to other facilities such as WCS; and what can remain on site. The additional information should be submitted.

Additional characterization of the site will be completed in accordance with License Condition 31. Characterization activities will be completed in phases, per the NRC-approved alternate decommissioning schedule. Volumes of contaminated materials and associated remediation costs will be determined upon completion of each phase of work. License Condition 37 requires FMRI to submit detailed plans for the remediation of WIP, CaF, contaminated soil and contaminated groundwater prior to initiating removal of these.

- 9.1 Section 7.2 states that remediation work may not be performed by contractors, but § 9.2.4 lists task[s] and activities to be performed by contractors. These statements are not consistent. The differences should be resolved.

Section 7.2 refers to calculation of costs – "The remediation alternative/option cost estimate will be based on actual costs expected to be incurred by decommissioning the

equipment not later than August 1, 2011. d. groundwater remediation (Phase 4) not later than January 5, 2012.

⁴ See also License Condition 54, which provides: "Not later than February 28, 2011, Licensee shall submit applicable FSSPs for Phases 3 and 4, for prior NRC approval, which shall include measures to evaluate volumetric, subsurface, and groundwater contamination that are beyond the scope of MARSSIM (NUREG-1575, Table 1.1).

facility and may not necessarily assume that the work will be performed by an independent third-party contractor.” The remediation will be accomplished either way. The decision of whether work will be performed by one or more contractors is not a barrier to successful completion of remediation. License Condition 37 requires FMRI to submit detailed plans for the remediation of WIP, CaF, contaminated soil, and contaminated groundwater prior to initiating the removal of these.

- 9.2 There is no information on specific contractors or work division between Fansteel and its contractors. This information should be provided.

Detailed plans (“second tier” documents), including work to be performed by contractors and the qualifications of all contractors, for remediating contamination at the site will be provided to the NRC pursuant to License Condition 37. These plans will be prepared in accordance with existing guidance. Based upon successful preparation of these plans in other, similar, cases, these plans are not expected to be an impediment to successful implementation of the DP. *See also* Response to Comment 9.1.

- 10.1 Section 10.0 states, “The current size RHASP [Radiation Health and Safety Program] . . . will be revised . . . to include decommissioning activities. . .” These activities should be identified and the RHASP revised as necessary.

Detailed plans (“second tier” documents) including RHASP will be prepared and made available at the site for review by NRC, pursuant to License Condition 52.⁵ These plans will be prepared in accordance with existing guidance. Based upon successful preparation of these plans in other, similar, cases, these plans are not expected to be an impediment to successful implementation of the DP.

⁵ License Condition 52 states, “Not later than August 1, 2004, Licensee shall make available at the site for review by NRC a revised RWMP and QA Plan, for Phase 1 of decommissioning activities. Thereafter, Fansteel shall update and have available at the site the RHSP, EMP, RWMP, and QA Plan prior to the beginning of each phase of decommissioning.”

10.2 Selection and use of surrogates should be discussed in detail.

Applicable Final Status Survey Plans ("FSSP") will be prepared and submitted to the NRC pursuant to License Condition 54.⁶ A discussion on the use of surrogates will be presented in the FSSPs.

10.3 Section 10.7 states, "The instrumentation program will include . . ." The plan should be developed fully, and include details of MDCs, especially under less than ideal conditions, such as in wet areas.

Applicable FSSPs will be prepared and submitted to the NRC, pursuant to License Condition 54, towards the end of the decommissioning process. Details such as instrumentation programs and associated MDC calculations will be provided in these documents. These plans will be prepared in accordance with existing guidance. Based upon successful preparation of these plans in other, similar cases, these plans are not expected to be an impediment to successful implementation of the DP.

11.1 Section 11.0 states, "The current site EMP [Environmental Monitoring Program] . . . will be revised to include decommissioning activities. . ." These activities and revised plan should be submitted.

Detailed plans ("second tier" documents) including the EMP will be prepared and made available at the site for review by the NRC, pursuant to License Condition 52. The program will be prepared in accordance with existing guidance. Based upon successful preparation of these programs in other, similar, cases, the program is not expected to be an impediment to successful implementation of the DP. In the NRC's Safety Evaluation Report dated December 4, 2003, the NRC concludes that, based on License Condition 52, the EMP will meet NRC requirements.

⁶ License Condition 54 states, "Not later than February 28, 2011, Licensee shall submit applicable FSSPs for Phases 3 and 4, for prior NRC approval, which shall include

- 11.2 There is no basis presented for using “recent sampling events,” that are not defined, as a baseline for effluent releases. Justification for baselines should be provided. Also, as of March 15, 2003, the NPDES permit had not been reissued; any changes to limits in the revised permit should be identified.

The revised site EMP will detail the use of data in support of effluent releases.

Effluent release activities are available for review routinely during site inspections by both the NRC and the OKDEQ. The OPDES permit was re-issued on December 12, 2003, and transferred to FMRI on December 23, 2003. There are no changes to limits in the revised permit.

- 12.1 The radioactive “solid waste management plan will include the following . . .” This plan has not yet been developed, in large measure because of the status of site characterization. Both [sic] should be completed and submitted.

Detailed plans (“second tier” documents), including the Radioactive Waste Management Plan (“RWMP”) will be prepared and made available at the site for review by the NRC pursuant to License Condition 52. The plan will be developed and revised as necessary based on the results of the additional characterization of the site required by License Condition 31. The plan will be prepared in accordance with existing guidance. Based on successful preparation of these plans in other, similar, cases, the plan is not expected to be an impediment to successful implementation of the DP. In the NRC Safety Evaluation Report dated December 4, 2003, the NRC concluded that, based on License Condition 52, the RWMP will meet NRC requirements.

- 13.1 This chapter states the existing [Quality Assurance (“QA”)] plan will be revised to address a variety of QA issues related to decommissioning. These revisions should be made and the revised plan submitted.

A detailed QA Plan will be prepared and made available at the site for review by the NRC pursuant to License Condition 52. The plan will be prepared in accordance with

measures to evaluate volumetric, subsurface, and groundwater contamination that are beyond the scope of MARSSIM (NUREG-1575, Table 1.1).”

existing guidance. Based upon successful preparation of these plans in other, similar, cases, the plan is not expected to be an impediment to successful implementation of the DP. In the NRC Safety Evaluation Report dated December 4, 2003, the NRC concluded that, based on License Condition 52, the QA Plan will meet NRC requirements.

- 14.1 As expressed above, characterization surveys are not comprehensive. This can also affect area classification. Additional characterization to justify site conditions should be provided.

The initial area classifications presented in the DP were made with existing site characterization information. These area classifications will be confirmed through additional characterization surveys of soils, buildings and groundwater required by License Condition 31 and Final Status Survey measurements required by License Condition 53.⁷ It should be noted that all open land (soil) areas of the licensed site were initially classified as "impacted."

- 14.2 Section 14.4 states, "An FSSP [Final Status Survey Plan] will be prepared . . ." The balance of Chapter 14 reiterates the MARSSIM theory, but provides no site-specific information. A comprehensive, site-specific plan should be submitted.

An FSSP will be prepared based on the commitments of the DP and guidance of NUREG-1575 prior to the performance of final status surveys on site.

- 15.3 The equation in Section 15.1.2 (page 15-3) does not properly compute the volume of the truncated pyramid used to approximate the ponds. One acceptable form to calculate the volume is [formula omitted].

⁷ License Condition 53 states, "Licensee shall conduct the following final status surveys and submit reports to NRC to demonstrate compliance with decommissioning criteria. NRC will be notified 30 days before a survey is performed, and NRC or its contractor will be given the opportunity to observe the licensee's survey and perform an independent confirmatory survey. If NRC does not approve a survey, additional remediation and resurvey shall be promptly conducted. a. Immediately following completion of remediation of all soils, buildings and equipment, but not later than nine months after approval of the FSSP, Licensee shall conduct a final status survey of all areas remediated and submit a Phase 3 FSSR. b. Immediately following completion of remediation of the groundwater, Licensee shall conduct a final status survey of site groundwater and submit a Phase 4 FSSR."

The equation utilized by FMRI and the one suggested by the NRC are the same. Recalculation of volumes using both equations yields essentially the same result. In addition, all WIP and CaF material will be excavated, dried, transported, and disposed as part of the DP implementation, regardless of the calculated volume.

- 15.4 There is no information on the shape of Ponds 1, 2, or 4. The drawings (*e.g.*, Figure 4.1) show an irregular shape for Pond 2; page 15-4 states the slope for ponds 5-9 is between 1.5 and 2. There is no contingency in the volume calculations to account for potential changes in the estimated volume of Pond 2. The correct volumes of all ponds, with contingencies, should be provided.

License Condition 29 commits FMRI to providing a physical description of Ponds 1, 1S, 1N and 4 by May 31, 2004.⁸ In addition, the licensee has committed to complete remediation of all pond WIP and CaF material, regardless of the shape and/or depth of the existing ponds, in the approved DP.

- 15.5 Fansteel must demonstrate IUC is authorized to accept the proposed shipments.

FMRI will provide appropriate documentation concerning transportation and disposal of all licensed materials, in accordance with all applicable regulations, at the time of transportation. Based upon all information known, including discussions with IUC, IUC will be able to take the material.

⁸ License Condition 29 states: "In accordance with provisions of 10 CFR 40.42(g)(4)(i) Licensee shall, not later than May 31, 2004, provide a physical description – dimensions, types of liners, etc. – of Pond 1, Pond 1S and 1N, and Pond 4, the time during which each of the ponds were used, what process-related materials and how much was placed in each of the ponds, and how and where those materials were disposed when the ponds were closed."

5.0 Dose Modeling Evaluations

Dose modeling has been used to assess the TEDE to an average member of the critical group from residual radioactivity at the Fansteel site. The dose modeling evaluations were performed to demonstrate compliance with the release criteria of the NRC final rule on "Radiological Criteria for License Termination," published in the FR (62 FR 39058) which was incorporated as Subpart E to Title 10 CFR Part 20. The regulatory requirements are that the TEDE to an average member of the critical group does not exceed 25 mrem/yr and that the TEDE is ALARA. The guidance provided in the following documents was used in the evaluations:

- 63 FR 64132, November 18, 1998, Supplemental Information on the Implementation of the Final Rule on Radiological Criteria for License Termination.
- 64 FR 68395, December 7, 1999, Supplemental Information on the Implementation of the Final Rule on Radiological Criteria for License Termination.
- 65 FR 37186, June 13, 2000, Use of Screening Values to Demonstrate Compliance with the Final Rule on Radiological Criteria for License Termination.
- NUREG-1549, Decision Methods for Dose Assessment to Comply With Radiological Criteria for License Termination, NRC, July 1998.
- NUREG/CR-5512, Vol. 1, Residual Radioactive Contamination From Decommissioning, Technical Basis for Translating Contamination Levels To Annual Effective Dose Equivalent, Final Report, NRC, October 1992.
- NUREG/CR-5512, Vol. 2, Residual Radioactive Contamination From Decommissioning: User's Manual DandD Version 2.1, April 2001.
- NUREG/CR-5512, Vol. 3, Residual Radioactive Contamination From Decommissioning, Parameter Analysis, Draft Report for Comment, NRC, October 1999.
- RG DG-4006, Demonstrating Compliance With The Radiological Criteria For License Termination, August 31, 1999.
- NUREG-1727, NMSS Decommissioning Standard Review Plan, September 15, 2000.
- Argonne National Laboratory (ANL), User's Manual For RESRAD Version 6.0, ANL/EAD-4, Argonne, IL, July 2001.
- Argonne National Laboratory (ANL), Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil, ANL/EAIS-8, Argonne, IL, 1993.
- NUREG/CR-6755, Technical Basis for Calculating Radiation Doses for the Building Occupancy Scenario Using Probabilistic RESRAD-BUILD 3.0 Code, NRC, February 2002.

Dose modeling has been used to estimate the TEDE to an average member of the critical group from residual radioactivity at the Fansteel site. The critical group is the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for the applicable set of circumstances or scenario as defined in 10 CFR 20.1003. Dose modeling has also been used to calculate the concentration of radioactivity that if uniformly distributed throughout the site area would result in a TEDE of 25 mrem to an average member of the critical group in any year. These radionuclide-specific values are called $DCGL_{ws}$ for relatively uniform distributions of residual radioactivity across a survey unit.

5.1 Unrestricted Release Using NRC Screening Criteria

The NRC has published radionuclide-specific screening levels for structural surfaces and open land areas derived using the NRC DandD code that can be used to show compliance with the dose criterion of 25 mrem TEDE without submitting a site-specific dose assessment for NRC approval. However, the screening values are not based on an industrial future land use scenario, and they are only applicable to a "simple site" as described in NUREG-1727.

According to NUREG-1549 and NUREG-1727, there are several Fansteel site-specific features that require dose modeling beyond the basic DandD screening model. These features include the existence of surface or groundwater contamination, relatively large quantities of contaminated material such as slag ponds, and areas of subsurface contamination greater than 15 centimeters below the ground surface. For these reasons, assessment of the Muskogee site using screening criteria is not applicable and not considered further.

5.2 Unrestricted Release Using Site-Specific Information

Site-specific dose modeling evaluations were performed for development of the DP in the context of NUREG-1549: Decision Methods for Dose Assessment to Comply with Radiological Criteria for License Termination (NRC, July 1998). Fansteel followed the process illustrated by the decision framework, as shown in Figure 1 of NUREG-1549.

Consistent with NUREG-1549, a phased approach to decision making was used to evaluate a variety of remedial options. Generally, these iterations in the first phase utilized a generic screening process, using predefined models and generic screening parameters, and then proceeded to include more site-specific evaluations. Site-specific dose modeling evaluations for structures and for soil at the Fansteel Muskogee site are presented in the following sections.

5.2.1 Unrestricted Release for Structures, Surface and Subsurface Soil Residual Radioactivity

In accordance with NUREG-1549, site-specific evaluations range in complexity from:

- a) use of NRC models with site-specific parameter values;
- b) to using both site-specific parameter values and site-specific model assumptions;
- c) to combinations of a and b and also remediating the site; or
- d) combinations of a, b, c, and also restricting release of the site.

Using the framework presented in Figure 1 of NUREG-1549, Step 1, existing site characterization data were reviewed to determine the nature and extent of uranium- and thorium-contaminated soil, residues, and structures at the Fansteel site. This included defining the principal radionuclides and their chemical form and physical properties, and characterizing the spatial distribution of the contamination. Historical characterization documents were also used to obtain information regarding site conditions and geological and hydrogeological information.

In Step 2, Scenario Definition/Pathway Identification, exposure scenarios were defined using generic scenarios and critical groups described within NUREG-1549. Initially, generic exposure scenarios were used with all exposure pathways active, with the exception of indoor radon as explained below.

Radon is a radioactive gas formed by the radioactive decay of radium, a member of the naturally occurring Uranium-238 radioactive decay chain. Radionuclides from this decay chain are found in natural background in various concentrations in most soils and rocks. Compliance with the 25 mrem/yr dose criterion is considered to have been demonstrated as long as radium, the principal precursor to radon (Ra-226), meets the requirements for unrestricted release without including doses from the radon pathway.

Step 3 included development of a conceptual site model and selection of an appropriate computer code or model and input parameters for the model. RESRAD Version 6.21 and RESRAD-Build Version 3.21, NRC-endorsed software packages for modeling exposure from soil and structural contamination respectively, were selected for site modeling.

In Step 4, the dose assessment is performed to assess the potential future radiological dose from residual radioactivity remaining at the site after decommissioning activities are completed. This was performed by first calculating the dose for the no action alternative and then calculating the DCGL_{WS} required to comply with the unrestricted site release criterion of 25 mrem/yr by removal of contaminated material. In

Step 5, the dose estimates were compared to the NRC's license termination requirements in 10 CFR 20, Subpart E for restricted and unrestricted use of facilities after license termination. Dose objectives for both unrestricted and restricted releases require assessments that consider cases in which the average member of the critical group (a hypothetical future land user) is located on the site. Because dose estimates for current site conditions (no action alternative) exceed the 25 mrem/yr dose criteria specified in 10 CFR 20.1402, the analysis proceeded past Step 6, ALARA requirements and Step 7, license termination, to Step 8.

Step 8 includes defining a range of options, including additional site characterization, remediation, and restricted-use options, to define the most effective and cost-efficient decontamination and decommissioning strategy. Because a relatively large proportion of the impacted soil exceeds the initial DCGL_{WS}, the analysis proceeded to evaluation of combinations of b, c, and d as stated above. Within this more complex framework of analysis, several options were considered that included remediating the site by removal of soil and pond residues, leaving some contaminated soil and/or pond residues on site, as well as developing site-specific exposure scenarios based on likely future uses of the site property.

Although inclusion of additional site-specific or regional characterization data, such as physical properties of the impacted zone, is likely to lower the estimated dose, the anticipated reduction is modest. Development of site-specific exposure scenarios and critical groups in light of plausible future site uses and surrounding property uses could reduce estimated doses. For example, consideration of site uses consistent with the industrial use environment, such as an industrial worker scenario, has been considered. Based on this assessment, Fansteel selected a decommissioning approach that will achieve unrestricted release in accordance with 10 CFR 20.1402. The dose evaluation for the selected approach is discussed below.

5.2.1.1 Source Term

5.2.1.1.1 Configuration /Principal Radionuclides

The raw materials used for tantalum and columbium production contained uranium and thorium as naturally occurring trace constituents. These radioactive species were present in the process feed materials at an approximate concentration of 0.1 percent uranium oxide and 0.25 percent thorium oxide. This concentration is sufficient to cause the ores and slag to be classified by the NRC as source materials. Uranium and thorium in the raw materials were not extracted from the ores by the digestion process. The radioactive species remained in the ore digestion residues that were disposed on site in the east plant area, specifically Pond Nos. 2 and 3. The radionuclides considered in this assessment are shown in Table 5-1

and include the long-lived isotopes of uranium, thorium, and radium present in the licensed radioactive material at the Fansteel site. The U-235 decay chain is included because U-235 constitutes 0.7 percent by weight (approximately 2.3 percent by radioactivity) of naturally occurring uranium. Tables 4-1 through 4-12 in Chapter 4.0 present soil and pond characterization data and relative activity ratios of the radionuclides identified by isotopic analysis. The data indicate that the decay chains of Uranium-238, Thorium-232, and Uranium-235 are present in secular equilibrium as expected based on past site operations described in Chapter 2.0, Section 2.1.4.

Table 5-1 Fansteel Licensed Radioactive Material in Soil

Radionuclide and Progeny Radionuclides	Half-life Parent (yrs)	Estimated Current Inventory (Ci)
U-238 (Th-234, Pa-234m, Pa-234)	4.5×10^9	9
U-234	2.4×10^5	9
Th-230	7.7×10^4	9
Ra-226 (including all progeny to stable Pb-206)	1.6×10^3	9
U-235 (including all progeny to stable Pb-207)	7.0×10^8	0.4
Th-232 (including all progeny from Ra-228, Ac-228 and Th-228 to stable Pb-208)	1.4×10^{10}	5.7

5.2.1.1.2 Chemical Form

The feed materials used for tantalum and columbium production contained uranium and thorium as naturally occurring trace constituents. These radioactive species were present in the process feed materials at an approximate concentration of 0.1 percent uranium oxide and 0.25 percent thorium oxide.

5.2.1.1.3 Residual Radioactivity Spatial Distribution

The characterization data presented in Tables 4-1 through 4-12 indicate that an area encompassing approximately 180,000 m² has potentially been impacted by historical operations at the Fansteel site. Approximately 40,000 m² of this area consists of ponds containing licensed radioactive material as a result of historical operations. The depth of licensed radioactive material in soil is generally within the top 0.762 m. Deeper layers of radioactive deposits at depths up to approximately 6 m were identified in samples taken east of the Chemical "A" Building and east of Former Pond No. 2. The depth of radioactivity in ponds ranges from approximately 5 to 6 m in Pond Nos. 2 and 3; 0.91 m to 1.5 m in Pond Nos. 5, 6, and 7; and approximately 7.6 m in Pond Nos. 8 and 9. At the time of FSS, the anticipated area-weighted average thickness of residual radioactivity in surface soil is estimated to be approximately 0.85 m (0.5 m for 70 percent of the site, 1 m for 20 percent of the site, and 3 m for 10 percent).

At the time of FSS and license termination, there will be several impacted and nonimpacted buildings located on the eastern portion of the Fansteel site. Most of the buildings are considered impacted from ore-processing activities that occurred during past operations described in Section 2.2.3. Building characterization data are presented in Section 4.2. The Chemical "C" Building is contaminated throughout while other impacted buildings contain only low levels of isolated contamination. At the time of FSS, structural contamination is expected to be only surface contamination. Any areas of volumetric contamination (greater than 0.4 inch or 10 mm) will be decontaminated so that only surface residual radioactivity remains.

5.2.1.2 Critical Groups, Scenarios, and Pathway Identification and Selection

Critical groups, pathway identification, and exposure scenarios were selected consistent with present and anticipated site use and Regulatory Guide DG-4006, NUREG-5512 and NUREG-1549.

5.2.1.2.1 Scenario Identification

Based on the current and expected future industrial land use of the Fansteel site, an industrial use scenario is the most appropriate to derive site-specific DCGL_{ws} for the residual radioactivity present in soil and on building surfaces at the time of FSS and Fansteel site release. The future use of the Fansteel site is controlled in accordance with the updated Master Plan for industrial properties issued by the Port of Muskogee (Master Plan of Development for the Muskogee Port and Industrial Park, Muskogee City-County Port Authority, November 28, 1967). Accordingly, it is anticipated that buildings and associated process equipment will be used for similar industrial processes as those previously conducted at the Fansteel site. Dose assessment results and corresponding DCGLs derived for the industrial occupancy scenario have been utilized for analysis, planning, design, and implementation of decommissioning activities at the site.

5.2.1.2.2 Critical Group Determination

Various site uses and scenarios were considered within the limits of plausible future uses of the site. Since the site is located in a zoned industrial area and is surrounded by other industrial sites, industrial workers are considered to comprise the critical group.

5.2.1.2.3 Exposure Pathways

External exposure to penetrating radiation, inhalation of soil dust (while outdoors and during building occupancy), and inadvertent ingestion of soil are the exposure pathways that were considered in deriving radionuclide-specific DCGL_{ws} for residual radioactivity in site soil for the industrial worker dose

assessment. Exposure pathways considered in the derivation of radionuclide-specific DCGL_{ws} for residual radioactivity on building and component surfaces included direct external gamma exposure including submersion, inhalation of resuspended residual radioactivity, inadvertent ingestion of residual radioactivity from surface sources, and ingestion of deposited radioactivity resulting from resuspension. Table 5-2 summarizes the exposure pathways identified for use in the industrial worker scenario. In the industrial worker scenario, it is assumed that no water or food from the site is consumed as indicated in Table 5-2. Table 5-3 summarizes key parameters used in the industrial worker scenario.

Ingestion of water or groundwater from an on-site well is not a pathway that is included in the industrial worker exposure as indicated in Table 5-2. The groundwater sample results from 1993 presented in Section 4.5 indicate that shallow groundwater has been impacted by Fansteel licensed material.

Table 5-2 Summary of Industrial Worker Exposure Pathways

Pathway	Industrial Worker Soil DCGL Pathways	Industrial Worker Building Occupancy DCGL Pathways
External Gamma Exposure	Yes	Yes
Inhalation of Dust or Resuspended Indoor Radioactivity	Yes	Yes
Ingestion of Plant Foods	No	No
Ingestion of Meat	No	No
Ingestion of Milk	No	No
Ingestion of Fish	No	No
Ingestion of Soil/Residual Radioactivity on Building Surface	Yes	Yes
Ingestion of Water	No	No

Table 5-3 Key Parameters in the Industrial Worker Scenario

Parameter	Unit	Industrial Worker	Technical Basis
Exposure Duration	yr	25	RESRAD ^a Section 2.4.2 based on 1997 USEPA Exposure Factor Handbook
Breathing Rate	m ³ /yr	11,400	RESRAD ^a Section 2.4.2 based on 1997 USEPA Exposure Factor Handbook
Fraction of Time Indoors (Building Occupancy)	Fraction of yr	0.17	RESRAD ^a Section 2.4.2 based on 1997 USEPA Exposure Factor Handbook
Fraction of Time	Fraction	0.06	RESRAD ^a Section 2.4.2

Parameter	Unit	Industrial Worker	Technical Basis
Outdoors Directly on Residual Radioactive Material	of yr		based on 1997 USEPA Exposure Factor Handbook
Contaminated Fraction of Plant Food	-	Not used	RESRAD ^a Section 2.4.2 based on 1997 USEPA Exposure Factor Handbook
Contaminated Fraction of Milk	-	Not used	RESRAD ^a Section 2.4.2 based on 1997 USEPA Exposure Factor Handbook
Contaminated Fraction of Meat	-	Not used	RESRAD ^a Section 2.4.2 based on 1997 USEPA Exposure Factor Handbook
Contaminated Fraction of Aquatic Food	-	Not used	RESRAD ^a Section 2.4.2 based on 1997 USEPA Exposure Factor Handbook
Soil Ingestion	g/yr	18.25	RESRAD ^a Section 2.4.2 based on 1997 USEPA Exposure Factor Handbook
Drinking Water Intake	l/yr	Not used	RESRAD ^a Section 2.4.2 Generic Industrial Worker Scenario

a. RESRAD (Yu et al., 2001).

5.2.1.3 Conceptual Model

The conceptual model generically represents the actual site configuration as it will exist at the time of the FSS and license termination. The site will consist of an open land area of approximately 180,000 m², containing residual radioactivity with an average area-weighted depth of 0.85 m. There will be several buildings and concrete pads remaining on the property. The site is assumed to be used for industrial work consistent with present land use (zoning) at and around the Fansteel site.

5.2.1.3.1 Relative Location and Activities of the Critical Group

The critical group is made up of industrial workers. The industrial worker spends 8 hours per day on the site. Of the 8 hours, 6 hours are spent indoors and the remaining 2 hours are spent outside. The primary activity of the industrial worker during the 8 hours on site is work.

5.2.1.3.2 Hydrologic and Environmental Transport Processes

Only contaminated zone hydrologic parameters are evaluated for the industrial worker scenario to assess the removal of contamination by natural processes such as erosion from the contaminated zone. Resuspension of soil (dust), wind, and surface erosion are the primary environmental transport processes included in the industrial worker scenario.

5.2.1.3.3 Dimensions, Location, and Spatial Variability of the Source Term

At the time of the FSS and license termination, the site will consist of two large industrial buildings located on an open land area of approximately 180,000 m². The open land area will generally contain uniform residual radioactivity at an average area-weighted depth of 0.85 m. The use of an area-weighted depth or thickness of residual radioactivity accounts for the anticipated spatial extent of residual radioactivity anticipated at the time of FSS. There will likely also be 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 presented in Section 5.2.2.5 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.

5.2.1.3.4 Major Assumptions

There are no major assumptions relative to the conceptual site model.

5.2.1.4 Calculations and Input Parameters

The deterministic mode of RESRAD Version 6.21 has been used to derive the radionuclide-specific DCGL_{ws} for the residual radioactivity present in soil at the time of the Fansteel site FSS and site release. Input parameters and justification for their use are discussed in Section 5.2.1.4.2. The deterministic mode of RESRAD-Build Version 3.21 has been used to derive the radionuclide-specific DCGL_{ws} for the residual radioactivity present on building and component surfaces at the time of the Fansteel site FSS and site release. Input parameters and justification for their use are discussed in Section 5.2.1.4.2.

5.2.1.4.1 Selection of Computer Model

Both RESRAD and RESRAD-Build computer models have been widely used for dose assessment in support of decommissioning. The RESRAD computer models were selected to derive Fansteel site-specific DCGLs, because they allow pathway modeling consistent with the conceptual site model and critical group.

5.2.1.4.2 Input Parameters

Estimates of physical, behavioral, and metabolic parameter values were developed from either site measurements or literature review. Available site-specific characterization data include meteorological, topographical, hydrogeological, soil texture characterization, and location and extent of contamination. Thus, site-specific data for annual precipitation, wind speed, area, and thickness of the contaminated zone

were used in the RESRAD analyses. Physical parameters related to industrial worker building occupancy used with RESRAD-Build, such as room size, deposition velocity, resuspension rate, building air exchange rate, air release fraction, and time for source removal, were adapted directly from NUREG/CR-6755 as recommended for deterministic analysis.

The parameter values used in the analysis of the Fansteel site industrial worker scenario are presented in Tables 5-4 through 5-7. As shown in Table 5-4, the radiation dose limit and time for calculations are 25 mrem/yr and 1,000 years respectively, as specified in 10 CFR 20.1401 and 20.1402.

Table 5-4 Industrial Worker Scenario: Contaminated Zone Parameters

Parameter	Parameter Value	Source/Justification
Area of Contaminated Zone	180,000 m ² for the entire impacted area including the following: <ul style="list-style-type: none"> • 37,000 m² for combined area of ponds with residual contamination ~ 1 m thick • 18,000 m² for residual contamination ~ 3 m thick • 125,000 m² for residual contamination ~ 0.5 m thick 	Fansteel Remediation Assessment ^a (1993) site-specific data presented in Chapter 4.0
Thickness of Contaminated Zone	0.85 m area-weighted average (representative thickness) for site	Calculated in accordance with NUREG-1727 recommendations for area weighting to determine representative thickness for the site
Length Parallel to Aquifer Flow	275 m	Fansteel Remediation Assessment (1993)
	Not used for industrial worker scenario	
Peak Annual Radiation Dose Limit	25 mrem/yr	10 CFR 20.1402
Time Since Placement of Material	Not used	
Time for Calculations	Through 1,000 years	10 CFR 20.1401(d)
Depth of Soil Mixing Layer	0.15 m	RESRAD ^b

a. Remediation Assessment, Fansteel Inc., Muskogee, Oklahoma, December 1993

b. (Yu et al., July 2001)

Table 5-5 Industrial Worker Scenario: Contaminated Zone Input Data

Parameter	Parameter Value	Source
Density of Contaminated Zone	1.51 g/cm ³	Fansteel Remediation Assessment ^a (1993) soil type and DandD2\ncrvol3\hyddesc.htm ^b Equation 6.56 used to calculate average soil density based on pond soil type
Contaminated Zone Erosion Rate	0.00006 m/yr	RESRAD ^c Appendix A for sites with a slope of ~2% and nonagricultural use
Contaminated Zone Total Porosity	0.44	Fansteel Remediation Assessment ^a (1993) soil type in ponds and RESRAD ^c Table E8 average value for silt/sand
Contaminated Zone Effective Porosity	0.27	Fansteel Remediation Assessment ^a (1993) soil type in ponds and RESRAD ^c Table E8 average value for silt/sand
Contaminated Zone Hydraulic Conductivity	5,550 m/yr	Fansteel Remediation Assessment ^a (1993) soil type in ponds and RESRAD ^c Table E2 value for sand
Contaminated Zone b Parameter	4.05	Fansteel Remediation Assessment ^a (1993) soil type in ponds and RESRAD ^c Table E2 value for sand
Evapotranspiration Coefficient	0.99	Fansteel Remediation Assessment ^a (1993) soil type, slope and RESRAD ^d data collection handbook (1993) Equation 12.1
Precipitation	1.1 m/yr	NRC website: ftp://ftp.wcc.nrcs.usda.gov
Irrigation	0.0 m/yr	No irrigation is assumed for the industrial worker scenario
Runoff Coefficient	0.4	Fansteel Remediation Assessment ^a (1993) soil type and RESRAD ^b Table E1
Watershed Area for Stream or Pond	1.8 × 10 ⁵ m ² Not used for industrial worker scenario	Site-specific area
Average Annual Wind Speed	4.52 m/s	National Climatic Data Center
Partition Coefficients:		NUREG/CR-5512, Vol.3 ^e
Ac-227	1730 cm ³ /g	
Pa-231	4.8 cm ³ /g	
Pb-210	2380 cm ³ /g	
Ra-226, Ra-228	3530 cm ³ /g	
Th-228, Th-230, Th-232	119 cm ³ /g	
U-234, U-235, U-238	2.18 cm ³ /g	
a. Remediation Assessment, Fansteel Inc., Muskogee, Oklahoma, December 1993		
b. DandD version 2.1 NUREG/CR-5512, Vol.2, HTML help document with user's manual		
c. (Yu et al., 2001)		
d. (Yu et al., 1993)		
e. NUREG/CR-5512, Vol. 3		

Table 5-6 Industrial Worker Scenario Soil (Dust) Inhalation and External Gamma Parameters

Parameter	Parameter Value	Source
Inhalation Rate	11,400 m ³ /yr	RESRAD ^a Section 2.4.2 based on 1997 USEPA Exposure Factor Handbook
Mass Loading for Inhalation	1 × 10 ⁻⁴ g/m ³	DandD2\ncrcvol3\cdxdesc.htm ^b outdoor dust loading Section 6.4.4.1
Exposure Duration	250 work days/year	RESRAD ^a Section 2.4.2 based on 1997 USEPA Exposure Factor Handbook
Shielding Factor, Inhalation	0.4	Fraction of outdoor dust in indoor air RESRAD ^a
Shielding Factor, External Gamma	0.552	NUREG-5512 ^c
Fraction of Time Indoors, On Site per Year	0.17	RESRAD ^a Based on 1997 USEPA Exposure Factor Handbook
Fraction of Time Outdoors, On Site per Year	0.06	RESRAD ^a Based on 1997 USEPA Exposure Factor Handbook
Shape Factor, External Gamma	1	RESRAD ^a
Soil Ingestion Rate	18.25 gram/yr	NUREG-5512 ^c

a. RESRAD (Yu et al., 2001).
b. DandD version 2.1 NUREG/CR-5512, Vol. 2, HTML document
c. NUREG-5512 vol. 3 (NRC, 1999)

Table 5-7 Industrial Worker Scenario: Building Occupancy Parameters

Parameter	Parameter Value	Source
Exposure Duration (days)	365.25	Evaluation for year of maximum dose (year 1)
Building Occupancy Fraction	0.17 or 6 hours/day	RESRAD ^a Section 2.4.2 based on 1997 USEPA Exposure Factor Handbook
Number of Rooms	1	NUREG-5512 Building Occupancy
Room Floor Area (m ²)	8 m × 8 m = 64	NUREG-5512 Building Occupancy
Room Height (m)	3	NUREG-5512 Building Occupancy
Deposition Velocity in Room (m/s)	3.9 × 10 ⁻⁴	NUREG/CR-6755 Table 4.2 for default deterministic input
Resuspension Rate (1/sec)	6.3 × 10 ⁻⁸	NUREG/CR-6755 Table 4.2 for default deterministic input
Building Air Exchange Rate (1/h)	1.52	NUREG/CR-6755 Table 4.2 for default deterministic input
Receptor Location	Center of room	NUREG/CR-6755 Table 4.2 for default deterministic input
Receptor Indirect Ingestion (m ² /h)	1.12 × 10 ⁻⁴	NUREG/CR-6755 Table 4.2 for default deterministic input

Parameter	Parameter Value	Source
Air Release Fraction for All 6 Sources	0.357	NUREG/CR-6755 Table 4.2 for default deterministic input
Time for Source Removal (days)	10,000	NUREG/CR-6755 Table 4.2 for default deterministic input
Receptor Inhalation Rate (m ³ /day)	31.21	RESRAD ^a Section 2.4.2 based on 1997 USEPA Exposure Factor Handbook
6 Area Sources-Floor, Ceiling, 4 Walls		NUREG/CR-6755 Table 4.2 for default deterministic input
Direct Ingestion Rate for All Sources (1/h)	4.91×10^{-7}	NUREG/CR-6755 Table 4.2 for default deterministic input
Removable Fraction	0.03	Site-specific decon level for removable
Radon Release Fraction	0	See discussion in Section 5.2.1 (Step 2)

5.2.1.4.3 RESRAD Soil Results

Table 5-8 lists the individual radionuclide DCGL_{ws} for soil calculated by RESRAD for the residual radioactivity at the Fansteel site. Appendix 5-1 contains the RESRAD summary output report. The year of the peak dose associated with each radionuclide as indicated in Table 5-8 is year zero, because the radionuclide decay chains at Fansteel are already in equilibrium. For radionuclide decay chains already in equilibrium, the single radionuclide soil guidelines are shown on Page 21 of the RESRAD Summary Report Single Radionuclide Soil Guidelines G (i,tmax). As expected under an industrial use scenario with the radionuclides present at the Fansteel site, the RESRAD results indicate that over 97 percent of the TEDE at the time of peak dose (time zero) is due to the external exposure from residual radioactivity as shown in Figure 5-1.

Table 5-8 Industrial Worker Scenario Individual Radionuclide DCGL_{ws} for Soils

Radionuclide and Progeny	Industrial Worker ^a DCGL _{ws} at Time Zero (pCi/g)	Time of Maximum Dose (yrs)
U-238 (Th-234, Pa-234m, Pa-234)	967	0
U-234	7915	0
U-235 (Th-231)	211	0
Pa-231	251	0
Ac-227 (Th-227 to stable Pb-207)	54.6	0
Th-232	255	0
Th-230	3,300	0
Th-228 (Ra-224 to stable Pb-208)	19.2	0
Ra-226 (Rn-222 to Po-210)	14.7	0

Radionuclide and Progeny	Industrial Worker ^a DCGL _w s	
	at Time Zero (pCi/g)	Time of Maximum Dose (yrs)
Ra-228 (Ac-228)	22.8	0
Pb-210 (Bi-210 thru Stable Pb-206)	799	0
a. Calculated by RESRAD using the parameters specified in Tables 5-4 through 5-6		

The sum of fractions rule combined with the DCGL_ws presented in Table 5-8 will be used to determine whether the site has met the unrestricted release conditions during the FSS. For example, based on the characterization data presented in Chapter 4.0 and the anticipated radiological conditions at the time of the FSS, the U-238, U-235, and Th-232 decay chains are expected to each be in secular equilibrium and the Thorium-232 to Uranium-238 activity ratio is expected to be approximately 1:1. Uranium-235 activity is expected to comprise approximately 2.3 percent of the total uranium activity while Uranium-238 and Uranium-234 are expected to comprise approximately 97.7 percent of the total uranium activity which is typical for natural uranium. Based on a concentration of 5.8 pCi/g for the Uranium-238 and Thorium-232 decay series, and a Uranium-235 concentration of 0.271 pCi/g, the sum of DCGL_w fractions using Table 5-10 DCGL_w values is calculated as follows:

U-238 Decay Chain

$$5.8/967 + 5.8/7,915 + 5.8/3,300 + 5.8/14.7 + 5.8/799 = 0.41$$

Th-232 Decay Chain

$$5.8/255 + 5.8/22.8 + 5.8/19.2 = 0.579$$

U-235 Decay Chain

$$0.271/211 + 0.271/251 + 0.271/54.6 = 0.007$$

The sum of the fractions above is 0.996 which is equivalent to a TEDE of (25 mrem) * (0.996) or 24.9 mrem. The identical concentration inputs to RESRAD produce a RESRAD calculated peak annual dose of 24.9 mrem as indicated on Page 11 of the RESRAD summary report in Appendix 5-1.

In addition to the DCGL_w values used to determine compliance for survey unit mean concentrations, the DCGL_{EMC} concentration values for limited areas within a survey unit have been calculated. The DCGL_{EMC} values are applicable to small, elevated areas of residual radioactivity within a larger survey area. Appendix 5-2 contains DCGL_{EMC} values for limited areas ranging from 1 m² to 1,000 m².

Sensitivity analyses indicate that the $DCGL_{EMC}$ values in Appendix 5-2 are not sensitive to thickness beyond the base case of 0.85 m. The $DCGL_{EMC}$ values in Appendix 5-2 will be used to assess compliance for survey units as long as the following sum of fractions is satisfied:

$$\Sigma[(\delta/DCGL_w) + [(average\ conc - \delta)/DCGL_{EMC}]] \leq 1$$

where:

δ is the average concentration for all samples outside the elevated area, and
average conc is the average concentration in the elevated area.

Area factors computed using $DCGL_{EMC}$ values in Appendix 5-2 are presented in Chapter 14.0.

5.2.1.4.4 RESRAD-Build Results

Table 5-9 lists the individual radionuclide $DCGL_w$ s for the residual radioactivity on building and component surfaces calculated using RESRAD-Build. Appendix 5-3 contains the RESRAD-Build summary output report. The year of the peak dose associated with each radionuclide as indicated in Table 5-9 is year zero, because the radionuclide decay chains at Fansteel are already in equilibrium. The RESRAD-Build results indicate that over 87 percent of the TEDE at the time of peak dose (time zero) is attributable to the inhalation and ingestion exposure pathways.

**Table 5-9 Industrial Worker Building Occupancy
Individual Radionuclide $DCGL_w$ s**

Radionuclide and Progeny	Dose Conversion Factors Based on RESRAD-Build Calculations (mrem/yr)/(1 dpm/100 cm ²)	Time of Maximum Dose (yrs)	Industrial Worker * $DCGL_w$ s at Time Zero (dpm/100 cm)
U-238 (Th-234, Pa-234m, Pa-234)	4.3×10^{-4}	0	58,140
U-234	4.6×10^{-4}	0	54,349
U-235 (Th-231)	5.2×10^{-4}	0	48,076
Pa-231	6.2×10^{-3}	0	4,032
Ac-227 (Th-227 to stable Pb-207)	2.3×10^{-2}	0	1,087
Th-232	5.5×10^{-3}	0	4,545
Th-230	1.1×10^{-3}	0	22,727
Th-228 (Ra-224 to stable Pb-208)	1.6×10^{-3}	0	15,625
Ra-226 (Rn-222 to Po-210)	1.2×10^{-3}	0	20,833
Ra-228 (Ac-228)	7.9×10^{-4}	0	31,646

Radionuclide and Progeny	Dose Conversion Factors Based on RESRAD-Build Calculations (mrem/yr)/(1 dpm/100 cm ²)	Time of Maximum Dose (yrs)	Industrial Worker *DCGL _w s at Time Zero (dpm/100 cm)
Pb-210 (Bi-210 thru Stable Pb-206)	1.6×10^{-3}	0	15,625

a. Based on calculations by RESRAD-Build using the parameters specified in Table 5-7

The sum of fractions rule combined with the DCGL_ws presented in Table 5-9 above will be used to determine whether the site has met the unrestricted release conditions after contamination measurements are obtained during the FSS. For example, based on the characterization data presented in Chapter 4.0 and the expected radiological conditions at the time of the FSS, the U-238, U-235, and Th-232 decay chains are expected to each be in secular equilibrium and the Thorium-232 to Uranium-238 activity ratio is expected to be approximately 1:1. Uranium-235 activity is expected to comprise approximately 2.3 percent of the total uranium activity which is typical for natural uranium. Based on a concentration level of 8.01×10^4 pCi/m² (1,780 dpm/100 cm²) for the Uranium-238 and Thorium-232 decay series, and a Uranium-235 concentration of 3,770 pCi/m² (83.7 dpm/100 cm²), the sum of DCGL_w fractions using Table 5-9 DCGL_w values is 1 calculated as follows:

U-238 Decay Chain

$$1,780/58,140 + 1,780/54,349 + 1,780/22,727 + 1,780/20,833 + 1,780/15,625 = 0.341$$

Th-232 Decay Chain

$$1,780/4,545 + 1,780/15,625 + 1,780/31,646 = 0.562$$

U-235 Decay Chain

$$83.7/48,076 + 83.7/4,032 + 83.7/1,087 = 0.0995$$

The sum of the fractions above is 1.0 which is equivalent to a TEDE of 25 mrem * (1.0) or 25 mrem. The identical concentration inputs to RESRAD-Build produce a RESRAD-Build-calculated peak annual dose of 25 mrem as indicated on Page 14 of the RESRAD-Build summary report in Appendix 5-3. Note that doses from ingrowth of progeny have been subtracted from the dose reported by RESRAD-Build as shown on Page 14 of the RESRAD-Build summary report, because the progeny are already in secular equilibrium.

In terms of gross alpha activity per decay of the uranium, thorium, and actinium (U-235) series in secular equilibrium, there are nine alpha particles emitted per decay of U-238, six alpha particles emitted per decay of Th-232, and eight alpha particles emitted per decay of U-235. Consequently, the gross alpha DCGL_ws for total alpha residual radioactivity at the Fansteel site are calculated as follows:

$$\begin{aligned} &1,780 \text{ dpm}/100 \text{ cm}^2 (9 \text{ alpha}/\text{U-238 dpm}) + 1,780 \text{ dpm}/100 \text{ cm}^2 (6 \text{ alpha}/\text{Th-232 dpm}) + 83.7 \text{ dpm}/100 \\ &\text{cm}^2 (8 \text{ alpha}/\text{U-238 dpm}) \\ &= 27,300 \text{ dpm}/100 \text{ cm}^2. \end{aligned}$$

In addition to the DCGL_w values used to determine compliance for structural survey unit mean concentrations, the DCGL_{EMC} concentration values for limited areas within a survey unit have been calculated. Appendix 5-4 contains DCGL_{EMC} values for limited floor and wall areas ranging from 1 m² to 20 m² for walls and from 1 to 30 m² for floors. The DCGL_{EMC} values in Appendix 5-4 will be used to assess compliance for survey units as long as the following sum of fractions is satisfied:

$$\Sigma[(\delta/\text{DCGL}_w) + [(average \text{ conc} - \delta)/\text{DCGL}_{EMC}]] \leq 1$$

where:

δ is the average concentration for all samples outside the elevated area, and
average conc is the average concentration in the elevated area.

Area factors computed using DCGL_{EMC} values in Appendix 5-4 are presented in Chapter 14.0.

5.2.1.5 Uncertainty Analysis

The dose assessment employed a deterministic approach to modeling using single input parameter values and RESRAD Version 6.21. In accordance with the guidance provided in NUREG-1549, uncertainty has been addressed by providing reasonable assurance that the estimated dose or DCGL_ws values were derived using parameter values that can readily be demonstrated as being conservative. This is accomplished by use of a simple modeling approach, simple assumptions, and parameter values that readily can be demonstrated as being conservative.

The behavioral and metabolic characteristics of the average member of the critical group are simply conservative default values identified in the literature including NUREG/CR-5512 Vol. 2, NUREG-5512 Vol. 3 (NRC, 1998), or RESRAD Version 6.23.

The uncertainty associated with physical parameters has also been addressed by using conservative values from NUREG/CR-5512 Vol. 2, NUREG-5512 Vol. 3 (NRC, 1998), or RESRAD Version 6.23. In addition, a sensitivity analysis has been used to identify physical input parameters to which the calculated DCGLs or peak annual dose is most sensitive. The results of the sensitivity analysis are summarized in Table 5-10. As indicated in Table 5-10, there are no parameters sensitive to changes over the range of realistic yet conservative values that any given parameter value could take on at the Fansteel site.

**Table 5-10 Industrial Worker Scenario
Sensitivity Summary**

Parameter Name	Parameter Value Used in DCGL Derivation (Baseline Value)	Sensitivity Upper and Lower Value of Parameter	Dose Increase with Increase or Decrease in Parameter Value	Comments
Contaminated Zone Area (m ²)	180,000	216,000/150,000	Increase	<1% increase in peak dose compared to baseline
Contaminated Zone Density (g/cm ³)	1.51	1.37/1.66	Increase	<1% increase in peak dose compared to baseline
Contaminated Zone Erosion Rate (m/y)	0.00006	0.0006/0.000006	No change	
Contaminated Zone Thickness (m)	0.85	8.5/0.085	Increase	<1% increase in peak dose compared to baseline
Contaminated Zone Evapotranspiration Coefficient	0.99	—	Increase	Maximum value has been used in DCGL derivation
Contaminated Zone Effective Porosity	0.27	0.135/0.54	No change	
Contaminated Zone Total Porosity	0.44	0.22/0.45	No change	
Contaminated Zone Hydraulic Conductivity (m/y)	5,550	15,000/100	No change	
Contaminated Zone b Parameter	4.05	11.3/1.44	No change	
Precipitation (m/y)	1.1	2.04/0.51	Decrease	<1% increase in peak dose compared to baseline
Runoff Coefficient	0.4	0.6/0.2	Increase	<1% increase in peak dose compared to baseline

5.2.1.6 Compliance with Radiological Criteria for License Termination

The NRC has established criteria for releasing a site for unrestricted use in 10 CFR Part 20, Subpart E. The objective of this dose assessment is to assess compliance with the dose criteria of these regulations.

Unrestricted Release	
Dose Criterion	25 mrem TEDE per year peak annual dose to the average mem- ber of the critical group
Time Frame	1,000 years
Other Requirements	ALARA

Dose modeling results to derive the radionuclide-specific DCGLs for unrestricted release are presented in Tables 5-8 and 5-9. Activity concentrations at the listed DCGL value for any of the radionuclides will result in 25 mrem TEDE. The sum of fractions rule is applied to the soil DCGL values in Section 5.2.1.4.3 and to the structures DCGL values in Section 5.2.1.4.4, based on the anticipated activity fractions of the radionuclides, to show compliance with the dose criterion. As previously stated, all dose estimates represent postremedial doses above background to the average members of the critical group under an industrial use scenario. To ensure compliance with the 25 mrem annual peak dose limitation, regardless of the ratio of Uranium-238 to Thorium-232, but taking secular equilibrium conditions into account for the U-238, U-235, and Th-232 decay chains, the DCGL_{ws} in Tables 5-11 and 5-12 below will be used in conjunction with the sum of fractions rule to evaluate FSS results and compliance.

Table 5-11 Industrial Worker Scenario Individual Radionuclide Decay Chain DCGL_{ws} for Soils

Radionuclide and Entire Decay Chain in Equilibrium	Industrial Worker DCGL_{ws} at Time Zero (pCi/g)	Time of Maximum Dose (yrs)
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_{ws}
for Building and Component Surfaces**

Radionuclide Decay Chain DCGL_{ws}	Industrial Worker DCGL_{ws} at Time Zero (dpm/100 cm²)	Time of Maximum Dose (yrs)
U-238 – Uranium Chain	5,200	0
U-235 – Actinium Chain	840	0
Th-232 – Thorium Chain	3,160	0

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Charles S. Raper

November 4, 2002

Fred Dohmann
Fansteel Metals
10 Tantalum Place
Muskogee, OK 74403

Re: Port Master Plan


Dear Fred:

Enclosed please find a copy of the Master Plan of Development for the Muskogee Port and Industrial Park, adopted by the Muskogee City-County Port Authority November 28, 1967, as amended.

As you can see from Plate IV, Fansteel property is included within the limits of the Muskogee Port and Industrial Park. By Second Amendment to the Master Plan, a 19.51 acre tract of the Fansteel property was reclassified from Land Used for Industrial Purposes to Land to be Appraised and Purchased. This property was acquired by the Port Authority in June, 1999. By Third Amendment to the Master Plan, Fansteel property necessary for the Port/BNSF Buildout was similarly reclassified. To date, no action has been initiated toward the acquisition of this property.

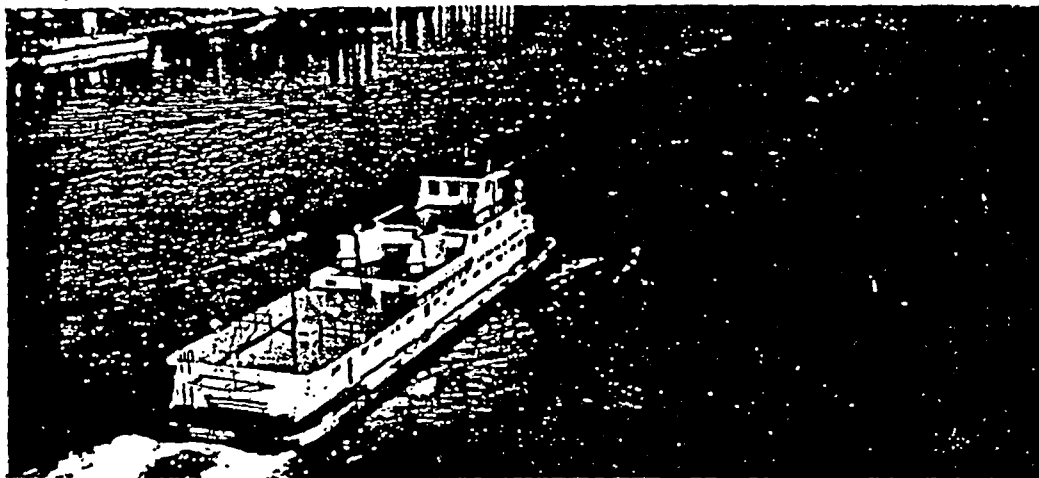
I hope this helps. Good luck.

Sincerely,



Scott Robinson
Port Director

**A PLAN for the
LOCATION, FINANCING
and DEVELOPMENT of the**



**MUSKOGEE PORT
and INDUSTRIAL PARK
CITY-COUNTY
of
MUSKOGEE, OKLAHOMA**

A PROPOSED PLAN FOR THE LOCATION, DEVELOPMENT AND
FINANCING OF THE MUSKOGEE PORT & INDUSTRIAL PARK

(A supplement to the Fredric R. Harris Report)

Adopted by the Metropolitan Area Planning Commission

May 17, 1965

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Business Extension Service

College of Business

Oklahoma State University

This report was prepared by the Muskogee Metropolitan Area Planning Commission in co-operation with the Oklahoma Department of Commerce and Industry, State Planning Agency and was financed in part through an Urban Planning Grant from the Housing and Home Finance Agency, under provisions of Section "701" (Continuing Planning) of the Housing Act of 1954, as amended.

PART I

PORT & INDUSTRIAL PARK LOCATION •

In July, 1962, Fredric R. Harris, Incorporated, submitted to the Muskogee Port Commission a report entitled "Proposed Inland Waterway Dock Facilities for the Port of Muskogee, Oklahoma". Among other items of valuable information, there was a statement and recommendation as to the proper location of the Port Facilities. Now, with a vast amount of information not available three years ago, it is well to reconsider and reevaluate the merits of the recommendation and statement mentioned below.

STATEMENT:

"An important feature of selecting Site E is the availability of adjacent lands for the development of an Industrial Port - see Plate I, page 2. Choosing Site E will permit the adjacent industrialization of approximately 250 acres inland from the Port, which, when added to the acreage described as Site A above, provides over 800 acres of land for such development."

RECOMMENDATION:

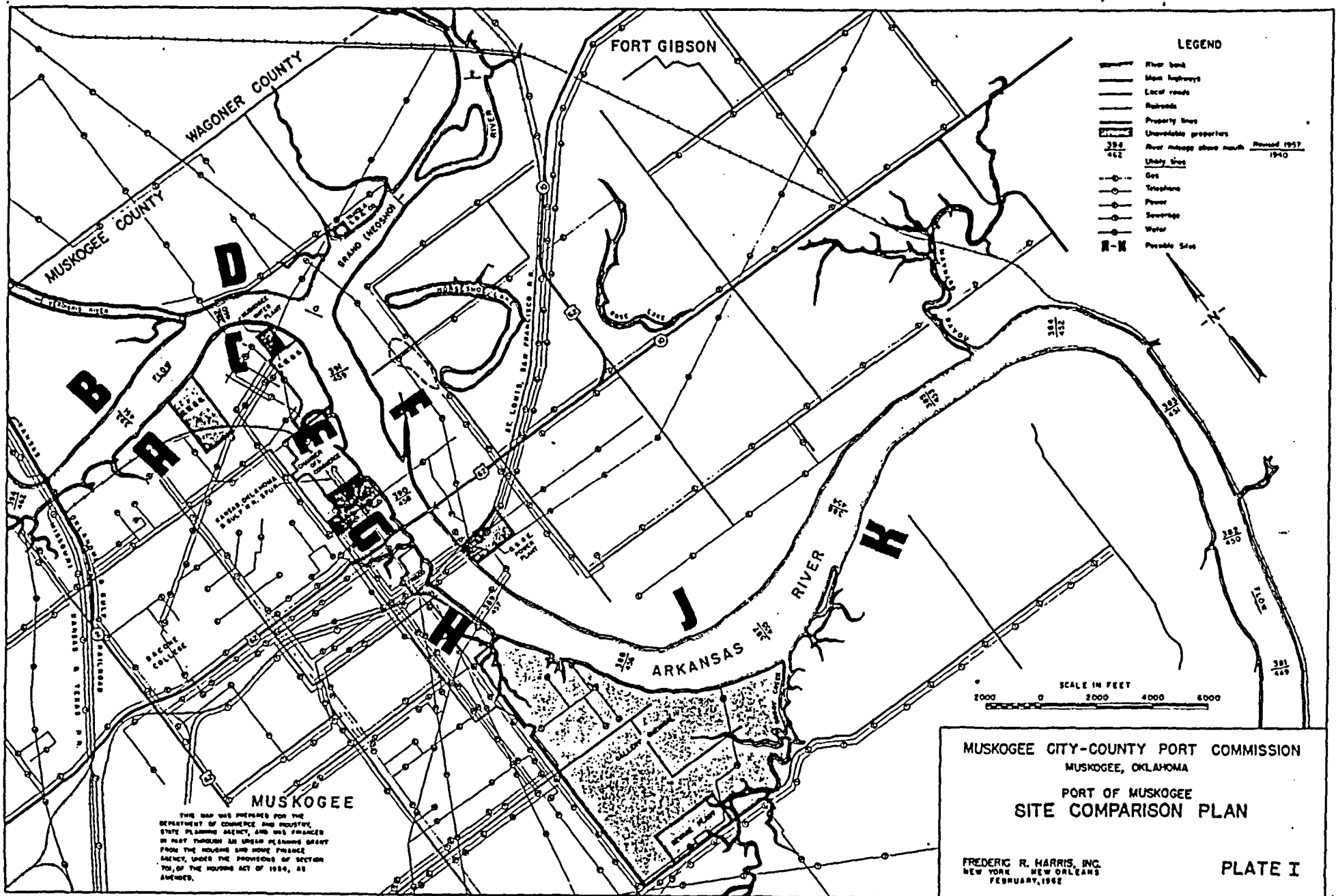
"As a result of this feasibility study, it is recommended that: 1. A port be established on the Arkansas River at the site indicated and in the manner detailed on the Master Plan and that the opening of this port coincide as closely as possible with the opening of the waterway."¹

Site E is established, locally (the Muskogee Community) as being on the right bank of the Arkansas River, just south of the City Water Filtration Plant and on land now under option to the Muskogee Industrial Foundation. The exact location of foundations, piers, and other structures can only be determined after a detailed engineering study.

Preparatory to considering the merits of the statement and recommendation, maps of the area were drawn which show:

- (a) existing access roads and railroads
- (b) the juncture of the Arkansas, Grand, and Verdigris Rivers

¹Fredric R. Harris, Inc., Proposed Inland Waterway and Dock Facilities for the Port of Muskogee, Oklahoma, page 5.



- (c) the proposed Muskogee Turnpike and service roads
- (d) existing utilities
- (e) the fifty year modified flood line*
- (f) land to be acquired by the Corps of Engineers
- (g) ownership

Further consideration was given to current information and the financial capabilities of the City and County to undertake the acquisition and development of the necessary lands to put the Port into operation on a competitive basis. After examining the advantages and disadvantages, it is concluded that the statement and recommendation are basically sound and upon this premise the Port Commission could, with confidence, employing the means as provided by law, set a course which would bring the Port and Industrial Park to a speedy reality.

ADVANTAGES:

1. It is ideally located when considering the over-all development of the community and the surrounding area. The prevailing winds are southerly and industries, which might be unacceptable in another location, could locate here without creating a nuisance by the emission of noise, dust, smoke, or odors, see Plate II, page 4.
2. There are no topographical or subterranean features which would economically preclude any type of construction.
3. Ownership of lands is of a nature and so geographically arranged to permit a minimum of expenditure of funds for improvements and yet could be subdivided into an acceptable Industrial Port.
4. Forethought and timely acquisition has provided adjacent lands for industrial use which could be incorporated into a Port and Industrial Park Plan.

*The modified flood line is defined as that area on which flooding might occur, based on the floods of records, over a 50 year period and which would be modified by the existing upstream reservoir system and assuming Webbers Falls Reservoir is in place and with 50 years sediment deposits.

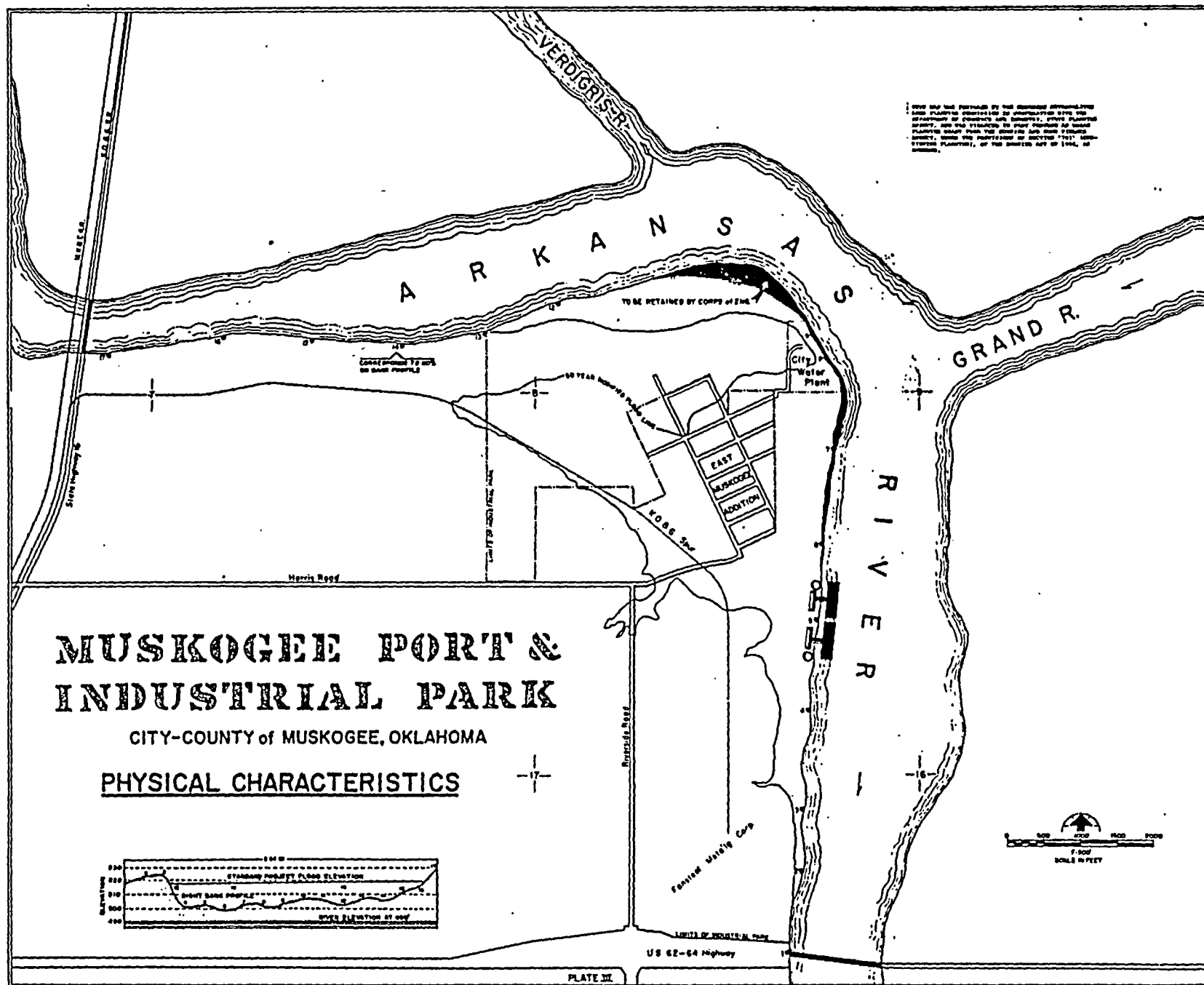
5. Utilities, especially large quantities of pure water, which is essential to industry, are available on and adjacent to the site, to duplicate the twenty-four inch (24") and the thirty inch (30") water lines on a different site, would cost well over a million dollars.
6. The proposed Muskogee Turnpike will border the area, thus completing all the requirements of an industrial site. Completion of the Turnpike is scheduled to coincide with the completion of navigation on the Arkansas River.
7. At the juncture of the three rivers the water transportation pattern will change - the navigation channel will narrow from 250 feet in the Arkansas River to 150 feet in the Verdigris River. It is historically true that where a break in the transportation pattern takes place, activity flourishes.
8. Sufficient access, both by rail and by road now exist in the area. The completion of the Muskogee Turnpike will further supplement the sites accessibility.
9. Full development of this area is within the financial capabilities of the City and County.
10. This is the only sizable area remaining in the vicinity of Muskogee proper which could be economically developed for a combination of port and industrial uses which is not susceptible to extensive flooding or which is not controlled by a Public Utility (the Frisco R. R.) or the Federal Government (Callery Chemical Co. Tract). The lands to the east, across the river from the proposed site are subject to flooding and it is expected that the Corps of Engineers will assume jurisdiction there. The Arkansas River Navigation Project does not extend west beyond the mouth of the Verdigris River. It must be assumed that any development west of this point must be financed solely by the local community.
11. It is proposed by the Corps of Engineers that at the southern juncture of the Grand and Arkansas Rivers, a recreation area will be established. This action will do much to enhance the desirability of the site.

12. Industries can see and be seen. The Muskogee Turnpike will be, due to the necessity of required clearance of the span across the river, slightly elevated as it traverses the area. This will permit passing motorists an undisturbed view of the industrial complex. Few are the present day industries that do not take pride in the aesthetic appearance of their plants.
13. It can, at this time, be predicted with some certainty that the navigation channel will be on the east bank of the river across from the proposed site. This is an advantage in that it will allow barges to proceed past the site without interfering with those tied to the docks.
14. The utilization of Site E would fit into the locational pattern of the existing industries which are located to the northeast of the City. Namely: Container Corporation, Farmers Co-Op, Corning Glass Co., Brockway Glass Co., Fansteel Metallurgical Corporation, O. G. & E., and the City Water Plant.
15. An important consideration in any type of industrial location is the opportunity for future expansion. Expansion could occur to the west along Riverside Road and north of Harris Road.
16. Only a small amount of this area is designated for acquisition - approximately 3 acres - by the Corps of Engineers.
17. Few places, anywhere, can offer the scenic background which is created by the juncture of the three rivers. The aesthetic characteristics of an Industrial Park is by no means the least important consideration. In a paper presented to the Southwestern Legal Foundation, Institute on Planning and Zoning, Mr. John Greifer, Vice-President, Cabot, Cabot, and Forbes Company of Boston, Massachusetts, had this to say, "Even the effect of aesthetics on what we call 'the southeast corner of the balance sheet' is not a simple subject; because, even though we obtain less money per square foot for our land with the higher aesthetics and the lower land use, nevertheless, the higher the aesthetic level,

the better our developments will be. Competition is becoming extremely keen both in price and in know-how and appearance. The appearance of the park itself is the only advantage we can maintain. It pays off in financing, in maintenance of value, and in the subleasing of properties."

DISADVANTAGES:

1. The presence of the residences located in the East Muskogee Addition is not desirable when considering the location of an Industrial Park. It is anticipated that these improvements will be assimilated into the industrial complex as industrial activity gains momentum. The greater majority of these residences are of a medium or low cost nature.
2. Twenty-two years ago a portion of this area was flooded. The possibility of flooding to this same extent has been somewhat reduced by the construction of Flood Control Reservoirs up stream on the three rivers. It is possible and economically so, with spoils from river dredging, to construct a dike around the entire area, thus protecting the Port and Industrial Park, as well as the surrounding area from any possibility of flooding. A look at the profile of the west and south bank of the river indicates that not more than two (2) miles of diking would be required.- see Plate III, page 8.



PART II
PROPOSED PORT & INDUSTRIAL PARK PLAN

It is proposed that the bond election to be called in the fall of 1965, be in the amount of \$300,000. Therefore, any immediate plan for expenditures for the Port and Industrial Park development must be in accord with monies immediately available.

After an examination of the ownership map and land costs which prevail in the area, it is possible to devise a Port & Industrial Park of 585.50 acres with a total river frontage of 12,640 feet (2.40 mi.) - see Plate IV, page 10. Details are shown below.

LAND DISPOSITION

Lands under option (M. I. F.)	113.00 ac.
Lands to be acquired	220.62 "
Lands allocated for industry (K.O. & G. Tracts)	116.38 "
Lands used for industry (Fansteel & Water Plant)	135.50 "
	<u>585.50 ac.</u>

RIVER FRONTAGE & CONTROL

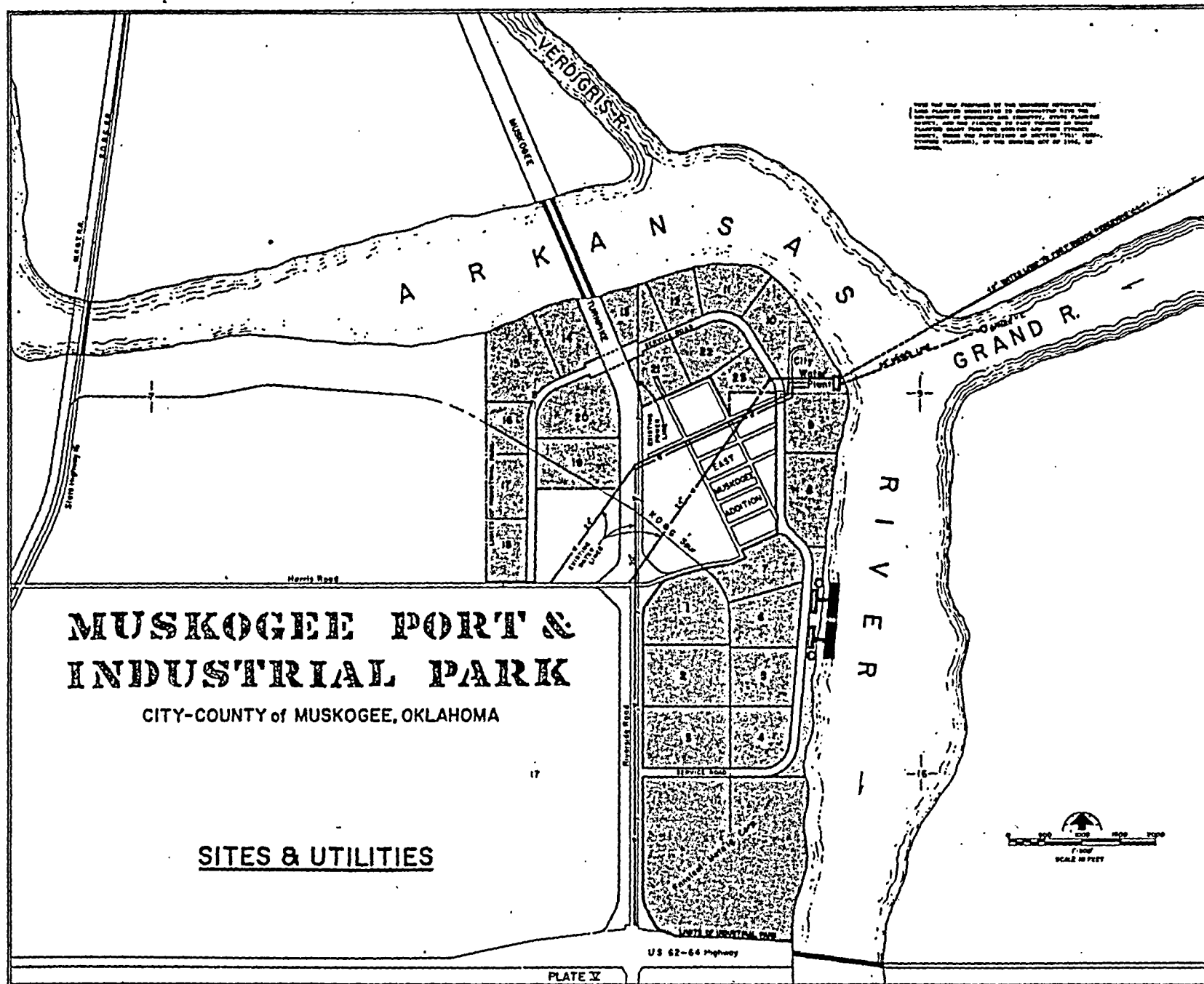
Port Authority	6,200' (1.18 mi.)
K. O. & G. Railroad	4,140' (0.79 mi.)
Fansteel	2,300' (0.43 mi.)
Total	<u>12,640' (2.40 mi.)</u>

ESTIMATED COSTS

Land to be acquired	\$210,000
Land under option to M. I. F.	50,000
Clearance and Service Road Construction	30,000
Legal fees and Marketing of Bonds	10,000
Total	<u>\$300,000</u>

A preliminary platting of the area indicates that there would be 23 lots ranging in size from 15 to 35 acres which would be immediately available for port and industrial purposes. Twelve of these lots would have direct access to the navigation channel - see Plate V, page 11.

The development of an enterprising Port and Industrial Park are well within the capabilities of the City and County of Muskogee. The proposals contained herein are the minimum efforts that should be made to utilize the benefits that will accrue to the community when the Arkansas River is navigable.



PART III

FINANCING AND DEVELOPMENT SCHEDULE
FOR THE PORT AND INDUSTRIAL SITE

(Revised 1-1-66)

January 13, 1966

Member: Muskogee
Metro-Plan Commission
Muskogee, Oklahoma

Dear Sirs:

On May 17, 1965, the Commission in joint session with the Port Authority, adopted "A Plan for the Location, Development and Financing of the Muskogee Port and Industrial Park". Subsequent to that time, the Public Works and Economic Development Act has been passed by the United States Congress. To take advantage of the new act, it is recommended that Part III, of the Port Plan be revised and adopted as shown on the following pages.

Members of the Port Authority have been invited to attend the regular meeting of the Planning Commission, on January 17, 1966, at 1:15 P. M., in the Meeting Room, First Floor, Municipal Building.

Ernest L. Wise, Chairman
Muskogee Metro-Plan Commission

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PART III

ACTION PROGRAM FOR THE FINANCING
AND DEVELOPMENT OF THE MUSKOGEE
PORT AND INDUSTRIAL PARK DURING
THE YEARS OF 1966 THROUGH 1969

(Revised 1-1-66)

SCHEDULE OF ACTION FOR THE YEAR 1966

- A. Prepare and submit to the Economic Development Office of the Department of Commerce an application for a federal grant and supplemental grant, as provided for in the Public Works and Economic Development Act of 1965. And upon approval of the application.
- B. Purchase land for port and industrial parks as shown in the plan adopted by the Metropolitan Area Planning Commission, in May, 1965, and revised in January, 1966.
- C. Interview and employ an engineering firm, qualified and experienced, in the development of inland port and dock facilities and industrial parks.
- D. Hold public hearing and attend to any other legal details that may be required.
- E. Begin preliminary land surveys and clearance of undergrowth.
- F. Establish a port development office in conjunction with the Muskogee Metropolitan Area Planning for the specific purpose of expediting the efficient and economic development of the Port and Industrial Park, and in particular to:
 - 1. Work closely with the Corps of Engineers insofar as their work schedule affects the area in which the Port and Industrial Park is to be located.
 - 2. Establish a working relationship with the Oklahoma Highway Commission and Turnpike Authority for the purpose of integrating and coordinating the Port and Industrial Park development with the plans and construction of the Muskogee Turnpike and connecting roads.
 - 3. Support and supply to the Muskogee Chamber of Commerce information and assistance in their efforts to advertise, publicize and otherwise get industry and commerce to locate in the Industrial Park and to utilize the port facilities.

*Upon completion of the Port and Industrial Park, this office will be terminated.

4. Furnish to the Port Commission, County Commissioners, City Council and the Economic Development Office; monthly and annual reports as to the progress being made toward the final completion of the Port.
5. Carry out the administrative duties that may be required by the Economic Development Office in fulfilling the specifications and agreements entered into upon final approval of the application mentioned in A, on previous page.
6. Keep current on all existing or pending legislation pertaining to the operation or development of ports, industrial sites, and navigable streams.

SCHEDULE OF ACTION FOR THE YEAR 1967

- A. Complete detailed construction plans and specifications for the Port and Industrial Park.
- B. Complete the clearance of undergrowth and other natural objects which are obviously (not all the trees for heavens sake) a hinderance to port and industrial development.
- C. Finalize and coordinate port and industrial park plans and work schedules with the Oklahoma Turnpike Authority, Corps of Engineers, and Oklahoma Highway Department, to insure that full advantage can be taken of the combined efforts of the four agencies.
- D. Commence road construction and installation of utilities for the Industrial Park.
- E. Continue in a more efficient way to carry out the specific purpose and particular duties of the Port Development Office.
- F. Submit to the Oklahoma State Legislature any amendments or new legislation that may be required to make the utilization of ports and navigable streams a more economical and efficient process.

SCHEDULE OF ACTION FOR THE YEAR 1968

- A. Through the process of education and explanation, successfully campaign for a county bond issue of \$700,000.
- B. Begin and complete construction of "Combined Use Facilities".

- C. Commence and complete "General Cargo Facilities".
- D. Implement any working agreements between the Port Commission and/or the Oklahoma Turnpike Authority, Corps of Engineers, and Oklahoma Highway Department.
- E. Complete Industrial Park.
- F. Redouble efforts to fulfill the specific purpose and particular duties of the Port Development Office.

SCHEDULE OF ACTION FOR THE YEAR 1969

- A. Complete the following facilities:
 - 1. Grain
 - 2. Coal
 - 3. Petroleum
 - 4. Sand, gravel and crushed stone
- B. Interview qualified personnel preparatory to manning the port and dock facilities, as well as management personnel for the Industrial Park.
- C. Review and finalize any lease or rental agreements between the Port Commission and prospective, potential or commissioned users of the Port and Industrial Park.
- D. Through the Chamber of Commerce, intensify and expand promotional and publicity campaign.
- E. Review state and federal legislation pertaining to the operation and development of ports, industrial sites and navigable streams.
- F. Terminate the Port Development Office and remove all records and files to the Port Commission Office.

Financing of the Port and Industrial Park is to be through the use of general obligation bonds voted by the County of Muskogee and federal grants and supplemental grants, as provided for in the Public Works and Economic Development Act of 1965. The total estimated cost of the project is \$2,435,750.

Presently, the Board of County Commissioners have on hand \$300,000 in general obligation bonds, which were voted for the specific purpose of purchasing land and construction of the Port and Industrial Park facilities. On November 27, 1965, the Metropolitan Area Planning Commission approved a

"Schedule of Community Expenditures and Public Improvements". Contained in this was a proposed expenditure of \$600,000 for Phase II for Port and Industrial facilities.

It has been definitely established by the Economic Development Administration that for Muskogee County, a limit of sixty percent (60%) will be set on the amount of grants and supplemental grants that will be paid on the total cost of a particular project. Should this limitation remain in effect and be adhered to, then the Muskogee Community must produce at least \$1,000,000 to pay their share of the estimated \$2,435,750 project cost. This would mean that the \$600,000 expenditure allocated for port improvements would have to be revised upward to \$700,000. Based on the projected 1968 taxable value of \$64,915,000 for Muskogee County and a rate of 3.5 percent interest for twenty years (20), the estimated millage for a \$700,000 bond issue, as compared to a \$600,000 bond issue, would be .992 and .864 mills respectively.

To arrive at a total estimated cost of the Port and Industrial Park Project, figures for construction, equipment, contingencies, engineering fees, administration and contractors cost, were excerpted from the Fredric R. Harris Report and fifteen percent (15%) added to allow for the rise in cost of labor and material since the figures were first originated in 1962. The cost of land and right-of-way was based on local estimates. Based on a more detailed cost estimate as shown in the table on the following page, the financing for the Port and Industrial Park would be as shown below.

FINANCING

50% Direct Federal Grant	= \$1,217,875
Local Funds (including 1968 bond issue)	= 1,000,000
9% Supplemental Grant	= <u>217,875</u>
	\$2,435,750

Costs and financing as shown should be considered minimum. Industrial land sites and port and dock facilities of less magnitude would not be in a position to compete with other communities along the river. The facilities proposed herein are to be the catalyst that will produce a Greater Muskogee Port and Industrial Basin.

ESTIMATED COSTS FOR THE MUSKOGEE CITY-COUNTY PORT AND INDUSTRIAL PARK

Construction - Equipment - Contingencies

<u>Facility</u>	<u>Construction</u>	<u>Equipment</u>	<u>Contingencies</u>	<u>Total</u>
Grain Facility	\$ 307,855	\$ 47,265	\$ 33,580	\$ 388,700
Coal Facility	61,525	66,700	15,525	143,750
S. G. & C. S. Facility	29,325		4,025	33,350
Petroleum Facility	93,150	32,200	14,950	140,300
General Cargo Facility	280,140	50,600	32,660	363,400
Combined Use Facility	265,305	24,725	26,220	316,250
Total	\$1,037,300	\$221,490	\$126,960	\$1,385,750

Other Costs

Port & Industrial Land and R/W	300,000
Engineering Fees	325,000
Contractors Overhead & Profit	325,000
Administration	100,000

Total Estimated Project Cost = \$2,435,750

BACKGROUND

May 23, 1963 - The Muskogee City-County Port Commission approved Port site recommendations contained in Fred R. Harris study entitled "Proposed Inland Waterway Dock Facilities for the Port of Muskogee, Oklahoma".

May 27, 1965 - The Metropolitan Area Planning Commission adopted "A Proposed Plan for the Location, Development and Financing of Muskogee Port and Industrial Park," hereafter, referred to as Master Plan.

September 22, 1967 - The Muskogee City-County Port Authority approved a resolution authorizing notice and hearing, as prescribed by statute, for consideration of the Master Plan.

November 28, 1967 - The Muskogee City-County Port Authority and the Metropolitan Area Planning Commission jointly held a public hearing for consideration of the Master Plan followed by the Port Authority's adoption thereof.

December 10, 1996 - The Muskogee City-County Port Authority approved a resolution authorizing notice and hearing, as prescribed by statute, for consideration of First Amendment to Master Plan.

January 28, 1997 - The Muskogee City-County Port Authority held a public hearing for consideration of First Amendment to Master Plan followed by the Port Authority's adoption thereof.

November 18, 1997 - The Muskogee City-County Port Authority approved a resolution authorizing notice and hearing, as prescribed by statute, for consideration of Second Amendment to Master Plan.

January 20, 1998 - The Muskogee City-County Port Authority held a public hearing for consideration of Second Amendment to Master Plan followed by the Port Authority's adoption thereof.

November 21, 2000 - The Muskogee City-County Port Authority approved a resolution authorizing notice and hearing, as prescribed by statute, for consideration of Third Amendment to Master Plan.

February 13, 2001 - The Muskogee City-County Port Authority held a public hearing for consideration of Third Amendment to Master Plan.

February 15, 2001 - The Muskogee City-County Port Authority adopted Third Amendment to Master Plan.

July 17, 2001 - The Muskogee City-County Port Authority approved a resolution authorizing notice and hearing, as prescribed by statute, for consideration of Fourth Amendment to Master Plan.

September 25, 2001 - The Muskogee City-County Port Authority held a public hearing for consideration of Fourth Amendment to Master Plan

October 11, 2001 - The Muskogee City-County Port Authority adopted Fourth Amendment to Master Plan.

THIRD AMENDMENT
TO
MASTER PLAN OF DEVELOPMENT
FOR
MUSKOGEE PORT AND INDUSTRIAL PARK
AUTHORIZED NOVEMBER 21, 2000
BY
MUSKOGEE CITY-COUNTY PORT AUTHORITY
ADOPTED FEBRUARY 15, 2001

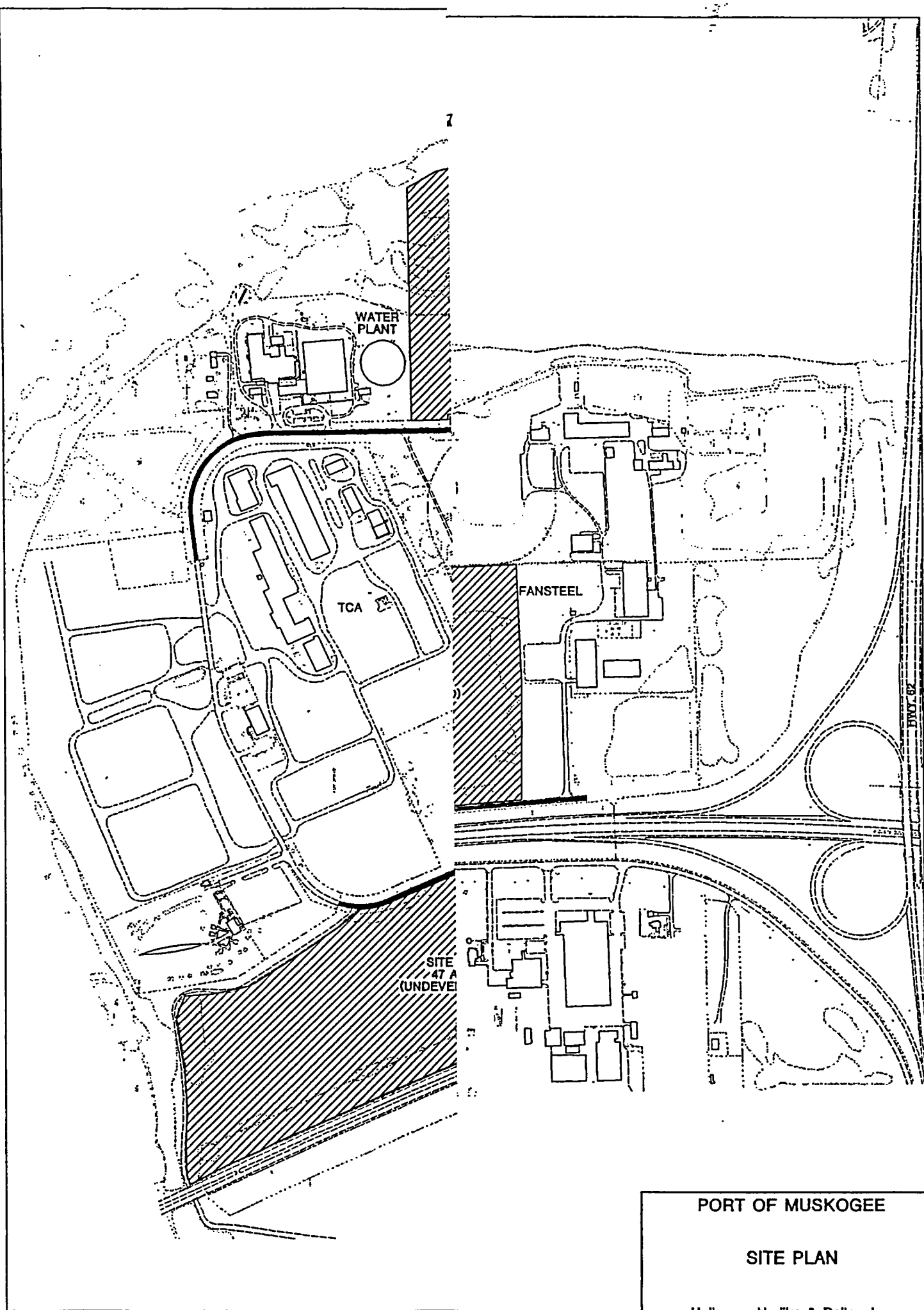
THIRD AMENDMENT

This Third Amendment to the Master Plan of Development for the Muskogee Port and Industrial Park includes the addition of properties necessary for Phase II Road Improvements, Port/BNSF Buildout and development of the Midland Valley Branch Line Corridor.

Published In The
Muskogee Daily Phoenix &
Times Democrat
December 23, 30 &
January 6, 2000

NOTICE

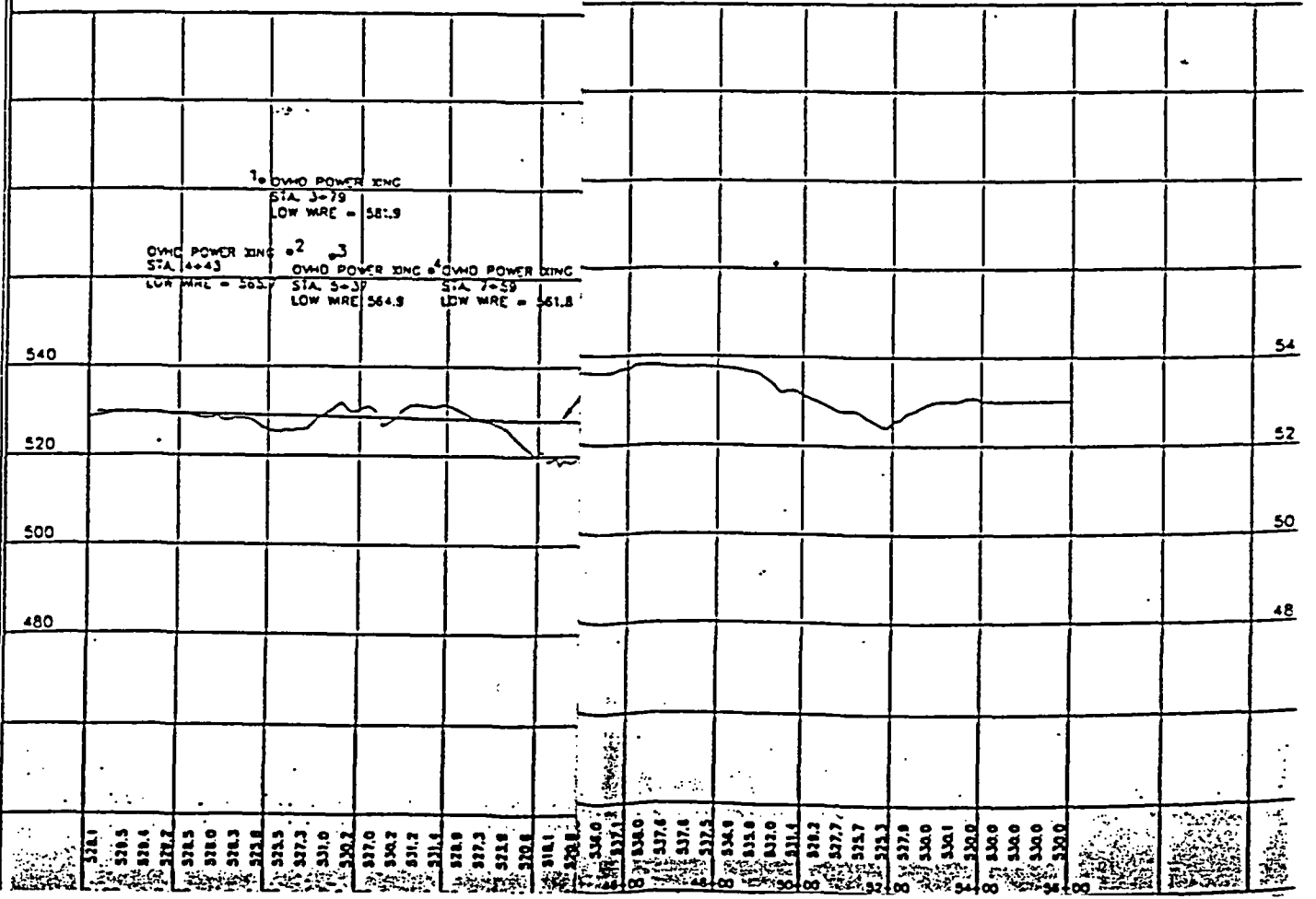
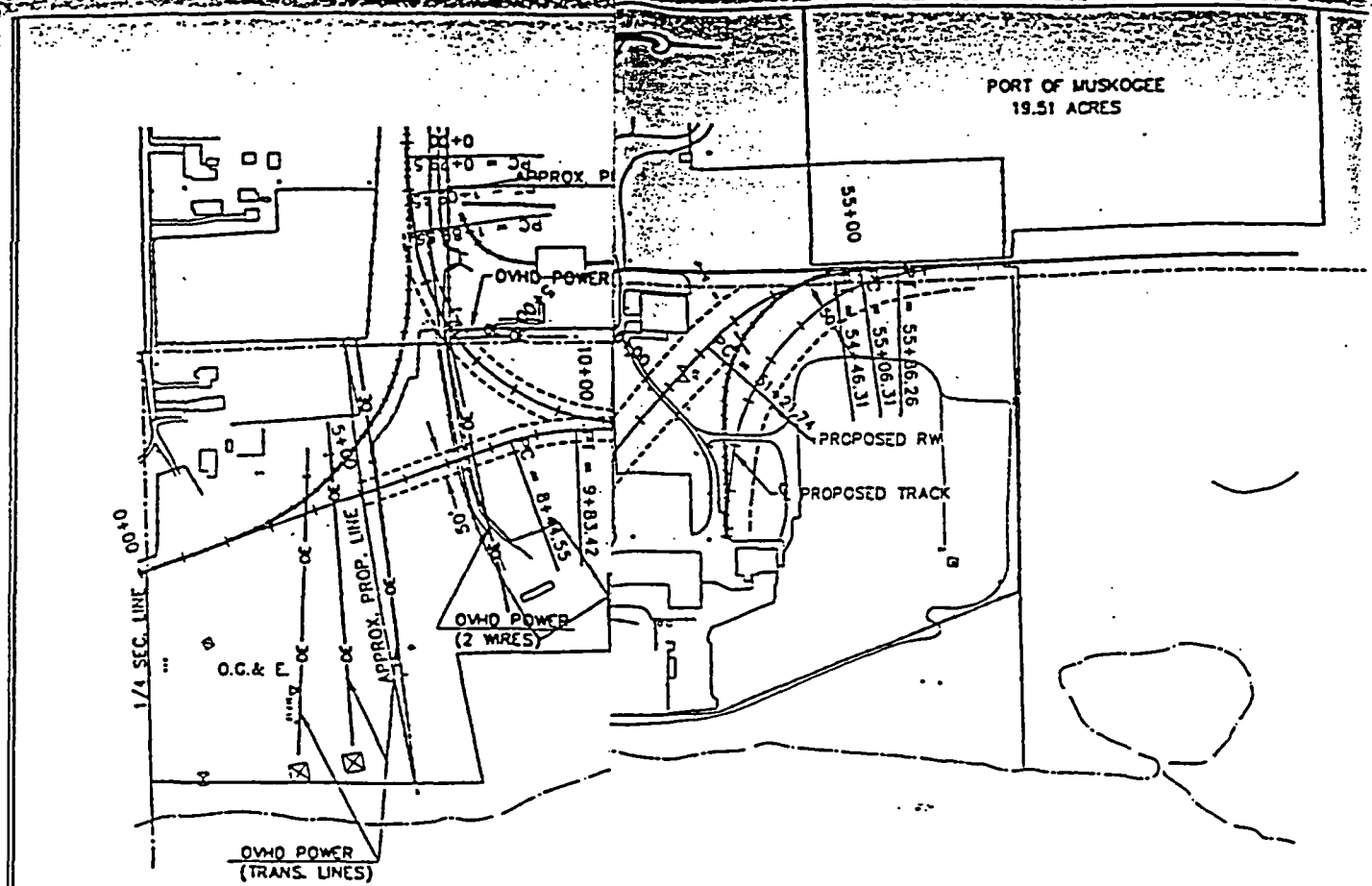
Notice is hereby given that on the 21st day of November, 2000, the Muskogee City-County Port Authority, at a regularly scheduled meeting, did authorize an Amendment to the Official Plan of Development for the Port of Muskogee, pursuant to Sections 1101 - 1137 of Chapter 15, Title 82 to the Oklahoma Statutes, for the development, construction and improvement of the Port of Muskogee and its facilities, to include the addition of such lands as are necessary for Phase II Road Improvements, Port/BNSF Buildout and development of the Midland Valley Branch Line Corridor. Maps, profiles and descriptions setting forth the location and character of the work to be undertaken are available for inspection at the offices of the Muskogee City-County Port Authority, 4901 Harold Scoggins Drive, Muskogee, Oklahoma, by all persons interested. A public hearing shall be and is hereby set for 10:30 a.m., Tuesday, February 13, 2001, in Meeting Room A, Muskogee Public Library, 801 West Okmulgee Avenue, Muskogee, Oklahoma, at which time any and all persons who object to such plan shall be heard, provided that written objections to such plan are filed with the Secretary of the Muskogee City-County Port Authority, 4901 Harold Scoggins Drive, Muskogee, Oklahoma, 74401, not less than five days prior to the date set for said hearing.



PORT OF MUSKOGEE

SITE PLAN

Holloway, Updike & Bellen, Inc.



1. OVHD POWER XING
 STA. 3+79
 LOW WRE = 581.9

 OVHD POWER XING 2
 STA. 4+43
 LOW WRE = 565.7

 OVHD POWER XING 3
 STA. 5+37
 LOW WRE = 564.9

 OVHD POWER XING 4
 STA. 7+59
 LOW WRE = 561.8

ARKANSAS RIVER

PORT OF MUSKOGEE

SHAWNEE AVE.

OKMULGEE AVE.

HATBOX FIELD

COUNTRY CLUB ROAD

MUSKOGEE TURNPIKE

CHANDLER ROAD

S. 32ND ST.

U.S. 69 HWY.

GRIFFIN PROPERTY

U.P. RR

U.S. 64 HWY.

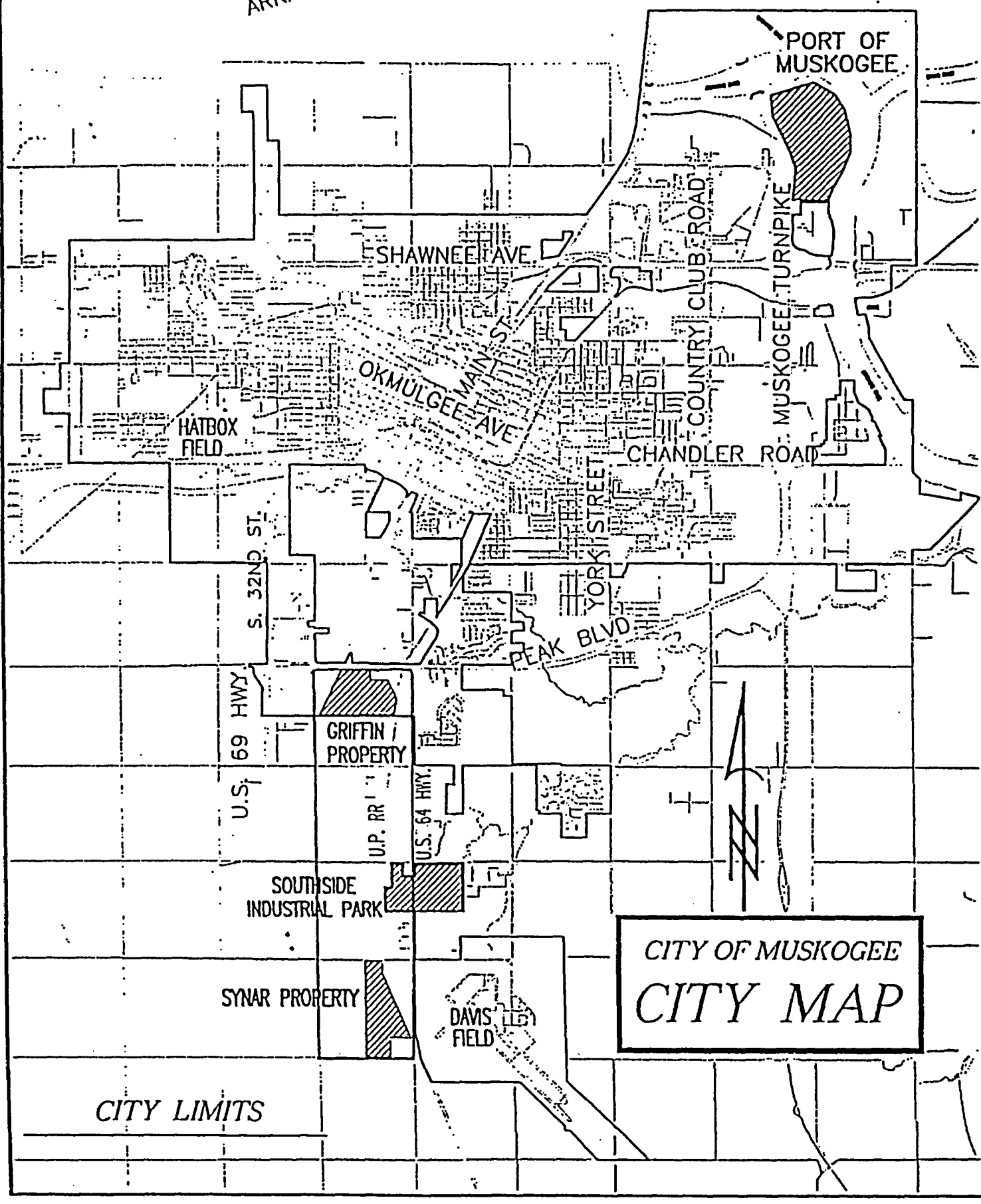
SOUTHSIDE INDUSTRIAL PARK

SYNAR PROPERTY

DAMS FIELD

CITY OF MUSKOGEE
CITY MAP

CITY LIMITS



MUSKOGEE CITY-COUNTY PORT AUTHORITY

4901 Harold Scoggins Drive Muskogee, Oklahoma 74403

918-682-7886 FAX 918-682-8062

www.muskogeeport.com

EDWIN L. GAGE, Chairman SCOTT ROBINSON, Port Director

A. Ernest Gilder
Walter L. Lambert
David P. Jones
David P. Thompson
Bill Isbell
John Paul Gilliam

John A. Schilt
David White
Richard C. Haugland
Domen Heidenreich
John H. Saxon, M.D.
Charles N. Raper

July 17, 2003

Scott A. Thompson, Director
Land Protection Division
Oklahoma Department of Environmental Quality
PO Box 1677
Oklahoma City, OK 73101-1677

Dear Mr. Thompson:

The Muskogee City-County Port Authority, an agency of the State of Oklahoma, is interested in acquiring property from Fansteel, Inc. The property is located adjacent to the Port of Muskogee and has been identified in the Master Plan of Development for the Port of Muskogee as property for future expansion, subject, of course, to a determination of environmental suitability for port development.

According to the Nuclear Regulatory Commission (NRC), certain areas of the Fansteel site have been unaffected by radioactive materials and therefore released by the NRC for unrestricted use. Pursuant to that determination, the Port Authority acquired a 19.51-acre parcel of land from Fansteel in June, 1999. Ultimately, the Port Authority would like to acquire all of the Fansteel property, the remainder of that which has already been released by the NRC for unrestricted use and that which will be cleaned up and released pursuant to an approved decommissioning plan.

Recognizing that certain parcels may have been affected differently than others by the operations of Fansteel, that the decommissioning and clean-up of the property may take years and that certain parcels have a higher priority to the Port Authority than others for acquisition, I have attached a site map showing the following: 1) the 19.51-acre parcel acquired by the Port Authority; 2) the remainder of Fansteel property having been released by NRC for unrestricted use; 3) a proposed 50 foot railroad right of way, currently subject to the NRC license; 4) a proposed Asphalt Terminal Expansion site, currently subject to the NRC license; and 5) the remainder of Fansteel property, currently subject to the NRC license.

The Port Authority would like to move forward to acquire additional parcels of the Fansteel property as soon as possible (parcels 2, 3 and 4 above having the highest priority for acquisition); however, we wish to proceed in a manner that limits the Port Authority's liability for historical contamination. In that regard, we are working closely with Fansteel, the Attorney General's office, NRC and DEQ. After discussions with Rita Kottke, Ph.D., of your staff, I understand that DEQ can provide assistance with the assessment of the property; accordingly, the Port Authority formally requests that DEQ conduct a Brownfield Targeted Site Assessment of the property, as applicable.

Please have your staff contact me at 918-682-7886 or via e-mail scott@muskogeeport.com to discuss the project further. Thank you for your assistance in this matter.

Sincerely,



Scott Robinson
Port Director

SR/pc

cc: Sarah Penn, Office of the Attorney General
Fred Dohmann, Fansteel, Inc.

PROMISSORY NOTE

(Primary FMRI Note)

\$30,600,000.00

North Chicago, Illinois
January 23, 2004

FOR VALUE RECEIVED and IN ACCORDANCE WITH the SECOND AMENDED JOINT REORGANIZATION PLAN OF FANSTEEL, INC. AND SUBSIDIARIES, dated December 23, 2003, under Chapter 11 of the Bankruptcy Code (as amended, modified or supplemented from time to time, the "Reorganization Plan"), the undersigned, FANSTEEL INC., a Delaware corporation ("Fansteel"), HEREBY PROMISES TO PAY to the order of FMRI, INC., a Delaware corporation ("FMRI"), the principal sum of THIRTY MILLION SIX HUNDRED THOUSAND DOLLARS (\$30,600,000.00) on or before December 31, 2013 (the "Maturity Date") in accordance with the payment schedule set forth below.

Definitions:

"Additional Mandatory Prepayment" means a payment made from time to time by Fansteel to FMRI comprised of Net Insurance Proceeds recovered by Fansteel with respect to the Muskogee Facility claims and/or Asset Sale Proceeds. No Additional Mandatory Prepayment shall be counted in computing the \$4,000,000.00 limit of the Annual Mandatory Prepayment.

"Annual Mandatory Prepayment" means an annual payment to be made within 100 days of Fansteel's fiscal year-end, in an amount equal to 50% of Excess Available Cash, up to a maximum of \$4,000,000.00, provided however, that if in any given fiscal year (A) the sum of the two Minimum Semi-Annual Payments and 50% of Excess Available Cash is less than (B) the budgeted amount for the current-year's remediation costs, then, additionally, up to 50% of the prior fiscal year-end cash balance shall be paid to FMRI, as and to the extent permissible under applicable law, so that FMRI shall have been reimbursed in full by Fansteel for the current year's remediation costs.

"Asset Sale Proceeds" means, with respect to any Asset sale by Fansteel and its subsidiaries, including Wellman, outside of the ordinary course of business, 50% of the first \$2,000,000.00 of sale proceeds, 35% of the next \$3,000,000.00 of sale proceeds, and 25% of all sale proceeds in excess of \$5,000,000.00, in each case net of (i) all transaction costs and (ii) all amounts, if any, due to Fansteel's secured creditors as a result of such sale(s); provided however, that Asset Sale Proceeds for purposes of this Note does not include the Old Fansteel Divestiture Asset Sale Proceeds.

"Asset(s)" means any and all real or personal property of any nature, including, without limitation, any real estate, buildings, structures, improvements, privileges, rights, easements, leases, subleases, licenses, goods, materials, supplies, furniture, fixtures, equipment, work in process, accounts, chattel paper, cash, deposit accounts, reserves, deposits, contractual rights, intellectual property rights, claims, causes of action and any other general intangibles of Fansteel, as the case may be, of any nature whatsoever.

"Bankruptcy Code" means the Bankruptcy Reform Act of 1978, as codified in title 11 of the United States Code, 11 U.S.C. §§ 101-1330, as now in effect or hereafter amended, and as applicable to the Fansteel Chapter 11 Case.

"Bankruptcy Court" means the United States District Court for the District of Delaware, or such other court as may have jurisdiction over the Reorganization Plan.

"Cash" means cash and cash equivalents, including, but not limited to, wire transfers, bank deposits, checks and legal tender of the United States.

"Decommissioning Trust" means all cash on deposit with the Bank of Waukegan, Waukegan, Illinois, pursuant to the Standby Trust Agreement dated February 3, 1994, as amended, by and between Fansteel and the Bank of Waukegan as trustee under Trust No. 2740.

"Excess Available Cash" means an amount to be determined by Fansteel within 90 days of each Fansteel fiscal year-end and to be certified by Fansteel's independent auditors, such amount to be equal to (A) the difference in dollars between the fiscal year-end cash balance of Fansteel and the previous fiscal year-end cash balance of Fansteel, less (B) the sum of (i) the net increase in borrowings, if any, in dollars by Fansteel against its credit lines, (ii) the Remaining Asset Sale Proceeds, if any, and (iii) capital expenditures of Fansteel, provided, that if such capital expenditures exceed 5% of consolidated sales in any given fiscal year, the amount in dollars equal to the excess of such capital expenditures over 5% of consolidated sales shall be added back to the fiscal year-end cash balance for the purpose of determining "Excess Available Cash."

"Exit Facility" means the new senior secured credit facility, in an aggregate principal amount of \$10,000,000.00, between Fansteel and Wellman, as borrowers, and Congress Financial Corporation (Central), as lender, dated the date hereof.

"Exit Muskogee Note Funding" means the funding, if any, provided to Fansteel pursuant to the Exit Facility that is specifically designated as funding for the obligations of Fansteel under this Note.

"Fansteel" has the meaning set forth in the preamble hereto.

"FMRI" has the meaning set forth in the preamble hereto.

"L/C Cash Reserve" means all Cash on deposit with the Bank of Waukegan, Waukegan, Illinois, pursuant to the Standby Trust Agreement dated February 3, 1994, as amended, by and between Fansteel and the Bank of Waukegan as trustee under Trust No. 2740.

"Maturity Date" has the meaning set forth in the preamble hereto.

"Minimum Semi-Annual Payment" means a payment in the amount of \$700,000.00, except that the first semi-annual payment shall be a payment in the amount of \$450,000.00, the difference between \$700,000.00 and the \$250,000.00 payment made by Fansteel on the date hereof.

"Muskogee Facility" means Old Fansteel's site located at Number Ten Tantalum Place, Muskogee, Oklahoma.

"Net Insurance Proceeds" means the amount of insurance proceeds received by Fansteel and/or any of its subsidiaries with respect to any and all claims made by Fansteel and/or any subsidiary for insurance coverage in respect of the Muskogee Facility net of Fansteel's costs related to the litigation and/or settlement of such claims.

"NRC" means the United States Nuclear Regulatory Commission.

"Old Fansteel" means Fansteel Inc., a Delaware Corporation, as it existed prior to the Effective Date (as defined in the Reorganization Plan) of the Reorganization Plan.

"Old Fansteel Divestiture Asset Purchase Agreements" means (i) the asset purchase agreement dated as of September 2, 2003, by and among Old Fansteel, as seller, and Phoenix Aerospace Corporation, Hydro Carbide, Inc. and California Drop Forge, Inc., each a Delaware corporation, and HBD Industries, Inc., as guarantor, and (ii) the asset purchase agreement dated as of October 1, 2003 by and among Old Fansteel, as seller and Plantsville Acquisition, LLC, a Connecticut limited liability company, each agreement governing the terms and conditions of the Old Fansteel Divestiture Asset Sale.

"Old Fansteel Divestiture Asset Sale" means the sale by Fansteel of (i) substantially all of the assets of Old Fansteel's Hydro Carbide and California Drop Forge operating divisions, (ii) any and all assets of Old Fansteel's Plantsville Division, and (iii) the equipment and inventory of Old Fansteel's Lexington Facility, pursuant to the Old Fansteel Divestiture Asset Purchase Agreements and/or any other agreement(s) approved by the Bankruptcy Court.

"Old Fansteel Divestiture Asset Sale Proceeds" means the net proceeds of the Old Fansteel Divestiture Asset Sale.

"Remaining Asset Sale Proceeds" means, with respect to any Asset sale by Fansteel outside of the ordinary course of business, 50% of the first \$2,000,000.00 of sale proceeds, 65% of the next \$3,000,000.00 of sale proceeds, and 75% of all sale proceeds in excess of \$5,000,000.00, in each case net of (i) all transaction costs and (ii) all amounts, if any, due to Fansteel's secured creditors as a result of such sale(s); provided however, that Remaining Asset Sale Proceeds for purposes of this Note does not include any Old Fansteel Divestiture Asset Sale Proceeds.

"Reorganization Plan" has the meaning set forth in the preamble hereto.

"Wellman" means Wellman Dynamics, Corp., a Delaware corporation.

The principal of this Note shall be paid as follows:

Principal shall be paid in (i) an initial payment of \$250,000.00 on the date hereof, (ii) a second payment of \$450,000.00 on or before June 30, 2004, (iii) consecutive installments of the Minimum Semi-Annual Payment commencing on December 31, 2004 and continuing thereafter on the last day of each second and fourth calendar quarter, (iv) an Annual Mandatory Prepayment, (v) Additional Mandatory Prepayments from time to time as required pursuant to the covenants set forth in this Note and (vi) on the Maturity Date, in the event that the principal has not been repaid in full prior thereto, the final installment shall be a payment equal to the amount necessary to repay in full the outstanding principal balance hereof.

All payments made to FMRI on account of principal hereof shall be noted by FMRI on the schedule that is attached hereto and hereby made a part hereof; provided, however, that any error or omission by FMRI in this regard shall not affect the obligation of Fansteel to pay the full amount of the principal due to FMRI.

If any amount payable hereunder shall be due on a day on which banks are required or authorized to close in Chicago (any other day being a "Business Day"), such payment may be made on the next succeeding Business Day.

Principal is payable in lawful money of the United States and in immediately available funds at the offices of FMRI, Number Ten Tantalum Place, Muskogee, Oklahoma 74403, Attention: A. Fred Dohmann, Chief Executive Officer & President, or at such other place as FMRI shall designate in writing to Fansteel.

Fansteel may, at its option, prepay this Note, in whole at any time or in part from time to time, without penalty or premium.

Fansteel hereby agrees that during the term of this Note:

1. Fansteel shall pay to FMRI any Exit Muskogee Note Funding that Fansteel receives; such Exit Muskogee Note Funding shall reduce the principal amount due pursuant to this Note;
2. All Net Insurance Proceeds, if any, received by Fansteel shall be paid to FMRI within 30 days of receipt; provided that FMRI shall use any Net Insurance Proceeds that it receives to repay its borrowings, if any, from the Decommissioning Trust (such repayment of borrowings to the Decommissioning Trust shall not reduce the outstanding principal amount of this Note); and provided further that FMRI shall deem any Net Insurance Proceeds that it receives in excess of any repayment of borrowings to the Decommissioning Trust as Additional Mandatory Prepayment(s) (such Additional Mandatory Prepayment(s) shall reduce the outstanding principal amount of this Note);
3. All Asset Sale Proceeds, if any, received by Fansteel and/ or any of its subsidiaries shall be paid to FMRI within 30 days of receipt; provided that FMRI shall use any Asset Sale Proceeds that it receives to repay its borrowings, if any, from the Decommissioning Trust (such repayment of borrowings to the Decommissioning Trust shall not reduce the outstanding principal amount of this Note); and provided further that FMRI shall deem any Asset Sale Proceeds that it receives in excess of any repayment of borrowings to the Decommissioning Trust as Additional Mandatory Prepayment(s) (such Additional Mandatory Prepayment(s) shall reduce the outstanding principal amount of this Note);
4. All Excess Available Cash, if any, held by Fansteel and/ or any of its subsidiaries shall be paid to FMRI within 10 days of the determination of such Excess Available Cash pursuant to its definition above; provided that FMRI shall use any Excess Available Cash that it receives to repay its borrowings, if any, from the Decommissioning Trust (such repayment of borrowings to the Decommissioning Trust shall not reduce the outstanding principal amount of this Note); and provided further that FMRI shall deem any Excess Available Cash that it receives in excess of any repayment of borrowings to the Decommissioning Trust as Additional Mandatory Prepayment(s) (such Additional Mandatory Prepayment(s) shall reduce the outstanding principal amount of this Note); and
5. Fansteel shall not pay a dividend to any shareholder.

If any of the following shall occur (each a "Default"): (a) Fansteel shall fail to pay any principal of this Note when due (whether by scheduled maturity, required prepayment, acceleration, demand or otherwise); provided that Fansteel's failure to pay any principal of this Note when due shall not be deemed a Default if FMRI shall be able to borrow such principal amount due from the Decommissioning Trust (the outstanding borrowings by FMRI from the Decommissioning Trust in the aggregate at any one time not to exceed \$2,000,000); provided further for purposes of clarification, Fansteel's failure to pay any Net Insurance Proceeds or

Asset Sale Proceeds or Excess Available Cash to FMRI as required pursuant to this Note shall be a Default; or (b) Fansteel shall fail to perform or observe any material covenant contained in this Note, and such failure shall remain unremedied for five days after written notice thereof shall have been given to Fansteel by FMRI; or (c) Fansteel shall admit in writing its inability to pay its debts generally, or shall make a general assignment for the benefit of creditors; or (d) any proceeding shall be instituted by or against Fansteel seeking to adjudicate it a bankrupt or insolvent, or seeking dissolution, liquidation, winding up, reorganization, arrangement, adjustment, protection, relief or composition of it or its debts under any law relating to bankruptcy, insolvency or reorganization or relief of debtors, or seeking the entry of an order for relief or the appointment of a receiver, trustee, custodian or other similar official for Fansteel or for any substantial part of its property, or Fansteel shall take any action to authorize or effect any of the actions set forth above in this clause (d); or (e) any provision of this Note or any other related document shall at any time for any reason be declared to be null and void by a court of competent jurisdiction, or the validity or enforceability thereof shall be contested by Fansteel, or a proceeding shall be commenced by Fansteel seeking to establish the invalidity or unenforceability thereof, or Fansteel shall deny that it has any liability or obligation hereunder or thereunder;

then FMRI may (i) declare the outstanding principal amount of this Note to be immediately due and payable, whereupon the outstanding principal amount of this Note shall become and shall be forthwith due and payable, without diligence, presentment, demand, protest or other notice of any kind, all of which are hereby expressly waived, and (ii) exercise any and all of its other rights under applicable law, hereunder.

All payments made by Fansteel hereunder will be made without setoff, counterclaim or other defense. All such payments shall be made free and clear of and without deduction for any present or future income, stamp or other taxes, levies, imposts, deductions, charges, fees, withholding, restrictions or conditions of any nature now or hereafter imposed, levied, collected, withheld or assessed by any jurisdiction or by any political subdivision or taxing authority thereof or therein, and all interest, penalties or similar liabilities, excluding taxes on the overall net income of FMRI (such non-excluded taxes are hereinafter collectively referred to as the "Taxes"). If Fansteel shall be required by law to deduct or to withhold any Taxes from or in respect of any amount payable hereunder, (i) the amount so payable shall be increased to the extent necessary so that after making all required deductions and withholdings (including Taxes on amounts payable to FMRI pursuant to this sentence) FMRI receives an amount equal to the sum it would have received had no such deductions or withholdings been made, (ii) Fansteel shall make such deductions or withholdings and (iii) Fansteel shall pay the full amount deducted or withheld to the relevant taxation authority in accordance with applicable law. Whenever any Tax is payable by Fansteel, as promptly as possible thereafter Fansteel shall send FMRI an official receipt showing payment. In addition, Fansteel agrees to pay any present or future taxes, charges or similar levies which arise from any payment made hereunder or from the execution, delivery, performance, recordation or filing of, or otherwise with respect to, this Note (hereinafter referred to as "Other Taxes"). Fansteel will indemnify FMRI for the full amount of Taxes or Other Taxes (including, any Taxes or Other Taxes on amounts payable to FMRI under this paragraph) paid by FMRI and any liability (including penalties, interest and expenses) arising therefrom or with respect thereto, upon written demand by FMRI therefor.

Fansteel agrees that all notices or other communications provided for hereunder shall be in writing (including telecommunications) and shall be mailed, telecopied or delivered to Fansteel at the address of Fansteel set forth next to its signature, or at such other address as may hereafter be specified by Fansteel to FMRI (at its address set forth herein) in writing. All notices and communications shall be effective (i) if mailed, when received or three days after mailing, whichever is earlier, (ii) if telecopied, when transmitted and confirmation is received, if transmitted on a Business Day and, if not, on the next Business Day, and (iii) if delivered, upon delivery, if delivered on a Business Day and, if not, on the next Business Day.

Fansteel agrees that the NRC, pursuant to the Pledge Agreement, dated the date hereof, by FMRI in favor of the NRC, shall be a third-party beneficiary of this Note.

No failure on the part of FMRI or the NRC, as the case may be, to exercise, and no delay in exercising, any right, power, privilege or remedy hereunder shall operate as a waiver thereof, nor shall any single or partial exercise thereof by FMRI or the NRC, as the case may be, preclude any other or further exercise thereof or the exercise of any other right, power, privilege or remedy of FMRI. No amendment or waiver of any provision of this Note, nor consent to any departure by Fansteel therefrom, shall in any event be effective unless the same shall be in writing and signed by FMRI or the NRC, as the case may be, and then such waiver or consent shall be effective only in the specific instance and for the specific purpose for which given.

Any provision hereof which is prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective only to the extent of such prohibition or unenforceability without invalidating the remaining provisions hereof or affecting the validity or enforceability of such provision in any other jurisdiction.

Fansteel hereby agrees to pay on demand all costs and expenses (including, without limitation, all reasonable fees and expenses of counsel to FMRI) incurred by FMRI in connection with (i) the preparation, execution, delivery, administration and amendment of this Note and the other Documents, and (iii) the enforcement of the rights of FMRI and/or the NRC, as the case may be, and the collection of all amounts due, hereunder.

Fansteel hereby (i) irrevocably submits to the jurisdiction of the United States Bankruptcy Court for the District of Delaware or any Illinois State or Federal court sitting in Chicago in any action or proceeding arising out of or relating to this Note, (ii) waives any defense based on doctrines of venue or forum non conveniens, or similar rules or doctrines, and (iii) irrevocably agrees that all claims in respect of such an action or proceeding may be heard and determined in the United States Bankruptcy Court for the District of Delaware or such Illinois State or Federal court. Fansteel would (by its acceptance hereof) waive any right to trial by jury in any action, proceeding or counterclaim arising out of or relating to this Note.

This Note shall be governed by, and construed in accordance with, the laws of the State of Illinois.

FANSTEEL INC

By: R. Michael McEntee

Name: R. Michael McEntee

Title: Vice President & Chief Financial Officer

Address: One Tantalum Place

North Chicago IL 60035

Attention R. Michael McEntee

Telephone: 847-689-4900

Telex: None

Telecopier: 847-689-0307

PROMISSORY NOTE
(Secondary FMRI Note)

\$4,200,000.00

North Chicago, Illinois
January 23, 2004

FOR VALUE RECEIVED and IN ACCORDANCE WITH the SECOND AMENDED JOINT REORGANIZATION PLAN OF FANSTEEL, INC. AND SUBSIDIARIES, dated December 23, 2003, under Chapter 11 of the Bankruptcy Code (as amended, modified or supplemented from time to time, the "Plan"), the undersigned, FANSTEEL INC., a Delaware corporation ("Fansteel"), HEREBY PROMISES TO PAY to the order of FMRI, INC., a Delaware corporation ("FMRI"), the principal sum of FOUR MILLION TWO HUNDRED THOUSAND DOLLARS (\$4,200,000.00) on or before December 31, 2023 (the "Maturity Date") in accordance with the payment schedule set forth below.

Definitions:

"Minimum Annual Payment" means a payment in the amount of \$282,000.00.

"Muskogee Facility" means Old Fansteel's site located at Number Ten Tantalum Place, Muskogee, Oklahoma.

"NRC" means the United States Nuclear Regulatory Commission.

"Old Fansteel" means Fansteel Inc., a Delaware Corporation, as it existed prior to the Effective Date (as defined in the Reorganization Plan) of the Reorganization Plan.

The principal of this Note shall be paid (i) in consecutive installments of the Minimum Annual Payment commencing on January 1, 2009 and continuing each January 1 thereafter and (ii) on the Maturity Date, in the event that the principal has not been repaid in full prior thereto, in a final installment equal to the amount necessary to repay in full the outstanding principal amount hereof.

All payments made to FMRI on account of principal hereof shall be noted by FMRI on the schedule that is attached hereto and hereby made a part hereof; provided, however, that any error or omission by FMRI in this regard shall not affect the obligation of Fansteel to pay the full amount of the principal due to FMRI.

If any amount payable hereunder shall be due on a day on which banks are required or authorized to close in Chicago (any other day being a "Business Day"), such payment may be made on the next succeeding Business Day.

Principal is payable in lawful money of the United States and in immediately available funds at the offices of FMRI, Number Ten Tantalum Place, Muskogee, Oklahoma 74403, Attention: A. Fred Dohmann, Chief Executive Officer & President, or at such other place as FMRI shall designate in writing to Fansteel.

Fansteel may, at its option, prepay this Note, in whole at any time or in part from time to time, without penalty or premium.

If any of the following shall occur (each a "Default"): (a) Fansteel shall fail to pay any principal of this Note when due (whether by scheduled maturity, required prepayment,

acceleration, demand or otherwise); or (b) Fansteel shall fail to perform or observe any material covenant contained in this Note, and such failure shall remain unremedied for five days after written notice thereof shall have been given to Fansteel by FMRI; or (c) Fansteel shall admit in writing its inability to pay its debts generally, or shall make a general assignment for the benefit of creditors; or (d) any proceeding shall be instituted by or against Fansteel seeking to adjudicate it a bankrupt or insolvent, or seeking dissolution, liquidation, winding up, reorganization, arrangement, adjustment, protection, relief or composition of it or its debts under any law relating to bankruptcy, insolvency or reorganization or relief of debtors, or seeking the entry of an order for relief or the appointment of a receiver, trustee, custodian or other similar official for Fansteel or for any substantial part of its property, or Fansteel shall take any action to authorize or effect any of the actions set forth above in this clause (d); or (e) any provision of this Note or any other related document shall at any time for any reason be declared to be null and void by a court of competent jurisdiction, or the validity or enforceability thereof shall be contested by Fansteel, or a proceeding shall be commenced by Fansteel seeking to establish the invalidity or unenforceability thereof, or Fansteel shall deny that it has any liability or obligation hereunder or thereunder;

then FMRI may (i) declare the outstanding principal amount of this Note to be immediately due and payable, whereupon the outstanding principal amount of this Note shall become and shall be forthwith due and payable, without diligence, presentment, demand, protest or other notice of any kind, all of which are hereby expressly waived, and (ii) exercise any and all of its other rights under applicable law, hereunder.

All payments made by Fansteel hereunder will be made without setoff, counterclaim or other defense. All such payments shall be made free and clear of and without deduction for any present or future income, stamp or other taxes, levies, imposts, deductions, charges, fees, withholding, restrictions or conditions of any nature now or hereafter imposed; levied, collected, withheld or assessed by any jurisdiction or by any political subdivision or taxing authority thereof or therein, and all interest, penalties or similar liabilities, excluding taxes on the overall net income of FMRI (such non-excluded taxes are hereinafter collectively referred to as the "Taxes"). If Fansteel shall be required by law to deduct or to withhold any Taxes from or in respect of any amount payable hereunder, (i) the amount so payable shall be increased to the extent necessary so that after making all required deductions and withholdings (including Taxes on amounts payable to FMRI pursuant to this sentence) FMRI receives an amount equal to the sum it would have received had no such deductions or withholdings been made, (ii) Fansteel shall make such deductions or withholdings and (iii) Fansteel shall pay the full amount deducted or withheld to the relevant taxation authority in accordance with applicable law. Whenever any Tax is payable by Fansteel, as promptly as possible thereafter Fansteel shall send FMRI an official receipt showing payment. In addition, Fansteel agrees to pay any present or future taxes, charges or similar levies which arise from any payment made hereunder or from the execution, delivery, performance, recordation or filing of, or otherwise with respect to, this Note (hereinafter referred to as "Other Taxes"). Fansteel will indemnify FMRI for the full amount of Taxes or Other Taxes (including, any Taxes or Other Taxes on amounts payable to FMRI under this paragraph) paid by FMRI and any liability (including penalties, interest and expenses) arising therefrom or with respect thereto, upon written demand by FMRI therefor.

Fansteel agrees that all notices or other communications provided for hereunder shall be in writing (including telecommunications) and shall be mailed, telecopied or delivered to

Fansteel at the address of Fansteel set forth next to its signature, or at such other address as may hereafter be specified by Fansteel to FMRI (at its address set forth herein) in writing. All notices and communications shall be effective (i) if mailed, when received or three days after mailing, whichever is earlier, (ii) if telecopied, when transmitted and confirmation is received, if transmitted on a Business Day and, if not, on the next Business Day and (iii) if delivered, upon delivery, if delivered on a Business Day and, if not, on the next Business Day.

Fansteel agrees that the NRC, pursuant to the Pledge Agreement, dated the date hereof, by FMRI in favor of the NRC, shall be a third-party beneficiary of this Note.

No failure on the part of FMRI or the NRC, as the case may be, to exercise, and no delay in exercising, any right, power, privilege or remedy hereunder shall operate as a waiver thereof, nor shall any single or partial exercise thereof by FMRI or the NRC, as the case may be, preclude any other or further exercise thereof or the exercise of any other right, power, privilege or remedy of FMRI. No amendment or waiver of any provision of this Note, nor consent to any departure by Fansteel therefrom, shall in any event be effective unless the same shall be in writing and signed by FMRI or the NRC, as the case may be, and then such waiver or consent shall be effective only in the specific instance and for the specific purpose for which given.

Any provision hereof which is prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective only to the extent of such prohibition or unenforceability without invalidating the remaining provisions hereof or affecting the validity or enforceability of such provision in any other jurisdiction.

Fansteel hereby agrees to pay on demand all costs and expenses (including, without limitation, all reasonable fees and expenses of counsel to FMRI) incurred by FMRI in connection with (i) the preparation, execution, delivery, administration and amendment of this Note and the other Documents, and (iii) the enforcement of rights of FMRI or the NRC, as the case may be, and the collection of all amounts due, hereunder.

Fansteel hereby (i) irrevocably submits to the jurisdiction of the United States Bankruptcy Court for the District of Delaware or any Illinois State or Federal court sitting in Chicago in any action or proceeding arising out of or relating to this Note, (ii) waives any defense based on doctrines of venue or forum non conveniens, or similar rules or doctrines, and (iii) irrevocably agrees that all claims in respect of such an action or proceeding may be heard and determined in the United States Bankruptcy Court for the District of Delaware or such Illinois State or Federal court. Fansteel would (by its acceptance hereof) waive any right to trial by jury in any action, proceeding or counterclaim arising out of or relating to this Note.

This Note shall be governed by, and construed in accordance with, the laws of the State of Illinois.

FANSTEEL INC.

By: R. Michael McEntee

Name: R. Michael McEntee

Title: Vice President & Chief Financial Officer

Address: One /tantalum Place

North Chicago IL 60035

Attention R. Michael McEntee

Telephone: 847-689-4900

Telex: None

Telecopier: 847-689-0307

INTERGOVERNMENTAL AGREEMENT

THIS AGREEMENT, dated as of January 23, 2004, between the UNITED STATES NUCLEAR REGULATORY COMMISSION (the "NRC"), as a third-party beneficiary to the FMRI Secondary Note, dated the date hereof and in substantially the same form as annexed to the Plan as Exhibit C-4 (the "FMRI Secondary Note"), by FANSTEEL, INC., a Delaware corporation ("Fansteel"), in favor of FMRI, Inc., a Delaware corporation ("FMRI"), pursuant to the Pledge Agreement, dated the date hereof and in substantially the same form as annexed to the Plan as Exhibit C-6 (the "NRC Pledge Agreement"), by FMRI in favor of the NRC, and the OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY (the "ODEQ", and collectively with the NRC, the "Creditors"), as a third-party beneficiary to the FMRI Secondary Note, pursuant to the Pledge Agreement, dated the date hereof and in substantially the same form as annexed to the Plan as Exhibit C-11 (the "ODEQ Pledge Agreement"), by FMRI in favor of the ODEQ.

RECITALS:

WHEREAS, pursuant to NRC Pledge Agreement and the ODEQ Pledge Agreement, each of the NRC and the ODEQ, respectively, have been granted a security interest in the FMRI Secondary Note and its proceeds;

WHEREAS, FMRI has delivered on the date hereof the FMRI Secondary Note to the NRC in order that the NRC might perfect its security interest in the FMRI Secondary Note;

WHEREAS, it is the intention of FMRI, the NRC and the ODEQ that the security interest of the ODEQ rank pari passu with the security interest of the NRC;

WHEREAS, pursuant to certain Indemnification Letters, dated the date hereof (the "Indemnification Letters") by Fansteel and FMRI in favor of the NRC and the ODEQ, respectively, Fansteel and FMRI have indemnified and granted third-party beneficiary status to the NRC and the ODEQ with respect to enforcing FMRI's rights, upon default, under the FMRI Secondary Note;

WHEREAS, the proceeds of any action by the NRC and/or the ODEQ as a third party beneficiary and/or secured creditor with respect to the FMRI Secondary Note are to be placed into a trust and are to be distributed by such trust to cover the applicable obligations of FMRI on such terms as may be agreed to by the NRC and the ODEQ;

WHEREAS, each of the NRC and the ODEQ is willing to enter into this Agreement on the terms and conditions set forth herein;

NOW, THEREFORE, in consideration of the forgoing and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, each Creditor does hereby agree as follows:

SECTION 1. Definitions. Capitalized terms that are used but not defined herein have the respective meanings specified in the FMRI Secondary Note, the NRC Pledge Agreement and the ODEQ Pledge Agreement. The following terms, for all purposes of this Agreement, including the recitals hereof, shall have the respective meanings specified in this Section. All terms defined in the Uniform Commercial Code as in effect in the State of Illinois (the "UCC") on the date hereof, unless otherwise defined herein, shall have the meanings set forth therein. All references to any term in the plural shall include the singular and all references to any term in the singular shall include the plural. All references to Sections, clauses or paragraphs shall be references to sections, clauses and paragraphs in this Agreement unless otherwise stated. All references to any agreement "as in effect on the date hereof" shall not be construed to affect the rights of any party to amend, modify or supplement such agreement, but shall be construed to mean that for purposes of this Agreement the applicable provisions of the agreement referred to shall be as such provisions are in effect on the date hereof, without giving effect to any subsequent amendments, modifications or supplements.

(a) "Collateral" shall mean the FMRI Secondary Note and the proceeds thereof.

(b) "Credit Documents" shall mean the FMRI Secondary Note, the NRC Pledge Agreement, the ODEQ Pledge Agreement, the Indemnification Letters and this Agreement

(c) "Payment" shall mean any amount received by any Creditor under any Credit Document (whether by voluntary payment, prepayment, redemption, by realization upon security, by counterclaim or cross action, by the enforcement of any right under the Credit Documents, or otherwise) in respect of the FMRI Secondary Note.

(d) "Plan" shall mean the Second Amended Joint Reorganization Plan of Fansteel Inc., et al. dated as of December 23, 2003 and as confirmed by order of the District Court for the District Delaware entered on December [23], 2003.

SECTION 2. Security Interests. Each Creditor acknowledges and agrees that the other Creditor has been granted a first priority security interest in the Pledged Interests (as defined in the ODEQ Pledge Agreement) and has been granted a lien in and to the Collateral. Each Creditor shall be responsible for perfecting and maintaining the perfection of its lien; provided, however, the NRC shall be responsible for maintaining possession of the FMRI Secondary Note to maintain the perfection of its lien for the benefit of itself and in trust for the benefit of the ODEQ until such time as the obligations under the FMRI Secondary Note shall have been paid in full and it shall have been terminated.

SECTION 3. Allocation of Payments. Notwithstanding the order or time of attachment, or the order or manner of perfection, or the order or time of filing or recordation of any document or instrument or other method of perfecting a security interest in favor of each Creditor in any Collateral, and notwithstanding any conflicting

terms or conditions which may be contained in any of the Credit Documents, the liens upon the Collateral are in favor of each Creditor equally. Each Creditor acknowledges and agrees that the other Creditor, as a third party beneficiary of the FMRI Secondary Note, has rights *pari passu* with its own and shall be entitled to fifty percent (50%), or such other percentage as may be agreed to in writing between the NRC and the ODEQ, of any and all (a) proceeds of the Collateral (net of costs and expenses, if any, expended in the enforcement of the Creditors' rights to and the collection of such proceeds of the Collateral) and (b) any and all Payments (net of costs and expenses, if any) received on account of the enforcement of rights under the Indemnification Letters.

SECTION 4. Distribution of Payments. Without limiting the provisions of Section 3, each Creditor agrees that any Payments made by FMRI and/or proceeds of any action by the NRC and/or ODEQ as a third party beneficiary and/or secured creditor with respect to the FMRI Secondary Note shall be placed into a trust and shall be distributed by such trust to be used for the costs of groundwater treatment and monitoring at the Muskogee Facility in accordance with the applicable obligations of FMRI and on such terms as may be agreed to by the NRC and ODEQ, and if no agreement then on such terms as directed by the Bankruptcy Court, as such term is defined in the Plan. Each Creditor hereby further agrees that, in any bankruptcy proceeding against or involving FMRI and/or Fansteel, it shall not assert (and is hereby estopped from asserting) any claim or other position challenging (i) the validity, enforceability or priority of the security interests of the other Creditor or (ii) the rights of the other Creditor under this Agreement.

SECTION 5. Remedies. The Creditors agree that each Creditor has the right, independently of the other, to exercise its rights under and enforce the terms of the Credit Documents; provided, however, at all times prior to the payment in full of the obligations under the FMRI Secondary Note, a Creditor, prior to taking an enforcement action (including, but not limited to, delivering a notice of breach or a notice of acceleration to FMRI and/or Fansteel), shall provide the other Creditor not less than five Business Days prior notice of its intent to take such action. The Creditors agree to cooperate with each other in the exercise of their remedies.

SECTION 6. Notices, Etc. All notices and other communications provided for hereunder shall be in writing and shall be mailed (by certified mail, postage prepaid and return receipt requested), telecopied or delivered, to a Creditor at its address specified below their signature hereto; or as to either Creditor at such other address as shall be designated by such Creditor in a written notice to the other Creditor complying as to delivery with the terms of this Section 6. All such notices and other communications shall be effective (i) if sent by certified mail, return receipt requested, when received or three Business Days after mailing, whichever first occurs, (ii) if telecopied, when transmitted and confirmation is received, if transmitted on a Business Day and, if not, on the next Business Day or (iii) if delivered, upon delivery, if delivered on a Business Day and, if not, on the next Business Day.

SECTION 7. Term. This Agreement is a continuing agreement and shall remain in full force and effect until the indefeasible satisfaction in full of the FMRI Secondary Note.

SECTION 8. Applicable Law. THIS AGREEMENT SHALL BE CONSTRUED IN ACCORDANCE WITH AND GOVERNED BY THE LAWS OF THE UNITED STATES.

SECTION 9. Submission to Jurisdiction. Each Creditor hereby irrevocably and unconditionally submits for itself in any action, suit or proceeding relating to this Agreement or any Credit Document, or for recognition and enforcement of any judgment in respect thereof, to the jurisdiction of the United States Bankruptcy Court for the District of Delaware.

SECTION 10. JURY TRIAL WAIVER. EACH CREDITOR HEREBY IRREVOCABLY AND UNCONDITIONALLY WAIVES ANY RIGHT TO TRIAL BY JURY IN ANY ACTION, PROCEEDING OR COUNTERCLAIM CONCERNING THIS AGREEMENT AND THE CREDIT DOCUMENTS OR ANY AMENDMENT, MODIFICATION OR OTHER DOCUMENT NOW OR HEREAFTER DELIVERED IN CONNECTION WITH ANY OF THE FOREGOING, AND AGREE THAT ANY SUCH ACTION, PROCEEDING OR COUNTERCLAIM SHALL BE TRIED BEFORE A COURT AND NOT BEFORE A JURY.

SECTION 11. Severability. In the event any one or more of the provisions contained in this Agreement should be held invalid, illegal or unenforceable in any respect, the validity, legality and enforceability of the remaining provisions contained herein and therein shall not in any way be affected or impaired thereby (it being understood that the invalidity of a particular provision in a particular jurisdiction shall not in and of itself affect the validity of such provision in any other jurisdiction). The parties shall endeavor in good-faith negotiations to replace the invalid, illegal or unenforceable provisions with valid provisions the economic effect of which comes as close as possible to that of the invalid, illegal or unenforceable provisions.

SECTION 12. Counterparts. This Agreement may be executed in counterparts (and by different parties hereto on different counterparts), each of which shall constitute an original but all of which when taken together shall constitute a single contract, and shall become effective. Delivery of an executed signature page to this Agreement by facsimile transmission shall be as effective as delivery of a manually signed counterpart of this Agreement.

SECTION 13. Headings. Article and Section headings used herein are for convenience of reference only, are not part of this Agreement and are not to affect the construction of, or to be taken into consideration in interpreting, this Agreement.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed by their respective authorized officers as of the day and year first above written.

UNITED STATES NUCLEAR
REGULATORY COMMISSION

by Claudia M. Craig
Name: Claudia M. Craig
Title: Section Chief, D&DM/NMSS/NRC

OKLAHOMA DEPARTMENT OF
ENVIRONMENTAL QUALITY

by _____
Name:
Title:

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed by their respective authorized officers as of the day and year first above written.

UNITED STATES NUCLEAR
REGULATORY COMMISSION

by Claudia M. Craig
Name: Claudia M. Craig
Title: Section Chief, DCB/DWM/NUSS/NRC

OKLAHOMA DEPARTMENT OF
ENVIRONMENTAL QUALITY

by Sarah E. Penn
Name: Sarah E. Penn
Title: Assistant Attorney General
Office of Attorney General
State of Oklahoma

9562724.4

ESCROW AGREEMENT

December 19, 2003

By Hand

United States Nuclear Regulatory Commission
Decommissioning Branch, Division of Waste Management
Office of Nuclear Material Safety & Safeguards
Mail Stop T7F27
Washington, D.C. 20555-0001
Attention: Daniel M. Gillen, Chief

Fansteel Inc.
Number One Tantalum Place
North Chicago, Illinois 60064
Attention: R. Michael McEntee, Chief Financial Officer & Vice President

FMRI, Inc.
Number Ten Tantalum Place
Muskogee, Oklahoma 74403
Attention: A. Fred Dohmann, Chief Executive Officer & President

Re: Fansteel Inc. – Contingent FMRI Note pursuant to
Reorganization Plan dated September 18, 2003 (the "Plan")

Gentlemen:

This letter shall constitute an escrow agreement (this "Agreement") by and among Fansteel Inc., and its successors in interest ("Fansteel"), FMRI, Inc., ("FMRI") and the Nuclear Regulatory Commission ("NRC"), as Escrow Agent (the "Escrow Agent").

A. Delivery of Documents. Delivered to Escrow Agent by Fansteel and FMRI is the single original counterpart of the FMRI Contingent Note by and between Fansteel and FMRI, to which the NRC is a third-party beneficiary (the "Delivered Document"), in substantial conformity with the FMRI Contingent Note filed as Exhibit C-5 to the Joint Reorganization Plan Of Fansteel, Inc. And Subsidiaries, dated September 18, 2003, under Chapter 11 of the Bankruptcy Code (as amended, modified or supplemented from time to time, the "Plan"), in response to and in connection with that certain letter from the NRC to Fansteel dated November 7, 2003 (the "November 7th Letter") regarding the approval of Fansteel's

requested license amendment and other approvals for the decommissioning of the Muskogee site pursuant to the Plan, which Delivered Document has been executed but contains several incomplete sections including, without limitation, the amount of the note, the effective date of the note, the maturity date of the note, and the minimum annual payment, such incomplete items to be filled in upon the completion of various acts of Fansteel, FMRI and/or the NRC as required by the Plan.

A. Definitions. Capitalized terms used herein but not defined herein shall have the meaning assigned to them in the Plan.

B. Actions to Complete the Delivered Document. The Escrow Agent shall continue to hold the FMRI Contingent Note in escrow until such time that FMRI and Reorganized Fansteel have advised and directed the Escrow Agent in writing in accordance with Article IV.E.4(c)(ii) of the Plan to (a) (i) complete the amount to be set forth in the FMRI Contingent Note, (ii) to complete the effective date of the FMRI Contingent Note, (iii) to complete the maturity date of the FMRI Contingent Note, (iv) to complete the minimum annual payment of the FMRI Contingent Note, and (v) to deliver the original FMRI Contingent Note, as completed to FMRI with a copy to Fansteel for re-execution by Fansteel or (b) destroy and/or deliver the FMRI Contingent Note in blank to Fansteel. Notwithstanding any such direction by FMRI and Fansteel to the Escrow Agent, nothing contained herein shall limit or impair the right of the NRC to object to the amount or terms of the FMRI Contingent Note by issuance of an order under 10 C.F.R. § 2.202 (or any successor section) or pursue a hearing to be conducted pursuant to the procedures set forth in 10 C.F.R., Part 2 as set forth in Article IV.E.4(c)(ii) of the Plan, although the Escrow Agent shall in any event be directed to deliver the FMRI Contingent Note in accordance with the instructions of FMRI and Reorganized Fansteel and in conformance with the decision of the NRC or a court of competent jurisdiction as to the terms of the FMRI Contingent Note.

C. Liability of Escrow Agent; Indemnification The Escrow Agent shall not be liable for and, each of Fansteel and FMRI shall jointly and severally indemnify and hold harmless the Escrow Agent from and against, any and all losses, liabilities, claims, actions, damages and expenses, including attorneys' fees and disbursements, arising out of or in connection with this Agreement; provided that the Escrow Agent shall be liable for its own willful misconduct with respect to losses, liabilities, claims, actions damages and expenses, including attorneys' fees and disbursements, based upon such willful misconduct that are successfully asserted against the Escrow Agent.

D. Reliance The Escrow Agent shall be entitled to rely upon any order, judgment, certification, demand, notice, instrument or other writing delivered to it hereunder without being required to determine the authenticity or the correctness of any fact stated therein or the propriety or validity or the service thereof. The Escrow Agent may act in reliance upon any instrument or signature believed by it to be genuine and may assume that any person purporting to give notice or receipt or advice or purporting to make any statement or to execute any document in connection with the provisions hereof has been duly authorized to do so. The Escrow Agent and any agent thereof may act pursuant to the advice of counsel with respect to

any matter relating to this Agreement and shall not be liable for any action taken or omitted in accordance with such advice.

E. Amendments. The provisions of this Agreement may not be amended, modified, supplemented or terminated, and waivers or consents to departures from the provisions hereof may not be given, without the written consent of Fansteel, FMRI and the Escrow Agent.

F. Representations and Warranties.

(1) Fansteel and FMRI makes the following representations and warranties to the Escrow Agent:

(a) Fansteel and FMRI each have full power and authority to execute and deliver this Agreement and to perform its obligations hereunder.

(b) This Agreement has been duly approved by all necessary corporate action of Fansteel and FMRI pursuant to Articles IV.K and N of the Plan as approved by the Confirmation Order and has been executed by duly authorized officers of Fansteel and FMRI, respectively, in accordance with the Plan and constitutes a valid and binding agreement of Fansteel and FMRI, enforceable in accordance with its terms, except as such enforceability may be limited by or subject to any bankruptcy, insolvency, reorganization, moratorium or other similar laws affecting creditors' rights generally and as such obligations are subject to general principles of equity (regardless of whether enforceability is considered in a proceeding in equity or at law).

(2) NRC makes the following representations and warranties to Fansteel and FMRI:

(a) NRC has full power and authority to execute and deliver this Agreement and to perform its obligations hereunder.

(b) This Agreement has been duly approved by all necessary action of the NRC and has been executed by duly authorized officer of NRC, enforceable in accordance with its terms, except as such enforceability may be limited by or subject to any bankruptcy, insolvency, reorganization, moratorium or other similar laws affecting creditors' rights generally and as such obligations are subject to general principles of equity (regardless of whether enforceability is considered in a proceeding in equity or at law).

G. Termination. This Agreement shall continue in effect until the earliest to occur of (i) the delivery of the FMRI Contingent Note by the Escrow Agent in accordance with paragraph C herein and (ii) mutual agreement, in writing, by the NRC, Fansteel and FMRI to terminate this Agreement prior to the date of delivery of the FMRI Contingent Note. Notwithstanding the aforementioned, if the conditions of the Effective Date of the Plan have not

occurred or been waived pursuant to Article IX.C of the Plan on or before January 23, 2004, then this Agreement shall terminate and be of no further force or effect and the Escrow Agent shall return the Delivered Document to Fansteel.

H. Successors and Assigns. This Agreement shall inure to the benefit of and be binding upon the parties hereto and their respective heirs, successors and assigns, including without limitation, "Reorganized Fansteel". For purposes of this Agreement, "successor" for any entity other than a natural person shall mean a successor to such entity as a result of such entity's merger, consolidation, sale of substantially all of its assets or similar transaction.

I. Counterparts. This Agreement may be executed in counterparts, each of which, when so executed and delivered, shall be deemed to be an original and enforceable, but all of which counterparts, taken together, shall constitute one and the same instrument.

J. Governing Law. This Agreement shall be governed by, and construed in accordance with, the laws of the State of New York (without giving effect to the conflict of laws principles thereof) or any other applicable law as the parties may agree upon.

K. Entire Agreement. This Agreement is intended by the parties as a final expression of their agreement and intended to be a complete and exclusive statement of the agreement and understanding of the parties hereto in respect of the subject matter contained herein. There are no restrictions, promises, representations, warranties, covenants or undertakings relating to such subject matter, other than those set forth or referred to herein. This Agreement supersedes all prior agreements and understandings between the Escrow Agent and the other parties to this Agreement, both written and oral, with respect to such subject matter. Notwithstanding the aforementioned, to the extent any provision within this Agreement is inconsistent with any provision of the Plan, the Confirmation Order (a copy of each of which is affixed hereto), the "NRC License" or the "Amended Decommissioning Plan" (as such terms are defined in the Plan), the provisions of the Plan, Confirmation Order, NRC License and/or Amended Decommissioning Plan, as the case may be, shall govern.

L. Waiver of Jury Trial. EACH OF THE PARTIES HEREBY IRREVOCABLY WAIVES TRIAL BY JURY IN ANY ACTION, SUIT OR PROCEEDING, WHETHER AT LAW OR EQUITY, BROUGHT BY ANY OF THEM IN CONNECTION WITH THIS AGREEMENT OR THE TRANSACTIONS CONTEMPLATED HEREBY.

M. Notice Parties. The following parties shall be designated to receive any notices to be issued pursuant to this Agreement (respectively, the "Notice Parties"):

For the NRC:

United States Nuclear Regulatory Commission
Decommissioning Branch, Division of Waste Management
Office of Nuclear Material Safety & Safeguards
Mail Stop T7F27

Fansteel Inc.
FMRI, Inc.
December 19, 2003
Page 5

Washington, D.C. 20555-0001
Attention: Daniel M. Gillen, Chief
Telephone: 301-415-7295
Facsimile: 301-415-5398
Email: dm2@nrc.gov

with a copy to:

Maria E. Schwartz
Office of General Counsel
Nuclear Regulatory Commission
Mail stop O15D21
Washington, D.C. 20555-0001
Telephone: 301-415-1888
Facsimile: 301-415-3725
Email: mes@nrc.gov

and to

Richard Gladstein, Senior Counsel
Environmental Enforcement Section
Environmental and Natural Resources Division
United States Department of Justice
P.O. Box 7611
Washington, D.C. 20044-7611
Telephone: 202-514-1711
Facsimile: 202-514-8395
Email: richard.gladstein@usdoj.gov

For Fansteel & FMRI:

Fansteel Inc.
Number One Tantalum Place
North Chicago, Illinois 60064
Attention: R. Michael McEntee, Chief Financial Officer & Vice President
Telephone: 847-689-4900
Facsimile: 847-689-0307
Email: mmcentee@fansteel.com

and

FMRI, Inc.

Number Ten Tantalum Place
Muskogee, Oklahoma 74403
Attention: A. Fred Dohmann, Chief Executive Officer & President
Telephone: 918-687-6303
Facsimile: 918-687-6112
Email: dohmannf@aol.com

with a copy to:

Schulte Roth & Zabel LLP
919 Third Avenue
New York, New York, 10022
Attn: Jeffrey S. Sabin
Telephone: 212-756-2000
Facsimile: 212-593-5955
Email: jeffrey.sabin@srz.com

and to:

Winston & Strawn LLP
1400 L Street, N.W.
Washington, DC 20005-3502
Attn: Mark J. Wetterhahn
Telephone: 202-371-5700
Facsimile: 202-371-5950
Email: mwetterhahn@winston.com

[REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK]

Please confirm your agreement to comply with the foregoing instructions, by signing the attached copy of this letter in the space provided on this last page and returning it to us.

Very truly yours,

Fansteel Inc.

ESCROW ACCEPTED
AND AGREED TO:

Fansteel Inc.

By: R Michael McEntee
R. Michael McEntee
Chief Financial Officer & Vice President

FMRI, Inc.

By: _____
A. Fred Dohmann
Chief Executive Officer & President

Nuclear Regulatory Commission

By: Claudia M. Craig
Name: Claudia M. Craig
Title: Section Chief, DCB/DWM/NMSS/NRC

Please confirm your agreement to comply with the foregoing instructions, by signing the attached copy of this letter in the space provided on this last page and returning it to us.

Very truly yours,

Fansteel Inc.

ESCROW ACCEPTED
AND AGREED TO:

Fansteel Inc.

By: _____
R. Michael McEntee
Chief Financial Officer & Vice President

FMRI, Inc.

By:  _____
A. Fred Dohmann
Chief Executive Officer & President

Nuclear Regulatory Commission

By: _____
Name: _____
Title: _____

9546929.4

Signature Page to Escrow Agreement
with respect to FMRI Contingent Note

PROMISSORY NOTE
(Contingent FMRI Note)

\$[]

North Chicago, Illinois
[], 200[]

FOR VALUE RECEIVED and IN ACCORDANCE WITH the SECOND AMENDED JOINT REORGANIZATION PLAN OF FANSTEEL, INC. AND SUBSIDIARIES, dated December 23, 2003, under Chapter 11 of the Bankruptcy Code (as amended, modified or supplemented from time to time, the "Plan"), the undersigned, FANSTEEL INC., a Delaware corporation ("Fansteel"), HEREBY PROMISES TO PAY to the order of FMRI, INC., a Delaware corporation ("FMRI"), the principal sum of [] DOLLARS (\$[]) on or before [], 200[] (the "Maturity Date") in accordance with the payment schedule set forth below.

Definitions:

"Additional Mandatory Prepayment" means a payment made from time to time by Fansteel to FMRI comprised of Net Insurance Proceeds recovered by Fansteel with respect to the Muskogee Facility claims and/or Asset Sale Proceeds. No Additional Mandatory Prepayment shall be counted in computing the \$4,000,000.00 limit of the Annual Mandatory Prepayment.

"Annual Mandatory Prepayment" means an annual payment to be made within 100 days of Fansteel's fiscal year-end, in an amount equal to 50% of Excess Available Cash, up to a maximum of \$4,000,000.00, provided however, that if in any given fiscal year (A) the sum of the two Minimum Annual Payments and 50% of Excess Available Cash is less than (B) the budgeted amount for the current-year's remediation costs, then, additionally, up to 50% of the prior fiscal year-end cash balance shall be paid to FMRI, as and to the extent permissible under applicable law, so that FMRI shall have been reimbursed in full by Fansteel for the current year's remediation costs.

"Asset Sale Proceeds" means, with respect to any Asset sale by Fansteel and its subsidiaries, including Wellman, outside of the ordinary course of business, 50% of the first \$2,000,000.00 of sale proceeds, 35% of the next \$3,000,000.00 of sale proceeds, and 25% of all sale proceeds in excess of \$5,000,000.00, in each case net of (i) all transaction costs and (ii) all amounts, if any, due to Fansteel's secured creditors as a result of such sale(s); provided however, that Asset Sale Proceeds for purposes of this Note does not include the Old Fansteel Divestiture Asset Sale Proceeds.

"Bankruptcy Court" means the United States District Court for the District of Delaware, or such other court as may have jurisdiction over the Reorganization Plan.

"Decommissioning Trust" means all cash on deposit with the Bank of Waukegan, Waukegan, Illinois, pursuant to the Standby Trust Agreement dated February 3, 1994, as amended, by and between Fansteel and the Bank of Waukegan as trustee under Trust No. 2740.

"Excess Available Cash" means an amount to be determined by Fansteel within 90 days of each Fansteel fiscal year-end and to be certified by Fansteel's independent auditors,

such amount to be equal to (A) the difference in dollars between the fiscal year-end cash balance of Fansteel and the previous fiscal year-end cash balance of Fansteel, less (B) the sum of (i) the net increase in borrowings, if any, in dollars by Fansteel against its credit lines, (ii) the Remaining Asset Sale Proceeds, if any, and (iii) capital expenditures of Fansteel, provided, that if such capital expenditures exceed 5% of consolidated sales in any given fiscal year, the amount in dollars equal to the excess of such capital expenditures over 5% of consolidated sales shall be added back to the fiscal year-end cash balance for the purpose of determining "Excess Available Cash."

"Minimum Annual Payment" means a payment in the amount of \$[].

"Muskogee Facility" means Old Fansteel's site located at Number Ten Tantalum Place, Muskogee, Oklahoma.

"Net Insurance Proceeds" means the amount of insurance proceeds received by Fansteel and/or any of its subsidiaries with respect to any and all claims made by Fansteel and/or any subsidiary for insurance coverage in respect of the Muskogee Facility net of Fansteel's costs related to the litigation and/or settlement of such claims.

"NRC" means the United States Nuclear Regulatory Commission.

"Old Fansteel" means Fansteel Inc., a Delaware Corporation, as it existed prior to the Effective Date (as defined in the Reorganization Plan) of the Reorganization Plan.

"Old Fansteel Divestiture Asset Purchase Agreements" means (i) the asset purchase agreement dated as of September 2, 2003, by and among Old Fansteel, as seller, and Phoenix Aerospace Corporation, Hydro Carbide, Inc. and California Drop Forge, Inc., each a Delaware corporation, and HBD Industries, Inc., as guarantor, and (ii) the asset purchase agreement dated as of October 1, 2003 by and among Old Fansteel, as seller and Plantsville Acquisition, LLC, a Connecticut limited liability company, each agreement governing the terms and conditions of the Old Fansteel Divestiture Asset Sale.

"Old Fansteel Divestiture Asset Sale" means the sale by Fansteel of (i) substantially all of the assets of Old Fansteel's Hydro Carbide and California Drop Forge operating divisions, (ii) any and all assets of Old Fansteel's Plantsville Division, and (iii) the equipment and inventory of Old Fansteel's Lexington Facility pursuant to the Old Fansteel Divestiture Asset Purchase Agreements and/or any other agreement(s) approved by the Bankruptcy Court.

"Old Fansteel Divestiture Asset Sale Proceeds" means the net proceeds of the Old Fansteel Divestiture Asset Sale.

"Remaining Asset Sale Proceeds" means, with respect to any Asset sale by Fansteel outside of the ordinary course of business, 50% of the first \$2,000,000.00 of sale proceeds, 65% of the next \$3,000,000.00 of sale proceeds, and 75% of all sale proceeds in excess of \$5,000,000.00, in each case net of (i) all transaction costs and (ii) all amounts, if any, due to Fansteel's secured creditors as a result of such sale(s); provided however, that Remaining Asset Sale Proceeds for purposes of this Note does not include any Old Fansteel Divestiture Asset Sale Proceeds.

"Wellman" means Wellman Dynamics, Corp., a Delaware corporation.

The principal of this Note shall be paid (i) in consecutive installments of the Minimum Annual Payment commencing on [_____, 200_] and continuing each [_____] thereafter, (ii) an Annual Mandatory Prepayment, (iii) Additional Mandatory Prepayments from time to time as required pursuant to the covenants set forth in this Note and (iv) on the Maturity Date, in the event that the principal has not been repaid in full prior thereto, in a final installment equal to the amount necessary to repay in full the outstanding principal amount hereof.

All payments made to FMRI on account of principal hereof shall be noted by FMRI on the schedule that is attached hereto and hereby made a part hereof; provided, however, that any error or omission by FMRI in this regard shall not affect the obligation of Fansteel to pay the full amount of the principal due to FMRI.

If any amount payable hereunder shall be due on a day on which banks are required or authorized to close in Chicago (any other day being a "Business Day"), such payment may be made on the next succeeding Business Day.

Principal is payable in lawful money of the United States and in immediately available funds at the offices of FMRI, Number Ten Tantalum Place, Muskogee, Oklahoma 74403, Attention: A. Fred Dohmann, Chief Executive Officer & President, or at such other place as FMRI shall designate in writing to Fansteel.

Fansteel may, at its option, prepay this Note, in whole at any time or in part from time to time, without penalty or premium.

Fansteel hereby agrees that during the term of this Note:

1. All Net Insurance Proceeds, if any, received by Fansteel shall be paid to FMRI within 30 days of receipt; provided that FMRI shall use any Net Insurance Proceeds that it receives to repay its borrowings, if any, from the Decommissioning Trust (such repayment of borrowings to the Decommissioning Trust shall not reduce the outstanding principal amount of this Note); and provided further that FMRI shall deem any Net Insurance Proceeds that it receives in excess of any repayment of borrowings to the Decommissioning Trust as Additional Mandatory Prepayment(s) (such Additional Mandatory Prepayment(s) shall reduce the outstanding principal amount of this Note);

2. All Asset Sale Proceeds, if any, received by Fansteel and/ or any of its subsidiaries shall be paid to FMRI within 30 days of receipt; provided that FMRI shall use any Asset Sale Proceeds that it receives to repay its borrowings, if any, from the Decommissioning Trust (such repayment of borrowings to the Decommissioning Trust shall not reduce the outstanding principal amount of this Note); and provided further that FMRI shall deem any Asset Sale Proceeds that it receives in excess of any repayment of borrowings to the Decommissioning Trust as Additional Mandatory Prepayment(s) (such Additional Mandatory Prepayment(s) shall reduce the outstanding principal amount of this Note); and

3. All Excess Available Cash, if any, held by Fansteel and/ or any of its subsidiaries shall be paid to FMRI within 10 days of the determination of such Excess Available Cash pursuant to its definition above; provided that FMRI shall use any Excess Available Cash that it receives to repay its borrowings, if any, from the Decommissioning Trust (such repayment of borrowings to the Decommissioning Trust shall not reduce the outstanding principal amount of this Note); and provided further that FMRI shall deem any Excess Available Cash that it receives in excess of any repayment of borrowings to the Decommissioning Trust as Additional

Mandatory Prepayment(s) (such Additional Mandatory Prepayment(s) shall reduce the outstanding principal amount of this Note).

If any of the following shall occur (each a "Default"): (a) Fansteel shall fail to pay any principal of this Note when due (whether by scheduled maturity, required prepayment, acceleration, demand or otherwise); provided that Fansteel's failure to pay any principal of this Note when due shall not be deemed a Default if FMRI shall be able to borrow such principal amount due from the Decommissioning Trust (the outstanding borrowings by FMRI from the Decommissioning Trust in the aggregate at any one time not to exceed \$2,000,000); provided further for purposes of clarification, Fansteel's failure to pay any Net Insurance Proceeds or Asset Sale Proceeds or Excess Available Cash to FMRI as required pursuant to this Note shall be a Default; or (b) Fansteel shall fail to perform or observe any material covenant contained in this Note, and such failure shall remain unremedied for five days after written notice thereof shall have been given to Fansteel by FMRI; or (c) Fansteel shall admit in writing its inability to pay its debts generally, or shall make a general assignment for the benefit of creditors; or (d) any proceeding shall be instituted by or against Fansteel seeking to adjudicate it a bankrupt or insolvent, or seeking dissolution, liquidation, winding up, reorganization, arrangement, adjustment, protection, relief or composition of it or its debts under any law relating to bankruptcy, insolvency or reorganization or relief of debtors, or seeking the entry of an order for relief or the appointment of a receiver, trustee, custodian or other similar official for Fansteel or for any substantial part of its property, or Fansteel shall take any action to authorize or effect any of the actions set forth above in this clause (d); or (e) any provision of this Note or any other related document shall at any time for any reason be declared to be null and void by a court of competent jurisdiction, or the validity or enforceability thereof shall be contested by Fansteel, or a proceeding shall be commenced by Fansteel seeking to establish the invalidity or unenforceability thereof, or Fansteel shall deny that it has any liability or obligation hereunder or thereunder;

then FMRI may (i) declare the outstanding principal amount of this Note to be immediately due and payable, whereupon the outstanding principal amount of this Note shall become and shall be forthwith due and payable, without diligence, presentment, demand, protest or other notice of any kind, all of which are hereby expressly waived, and (ii) exercise any and all of its other rights under applicable law, hereunder.

All payments made by Fansteel hereunder will be made without setoff, counterclaim or other defense. All such payments shall be made free and clear of and without deduction for any present or future income, stamp or other taxes, levies, imposts, deductions, charges, fees, withholding, restrictions or conditions of any nature now or hereafter imposed, levied, collected, withheld or assessed by any jurisdiction or by any political subdivision or taxing authority thereof or therein, and all interest, penalties or similar liabilities, excluding taxes on the overall net income of FMRI (such non-excluded taxes are hereinafter collectively referred to as the "Taxes"). If Fansteel shall be required by law to deduct or to withhold any Taxes from or in respect of any amount payable hereunder, (i) the amount so payable shall be increased to the extent necessary so that after making all required deductions and withholdings (including Taxes on amounts payable to FMRI pursuant to this sentence) FMRI receives an amount equal to the sum it would have received had no such deductions or withholdings been made, (ii) Fansteel shall make such deductions or withholdings and (iii) Fansteel shall pay the full amount deducted or withheld to the relevant taxation authority in accordance with applicable law. Whenever any

Tax is payable by Fansteel, as promptly as possible thereafter Fansteel shall send FMRI an official receipt showing payment. In addition, Fansteel agrees to pay any present or future taxes, charges or similar levies which arise from any payment made hereunder or from the execution, delivery, performance, recordation or filing of, or otherwise with respect to, this Note (hereinafter referred to as "Other Taxes"). Fansteel will indemnify FMRI for the full amount of Taxes or Other Taxes (including, any Taxes or Other Taxes on amounts payable to FMRI under this paragraph) paid by FMRI and any liability (including penalties, interest and expenses) arising therefrom or with respect thereto, upon written demand by FMRI therefor.

Fansteel agrees that all notices or other communications provided for hereunder shall be in writing (including telecommunications) and shall be mailed, telecopied or delivered to Fansteel at the address of Fansteel set forth next to its signature, or at such other address as may hereafter be specified by Fansteel to FMRI (at its address set forth herein) in writing. All notices and communications shall be effective (i) if mailed, when received or three days after mailing, whichever is earlier, (ii) if telecopied, when transmitted and confirmation is received, if transmitted on a Business Day and, if not, on the next Business Day and (iii) if delivered, upon delivery, if delivered on a Business Day and, if not, on the next Business Day.

Fansteel agrees that the NRC, pursuant to the Pledge Agreement, dated the date hereof, by FMRI in favor of the NRC, shall be a third-party beneficiary of this Note.

No failure on the part of FMRI or the NRC, as the case may be, to exercise, and no delay in exercising, any right, power, privilege or remedy hereunder shall operate as a waiver thereof, nor shall any single or partial exercise thereof by FMRI or the NRC, as the case may be, preclude any other or further exercise thereof or the exercise of any other right, power, privilege or remedy of FMRI. No amendment or waiver of any provision of this Note, nor consent to any departure by Fansteel therefrom, shall in any event be effective unless the same shall be in writing and signed by FMRI or the NRC, as the case may be, and then such waiver or consent shall be effective only in the specific instance and for the specific purpose for which given.

Any provision hereof which is prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective only to the extent of such prohibition or unenforceability without invalidating the remaining provisions hereof or affecting the validity or enforceability of such provision in any other jurisdiction.

Fansteel hereby agrees to pay on demand all costs and expenses (including, without limitation, all reasonable fees and expenses of counsel to FMRI) incurred by FMRI in connection with (i) the preparation, execution, delivery, administration and amendment of this Note and the other Documents, and (iii) the enforcement of rights of FMRI or the NRC, as the case may be, and the collection of all amounts due, hereunder.

Fansteel hereby (i) irrevocably submits to the jurisdiction of the United States Bankruptcy Court for the District of Delaware or any Illinois State or Federal court sitting in Chicago in any action or proceeding arising out of or relating to this Note, (ii) waives any defense based on doctrines of venue or forum non conveniens, or similar rules or doctrines, and (iii) irrevocably agrees that all claims in respect of such an action or proceeding may be heard and determined in the United States Bankruptcy Court for the District of Delaware or such Illinois State or Federal court. Fansteel would (by its acceptance hereof) waive any right to trial by jury in any action, proceeding or counterclaim arising out of or relating to this Note.

This Note shall be governed by, and construed in accordance with, the laws of the
State of Illinois.

FANSTEEL INC.

By: 

Name: Gary L. Tessitore

Title: President & CEO

Address: 1 Tantalum Pl. North Chicago IL 60064

Attention

Telephone: 847-689-4900

Telex:

Telecopier: 847-689-0307

Fansteel Inc.
Number One Tantalum Place
North Chicago, Illinois 60064

FMRI, Inc.
Number Ten Tantalum Place
Muskogee, Oklahoma 74403

January 23, 2004

United States Nuclear Regulatory Commission
Decommissioning Branch, Division of Waste Management
Office of Nuclear Material Safety & Safeguards
Washington, D.C. 20555-0001

Ladies and Gentlemen:

Indemnification Letter

Reference is made to (i) the Promissory Note dated January 23, 2004 (the "FMRI Primary Note") by Fansteel Inc. ("Fansteel") in favor of FMRI, Inc. ("FMRI") in the principal amount of \$30,600,000.00, (ii) the Promissory Note dated January 23, 2004 (the "FMRI Secondary Note") by Fansteel in favor of FMRI in the principal amount of \$4,200,000.00, (iii) the Promissory Note by Fansteel in favor of FMRI in a principal amount to be determined (the "FMRI Contingent Note"), and (iv) the Pledge And Security Agreement dated as of January 23, 2004 (the "Pledge Agreement") between FMRI, as Pledgor, and the United States Nuclear Regulatory Commission (the "NRC"), as Pledgee, pursuant to which FMRI pledged all of its right, title and interest in and to the FMRI Primary Note, in and to the FMRI Secondary Note and in and to the FMRI Contingent Note, if any, to the NRC.

Fansteel hereby agrees to indemnify the NRC with respect to Fansteel's obligations to FMRI, Inc. under the FMRI Primary Note, the FMRI Secondary Note, and the FMRI Contingent Note. As a third party beneficiary, the NRC shall have standing to seek relief for any breach by Fansteel of its obligations under the FMRI Primary Note, the FMRI Secondary Note, or the FMRI Contingent Note.

The undersigned hereby jointly and severally agree to indemnify and hold the NRC harmless from and against any and all claims, damages, losses, liabilities, obligations, penalties, costs and expenses (including, without limitation, legal fees and disbursements of the NRC's counsel) to the extent that they arise out of or otherwise result from the Pledge Agreement (including, without limitation, enforcement of the Pledge Agreement) and, pursuant thereto, the enforcement of the FMRI Primary Note, the FMRI Secondary Note, and the FMRI Contingent

Note, if any, except claims, losses or liabilities resulting from the NRC's gross negligence or willful misconduct as determined by a final judgment of a court of competent jurisdiction.

The undersigned hereby agree that upon demand Fansteel and FMRI will pay to a designee of the NRC, the name of such designee to be provided to Fansteel by the NRC in writing, the amount of any and all costs and expenses, including the reasonable fees and disbursements of the NRC's counsel and of any experts and agents, which the NRC may incur in connection with (i) the custody, preservation, use or operation of, or the sale of, collection from, or other realization upon, any Pledged Interest (as defined in the Pledge Agreement), (ii) the exercise or enforcement of any of the rights of the NRC thereunder, or (iii) the failure by FMRI to perform or observe any of the provisions thereof. For purposes of clarification, any payments payable to the NRC pursuant to this Indemnification Letter shall be paid to the NRC's designee.

No waiver, amendment or other modification of this letter agreement shall be effective unless in writing and signed by each party to be bound thereby.

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This letter agreement shall be governed by, and construed in accordance with, the laws of the State of Illinois applicable to contracts executed in and to be performed in that state.

Please confirm that the foregoing currently sets forth our agreement by signing and returning the duplicate copy of this letter agreement enclosed herewith.

FANSTEEL INC.,
a Delaware corporation

By: R. Michael McEntee

Name: R. Michael McEntee

Title: Vice President & Chief Financial Officer

FMRI INC.,
a Delaware corporation

By: _____

Name: A. Fred Dohmann

Title: President

Acknowledgment and Consent,

Dated January 23, 2004

UNITED STATES NUCLEAR REGULATORY COMMISSION

By: Claudia M. Craig

Name: Claudia M. Craig

Title: Section Chief, DCB/DWM/NHSS/NRC

United States Nuclear Regulatory Commission
Page 3

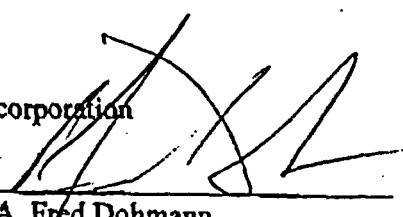
This letter agreement shall be governed by, and construed in accordance with, the laws of the State of Illinois applicable to contracts executed in and to be performed in that state.

Please confirm that the foregoing currently sets forth our agreement by signing and returning the duplicate copy of this letter agreement enclosed herewith.

FANSTEEL INC.,
a Delaware corporation

By: _____
Name: R. Michael McEntee
Title: Vice President & Chief Financial Officer

FMRI INC.,
a Delaware corporation

By: 
Name: A. Fred Dohmann
Title: President

Acknowledgment and Consent,
Dated _____, 2004

UNITED STATES NUCLEAR REGULATORY COMMISSION

By: _____
Name:
Title:

PLEDGE AGREEMENT

PLEDGE AND SECURITY AGREEMENT dated as of January 23, 2004, made by FMRI, INC., a Delaware corporation (the "Pledgor"), in favor of the UNITED STATES NUCLEAR REGULATORY COMMISSION (the "NRC").

W I T N E S S E T H:

WHEREAS, Fansteel Inc., a Delaware corporation ("Reorganized Fansteel"), is the successor-in-interest to Fansteel Inc., a debtor and debtor-in-possession and co-proponent of the Second Amended Joint Reorganization Plan of Fansteel Inc. and Subsidiaries dated December 23, 2003 in Chapter 11 Case No. 02-10109(JJF)(Jointly Administered) (such plan, as amended, restated or otherwise modified from time to time, being hereinafter referred to as the "Reorganization Plan");

WHEREAS, pursuant to the Reorganization Plan, the Pledgor, a wholly-owned subsidiary of Reorganized Fansteel, has been organized as a special purpose vehicle as the successor-in-interest to Fansteel Inc., a Delaware corporation as it existed prior to the Effective Date (as defined in the Reorganization Plan) of the Reorganization Plan ("Old Fansteel"), in respect of all licenses (including, but not limited to, the NRC License SMB-911 (Docket No. 40-7580)), permits, equipment, real property, improvements and the L/C Cash Reserve (as defined in the Reorganization Plan) in order to fulfill obligations under the licenses and the Amended Decommissioning Plan;

WHEREAS, pursuant to the Reorganization Plan, Reorganized Fansteel has the obligation to fund the operations and activities of FMRI, in furtherance of such obligation Reorganized Fansteel has executed the FMRI Primary Note dated the date hereof in favor of FMRI in the principal amount of \$30,600,000.00 (the "FMRI Primary Note") and the FMRI Secondary Note dated the date hereof in favor of FMRI in the principal amount of \$4,200,000.00 (the "FMRI Secondary Note") and the FMRI Contingent Note in favor of FMRI in an amount to be determined in the manner set forth in the Reorganization Plan and on such terms as may be mutually agreed to by the parties (the "FMRI Contingent Note", together with the FMRI Primary Note and the FMRI Secondary Note, the "Notes"), such FMRI Contingent Note to be held in escrow by the NRC pursuant to the escrow letter, dated the date hereof (the "Escrow Letter"), by and between Reorganized Fansteel, FMRI and the NRC;

WHEREAS, pursuant to the Reorganization Plan, the Amended Decommissioning Plan (as defined below), and NRC License SMB-911 issued to FMRI, FMRI has the obligation to use the funds obtained from the FMRI Primary Note, the FMRI Secondary Note, and the FMRI Contingent Note exclusively for purposes of decommissioning the Muskogee Site;

WHEREAS, pursuant to the Reorganization Plan, the NRC shall be a third-party beneficiary of the FMRI Primary Note, the FMRI Secondary Note and, if any, the FMRI Contingent Note and the Pledgor shall grant the NRC a perfected first priority lien on and in the FMRI Primary Note and its proceeds, on and in the FMRI Secondary Note and its proceeds and,

if any, on and in the Contingent Note and its proceeds (it being the parties' understanding that the proceeds of the aforementioned Notes include, without limitations, any proceeds derived from Asset Sale Proceeds (as defined in the applicable Note) and Net Insurance Proceeds (as defined in the applicable Note));

NOW, THEREFORE, in consideration of the foregoing and the agreements herein and in order to satisfy the terms of the Reorganization Plan, the Pledgor agrees with the NRC as follows:

SECTION 1. Definitions. All capitalized terms used in this Agreement which are defined in the Reorganization Plan, the FMRI Primary Note, the FMRI Secondary Note or the FMRI Contingent Note, as applicable, or in Article 8 or Article 9 of the Uniform Commercial Code (the "Code") currently in effect in the State of Illinois and which are not otherwise defined herein shall have the same meanings herein as set forth therein.

Definitions:

"Amended Decommissioning Plan" means Fansteel's decommissioning plan for the Muskogee Facility, dated January 14, 2003, as supplemented by letters dated May 8, 2003 and May 9, 2003, and resubmitted by Old Fansteel for review by the NRC on July 24, 2003, as the same may be further amended, modified, or supplemented.

"Decommissioning Trust" means all cash on deposit with the Bank of Waukegan, Waukegan, Illinois, pursuant to the Standby Trust Agreement dated February 3, 1994, as amended, by and between Fansteel and the Bank of Waukegan as trustee under Trust No. 2740.

SECTION 2. Pledge and Grant of Security Interest. The Pledgor hereby pledges and assigns to the NRC, and grants to the NRC a continuing security interest in, all of the Pledgor's right, title and interest in and to the following (the "Pledged Interests"):

(a) the FMRI Primary Note evidencing Reorganized Fansteel's obligation to the Pledgor (the "Primary Pledged Debt");

(b) the FMRI Secondary Note evidencing Reorganized Fansteel's obligation to the Pledgor (the "Secondary Pledged Debt");

(c) the FMRI Contingent Note, if any, evidencing Reorganized Fansteel's obligation to the Pledgor (the "Contingent Pledged Debt", together with the Primary Pledged Debt and the Secondary Pledge Debt, the "Pledged Debt");

(d) all cash, instruments, investment property and other property from time to time received, receivable or otherwise distributed in exchange for any or all of the Pledged Debt; and

(e) all proceeds (including proceeds of proceeds) of any and all of the foregoing;

in each case, whether now owned or hereafter acquired by the Pledgor and howsoever its interest therein may arise or appear (whether by ownership, security interest, claim or otherwise).

SECTION 3. Security for Obligations. The security interest created hereby in the Pledged Interests constitutes continuing collateral security for all of the following obligations, whether now existing or hereafter incurred (the "Obligations"):

(a) the prompt payment by Reorganized Fansteel, as and when due and payable (by scheduled maturity, required prepayment, acceleration, demand or otherwise), of all amounts from time to time owing by it in respect of the FMRI Primary Note, including, without limitation, principal of the FMRI Primary Note, all fees, commissions, expense reimbursements, indemnifications and all other amounts due or to become due under the FMRI Primary Note;

(b) the prompt payment by Reorganized Fansteel, as and when due and payable (by scheduled maturity, required prepayment, acceleration, demand or otherwise), of all amounts from time to time owing by it in respect of the FMRI Secondary Note, including, without limitation, principal of the FMRI Secondary Note, all fees, commissions, expense reimbursements, indemnifications and all other amounts due or to become due under the FMRI Secondary Note;

(c) the prompt payment by Reorganized Fansteel, as and when due and payable (by scheduled maturity, required prepayment, acceleration, demand or otherwise), of all amounts from time to time owing by it in respect of the FMRI Contingent Note, if any, including, without limitation, principal of the FMRI Contingent Note, all fees, commissions, expense reimbursements, indemnifications and all other amounts due or to become due under the FMRI Contingent Note; and

(d) the due performance and observance by FMRI of all of its other obligations from time to time existing in respect of the Reorganization Plan.

SECTION 4. Delivery of the Pledged Collateral. The FMRI Primary Note, the FMRI Secondary Note and the FMRI Contingent Note (along with its related Escrow Letter) shall be delivered to the NRC on or prior to the day of execution and delivery of this Agreement. Pledgor further agrees that if within 90 days of Pledgor's receipt of written notice from the NRC to the Pledgor that the NRC, in its discretion, has deemed either of the Pledgor or Reorganized Fansteel to be in material breach of its obligations under the Amended Decommissioning Plan, the Reorganization Plan, or the FMRI Promissory Notes, the Pledgor and/or Fansteel, as the case may be, has not cured such material breach, then Pledgor shall deliver to a custodian or nominee designated in writing by the NRC (the "NRC Designee"), which NRC Designee may include the Decommissioning Trust, all cash, instruments, investment property or other payments that it has received and has in its possession and that it may receive from time to time under the FMRI Primary Note, the FMRI Secondary Note, the FMRI Contingent Note, Net Insurance Proceeds, and Reorganized Fansteel Asset Sale Proceeds. All such instruments shall be held on behalf of the NRC pursuant hereto and shall be delivered to NRC Designee in suitable form for transfer by delivery or shall be accompanied by duly executed assignment in blank, in a form substantially similar to the Form of Assignment and Acceptance attached hereto as Exhibit A. If any Pledged

Interest consists of uncertified securities, unless the immediately following sentence is applicable thereto, the Pledgor shall cause the NRC Designee to become the registered holder thereof, or cause each issuer of such securities to agree that it will comply with the instructions originated by the NRC with respect to such securities without further consent by the Pledgor. If any Pledged Interest consists of security entitlements, the Pledgor shall transfer such security entitlements to the NRC Designee or cause the applicable securities intermediary to agree that it will comply with entitlement orders by the NRC without further consent by the Pledgor.

SECTION 5. Representations and Warranties. The Pledgor represents and warrants as follows:

(a) The Pledgor is and will be at all times the legal and beneficial owner of the Pledged Interests free and clear of any lien except for the security interest created by this Agreement.

(b) This Agreement creates a valid security interest in favor of the NRC in the Pledged Interests, as security for the Obligations. The NRC's having possession of the FMRI Primary Note, the FMRI Secondary Note and, if any, the FMRI Contingent Note results in the perfection of such security interest. Such security interest is, or in the case of any Pledged Interest in which the Pledgor obtains rights after the date hereof, will be, a perfected, first priority security interest. All action necessary or desirable to perfect and protect such security interest has been duly taken, except for the NRC's having possession of such instruments constituting Pledged Interests after the date hereof.

SECTION 6. Covenants as to the Pledged Interests. So long as any Obligations shall remain outstanding and the FMRI Primary Note, the FMRI Secondary Note and, if any, the Contingent Note shall not have been paid in full, the Pledgor will, unless the NRC shall otherwise consent in writing:

(a) keep adequate records concerning the Pledged Interests;

(b) at its expense, promptly deliver to the NRC a copy of each notice or other communication received by it in respect of the Pledged Interests;

(c) at its expense, defend the NRC's right, title and security interest in and to the Pledged Interests against the claims of any Person;

(d) at its expense, at any time and from time to time, promptly execute and deliver all further instruments and documents and take all further action that may be necessary or desirable or that the NRC may reasonably request in order to (i) perfect and protect the security interest purported to be created hereby and any liens thereon, (ii) enable the NRC to exercise and enforce its rights and remedies hereunder in respect of the Pledged Interests or (iii) otherwise effect the purposes of this Agreement;

(e) not sell, assign (by operation of law or otherwise), exchange or otherwise dispose of the Pledged Interests;

(f) not create or suffer to exist any lien, security interest or other charge or encumbrance upon or with respect to the Pledged Interests, including any Pledged Interests derived from the proceeds of the Notes which may include, without limitation, proceeds from Minimum Semi-Annual Payments, Annual Mandatory Prepayments, Asset Sale Proceeds or Net Insurance Proceeds (each capitalized term as defined in the applicable Note), except for the security interest created hereby;

(g) not make or consent to any material amendment or other modification or waiver with respect to the Pledged Interests or enter into any agreement or permit to exist any restriction with respect to any Pledged Interest without the consent of the NRC which consent shall not be unreasonably withheld; and

(h) not take or fail to take any action which would in any manner impair the enforceability of the NRC's security interest in any Pledged Interest.

SECTION 7. Additional Provisions Concerning the Pledged Interests.

(a) The Pledgor hereby authorizes the NRC to file, without the signature of the Pledgor where permitted by law, one or more financing or continuation statements, and amendments thereto, relating to the Pledged Interests.

(b) The Pledgor hereby irrevocably appoints the NRC as its attorney-in-fact and proxy, with full authority in the place and stead of the Pledgor and in the name of the Pledgor or otherwise, from time to time in the NRC's discretion, to take any action and to execute any instrument which the NRC may deem necessary or advisable to accomplish the purposes of this Agreement, including, without limitation, to receive, indorse and collect all instruments made payable to the Pledgor representing any dividend, interest payment or other distribution in respect of any Pledged Interest and to give full discharge for the same. This power is coupled with an interest and is irrevocable until all of the Obligations are paid in full and the FMRI Primary Note and the FMRI Secondary Note shall have been terminated.

(c) If the Pledgor fails to perform any agreement or obligation contained herein, the NRC itself may perform, or cause performance of, such agreement or obligation, and the expenses of the NRC incurred in connection therewith shall be payable by Reorganized Fansteel and the Pledgor pursuant to the Indemnification Letter dated the date hereof in favor of the NRC by Reorganized Fansteel and the Pledgor (the "Indemnification Letter") and shall be secured by the Pledged Interests.

(d) Other than the exercise of reasonable care to assure the safe custody of the Pledged Interests while held hereunder, the NRC shall have no duty or liability to preserve rights pertaining thereto and shall be relieved of all responsibility for the Pledged Interests upon surrendering it or tendering surrender of it to the Pledgor. The NRC shall be deemed to have exercised reasonable care in the custody and preservation of the Pledged Interests in its possession if the Pledged Interests are accorded treatment substantially equal to that which the NRC accords its own property, it being understood that the NRC shall not have responsibility for taking any necessary steps to preserve rights against any parties with respect to any Pledged Interest.

(e) The powers conferred on the NRC hereunder are solely to protect its interest in the Pledged Interests and shall not impose any duty upon it to exercise any such powers. Except for the safe custody of any Pledged Interest in its possession, the NRC shall have no duty as to any Pledged Interest or as to the taking of any necessary steps to preserve rights against prior parties or any other rights pertaining to any Pledged Interest.

SECTION 8. Remedies Upon Default. If any Default (as defined in the FMRI Primary Note, the FMRI Secondary Note and, if any, the FMRI Contingent Note, as applicable) shall have occurred and be continuing:

(a) The NRC may exercise in respect of the Pledged Interests, in addition to other rights and remedies provided for herein or otherwise available to it, all of the rights and remedies of a secured party on default under the Code then in effect in the State of Illinois; and without limiting the generality of the foregoing and without notice except as specified below, sell the Pledged Interests or any part thereof in one or more parcels at public or private sale, at any exchange or broker's board or elsewhere, at such price or prices and on such other terms as the NRC may deem commercially reasonable. The Pledgor agrees that, to the extent notice of sale shall be required by law, at least 10 business days' notice to the Pledgor of the time and place of any public sale or the time after which any private sale is to be made shall constitute reasonable notification. The NRC shall not be obligated to make any sale of Pledged Interests regardless of notice of sale having been given. The NRC may adjourn any public or private sale from time to time by announcement at the time and place fixed therefor, and such sale may, without further notice, be made at the time and place to which it was so adjourned.

(b) Any cash held by the NRC as Pledged Interests and all cash proceeds received by the NRC in respect of any sale of, collection from, or other realization upon, all or any part of the Pledged Interests may, in the discretion of the NRC, be held by the NRC as collateral for, and/or then or at any time thereafter applied (after payment of any amounts payable to the NRC pursuant to the Indemnification Letter) in whole or in part by the NRC against, all or any part of the Obligations in such order as the NRC shall elect consistent with the provisions of the Reorganization Plan. Any surplus of such cash or cash proceeds held by the NRC and remaining after payment in full of all of the Obligations shall be paid over to the Pledgor or to such person as may be lawfully entitled to receive such surplus.

SECTION 9. Notices, Etc. All notices and other communications provided for hereunder shall be in writing and shall be mailed (by certified mail, postage prepaid and return receipt requested), telecopied or delivered, if to the Pledgor or to the NRC, to such Person at its address specified below their signature hereto; or as to either such Person at such other address as shall be designated by such Person in a written notice to such other Person complying as to delivery with the terms of this Section 9. All such notices and other communications shall be effective (i) if sent by certified mail, return receipt requested, when received or 3 Business Days after mailing, whichever first occurs, (ii) if telecopied, when transmitted and confirmation is received, if transmitted on a Business Day and, if not, on the next Business Day or (iii) if delivered, upon delivery, if delivered on a Business Day and, if not, on the next Business Day.

SECTION 10. Miscellaneous.

(a) No amendment of any provision of this Agreement shall be effective unless it is in writing and signed by the Pledgor and the NRC, and no waiver of any provision of this Agreement, and no consent to any departure by the Pledgor therefrom, shall be effective unless it is in writing and signed by the NRC, and then such waiver or consent shall be effective only in the specific instance and for the specific purpose for which given.

(b) No failure on the part of the NRC to exercise, and no delay in exercising, any right hereunder or under the FMRI Primary Note, the FMRI Secondary Note, the FMRI Contingent Note, if any, and the Reorganization Plan shall operate as a waiver thereof; nor shall any single or partial exercise of any such right preclude any other or further exercise thereof or the exercise of any other right. The rights and remedies of the NRC provided herein and in the FMRI Primary Note, in the FMRI Secondary Note, in the FMRI Contingent Note, if any, and in the Reorganization Plan are cumulative and are in addition to, and not exclusive of, any rights or remedies provided by law. The rights of the NRC under the FMRI Primary Note, the FMRI Secondary Note, the FMRI Contingent Note, if any, and the Reorganization Plan against any party thereto are not conditional or contingent on any attempt by the NRC to exercise any of its rights under the FMRI Primary Note, the FMRI Secondary Note and the Reorganization Plan against such party or against any other Person, including but not limited to, the Pledgor.

(c) Any provision of this Agreement which is prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such prohibition or unenforceability without invalidating the remaining portions hereof or thereof or affecting the validity or enforceability of such provision in any other jurisdiction.

(d) This Agreement shall create a continuing security interest in the Pledged Interests and shall (i) remain in full force and effect until the payment in full or release of the Obligations and after the FMRI Primary Note, the FMRI Secondary Note and the FMRI Contingent Note, if any, shall have been paid in full and (ii) be binding on the Pledgor and, by its acceptance hereof, the NRC, and its respective successors, transferees and assigns and shall inure, together with all rights and remedies of the NRC hereunder, to the benefit of the NRC and its respective successors, transferees and assigns. None of the rights or obligations of the Pledgor or the NRC hereunder may be assigned or otherwise transferred without the prior written consent of the other party, which consent shall not be unreasonably withheld, and any such assignment or transfer shall be null and void.

(e) Upon the satisfaction in full of the Obligations after the FMRI Primary Note, the FMRI Secondary Note and the FMRI Contingent Note, if any, shall have been paid in full, (i) this Agreement and the security interests created hereby shall terminate and all rights to the Pledged Interests shall revert to the Pledgor, and (ii) the NRC will, upon the Pledgor's request and at the Pledgor's expense, (A) return to the Pledgor such of the Pledged Interests as shall not have been sold or otherwise disposed of or applied pursuant to the terms hereof, and (B) execute and deliver to the Pledgor, without recourse, representation or warranty, such documents as the Pledgor shall reasonably request to evidence such termination.

(f) This Agreement shall be governed by and construed in accordance with the laws of the State of Illinois, except as required by mandatory provisions of law and except to the extent that the validity and perfection or the perfection and the effect of perfection or non-perfection of the security interest created hereby, or remedies hereunder, in respect of any particular Pledged Interest are governed by the law of a jurisdiction other than the State of Illinois.

(g) This Agreement may be executed in any number of counterparts and by different parties hereto in separate counterparts, each of which shall be deemed to be an original, but all of which taken together shall constitute one in the same agreement.

(h) Notwithstanding anything to the contrary contained herein, any and all payments payable to the NRC pursuant to this Pledge Agreement shall be paid to the NRC Designee.

SECTION 11. Submission to Jurisdiction; Waivers. The Pledgor hereby irrevocably and unconditionally:

(a) Submits for itself and its property in any action, suit or proceeding relating to this Pledge Agreement or the FMRI Primary Note, the FMRI Secondary Note, the FMRI Contingent Note, if any, or the Reorganization Plan, or for recognition and enforcement of any judgment in respect thereof, to the jurisdiction of the United States Bankruptcy Court for the District of Delaware and the courts of the State of Illinois, the courts of the United States of America for the Northern District of Illinois, and appellate courts thereof;

(b) Agrees that any such action, suit or proceeding may be brought in such courts and waives any objection that it may now or hereafter have to the venue of any such action, suit or proceeding in any such court or that such action, suit or proceeding was brought in an inconvenient court and agrees not to plead or claim the same;

(c) Irrevocably consents to the service of any and all process in any such action, suit or proceeding by the mailing of copies of such process by registered or certified mail (or any substantially similar form of mail), postage prepaid, to the Pledgor, at its address set forth by its signature below or at such other address of which the NRC shall have been notified pursuant thereto;

(d) To the extent that the Pledgor has or hereafter may acquire any immunity from jurisdiction of any court or from any legal process (whether through service or notice, attachment prior to judgment, attachment in aid of execution, execution or otherwise) with

respect to itself or its property, the Pledgor hereby irrevocably waives such immunity in respect of its obligations under this Pledge Agreement;

(e) Agrees that nothing herein shall affect the right of the NRC to effect service of process in any other manner permitted by law or shall limit the right to sue in any other jurisdiction; and

(f) Waives any right it may have to claim or recover in any legal action or proceeding referred to in this Section any special, exemplary, punitive or consequential damages.

SECTION 12. JURY TRIAL WAIVER. THE PLEDGOR AND NRC (BY ITS ACCEPTANCE OF THIS PLEDGE AGREEMENT) HEREBY IRREVOCABLY AND UNCONDITIONALLY WAIVE ANY RIGHT TO TRIAL BY JURY IN ANY ACTION, PROCEEDING OR COUNTERCLAIM CONCERNING THIS PLEDGE AGREEMENT, THE FMRI PRIMARY NOTE, THE FMRI SECONDARY NOTE, THE FMRI CONTINGENT NOTE, IF ANY, OR ANY AMENDMENT, MODIFICATION OR OTHER DOCUMENT NOW OR HEREAFTER DELIVERED IN CONNECTION WITH ANY OF THE FOREGOING, AND AGREE THAT ANY SUCH ACTION, PROCEEDING OR COUNTERCLAIM SHALL BE TRIED BEFORE A COURT AND NOT BEFORE A JURY.

[REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK]

IN WITNESS WHEREOF, the Pledgor has caused this Agreement to be executed and delivered by its officer thereunto duly authorized, as of the date first above written.

FMRI INC.,
a Delaware corporation

By: 

Name: A. Fred Dohmann
Title: President

Acknowledged and consented to
this ____ day of _____, 2003:

FANSTEEL INC.

By: _____

Name: R. Michael McEntee
Title: Vice President & Chief Financial Officer

IN WITNESS WHEREOF, the Pledgor has caused this Agreement to be executed and delivered by its officer thereunto duly authorized, as of the date first above written.

FMRI INC.,
a Delaware corporation

By: _____
Name: A. Fred Dohmann
Title: President

Acknowledged and consented to
this ____ day of _____, 2003:

FANSTEEL INC.

By: R. Michael McEntee
Name: R. Michael McEntee
Title: Vice President & Chief Financial Officer

FORM OF ASSIGNMENT AND ACCEPTANCE

This Assignment and Assumption (the "Assignment") is dated as of the Effective Date set forth below and is entered into by and between FMRI INC. (the "Assignor") and the UNITED STATES NUCLEAR REGULATORY COMMISSION (the "Assignee"). Capitalized terms used but not defined herein shall have the meanings given to them in the Note identified below (as it may be amended, supplemented, waived or otherwise modified from time to time, the "Note"), receipt of which is hereby acknowledged by the Assignee.

The Assignor hereby irrevocably assigns and transfers to the Assignee, and the Assignee hereby irrevocably accepts and assumes from the Assignor, as of the Effective Date, the interest in and to all of the Assignor's rights and obligations under [the FMRI Primary Note dated January __, 2004, made by FANSTEEL INC. in favor of FMRI in the principal amount of \$30,600,000.00 (the "FMRI Primary Note")/the FMRI Secondary Note dated January __, 2004, made by FANSTEEL INC. in favor of FMRI in the principal amount of \$4,200,000.00 (the "FMRI Secondary Note")/the FMRI Contingent Note dated ____, 20__, made by FANSTEEL INC. in favor of FMRI in a principal amount to be determined (the "FMRI Contingent Note")]. Such assignment is without recourse to the Assignor and, except as expressly provided in this Assignment, without representation or warranty by the Assignor.

(Print or type assignee's name, address and zip code below)

(Insert assignee's social security or tax I.D. No. below)

ASSIGNOR:

FMRI INC.

By: _____

Name:

Title:

[ADDRESS]

[ADDRESS]

[ADDRESS]

ASSIGNEE:

UNITED STATES NUCLEAR REGULATORY
COMMISSION

By: _____

Name:

Title:

[ADDRESS]

[ADDRESS]

[ADDRESS]

Effective Date: _____, 20__

WAIVER AND CONSENT

WAIVER AND CONSENT, dated as of January 23, 2004, to the PLEDGE AND SECURITY AGREEMENT dated as of January 23, 2004 (the "NRC Pledge Agreement"), made by FMRI, INC., a Delaware corporation (the "Pledgor"), in favor of the UNITED STATES NUCLEAR REGULATORY COMMISSION (the "NRC").

Pursuant to the NRC Pledge Agreement, the Pledgor has granted to the NRC a security interest in and a lien in and to the FMRI Secondary Note, dated the date hereof (the "FMRI Secondary Note"), by Fansteel Inc. in favor of the Pledgor and all proceeds thereto.

Pursuant to the NRC Pledge Agreement, the Pledgor has made a covenant that it shall not grant a security interest in and a lien in and to the FMRI Secondary Note and all proceeds thereto to any other person.

Pledgor has requested a waiver of such covenant by the NRC in order that the Pledgor may enter into (A) Pledge And Security Agreement and (B) Indemnification Letter, each dated as of the date hereof, in favor of the OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY (the "ODEQ") pursuant to which it shall grant a security interest to the ODEQ in and a lien in and to the FMRI Secondary Note, and all proceeds thereto and provide certain indemnity for costs related thereto.

The granting by FMRI of such security interest in and the lien in and on the FMRI Secondary Note and the incurrence of indemnity obligations to ODEQ will result in a default under the NRC Pledge Agreement, and FMRI has requested the NRC to waive such default. The NRC has agreed to such waiver subject to the terms and conditions hereof.

1. All terms used herein which are defined in the NRC Pledge Agreement and not otherwise defined herein are used herein as defined therein.
2. Pursuant to the request of FMRI, the NRC hereby consents to, thereby waiving any default that shall arise pursuant to failure of FMRI to comply with covenants 6(e), 6(f), 6(g) and any other covenant of the NRC Pledge Agreement, the actions of FMRI granting a security interest to the ODEQ in and a lien in and to the FMRI Secondary Note, and all proceeds thereto, and incurring certain indemnification obligations related thereto.

IN WITNESS WHEREOF, the NRC has caused this Waiver and Consent to be executed as of the date first above written.

UNITED STATES NUCLEAR REGULATORY
COMMISSION

by Claudia M. Craig
Name: Claudia M. Craig
Title: Section Chief, DCB/DWM/NH55/NRC

**AMENDMENT NUMBER TWO
TO STANDBY TRUST AGREEMENT**

This Amendment Number Two to Standby Trust Agreement dated February 3, 1994, and amended as of March 6, 1997, by and between Fansteel Inc., a Delaware corporation, herein referred to as the "Grantor", and the Bank of Waukegan as trustee under Trust No. 2740, and not individually, of Waukegan, Illinois, herein referred to as the "Trustee", is entered into this ~~23rd~~ day of ~~November~~, 2001.
January 4

WHEREAS, the Grantor and Trustee entered into the Standby Trust Agreement, as heretofore amended, herein referred to as the "Agreement", described above in conjunction with Grantor providing financial assurance that funds will be available when needed for required decommissioning activities described in the Agreement; and

WHEREAS, the Grantor originally elected to use letters of credit to provide financial assurance for the facilities identified in the Agreement; and

WHEREAS, because of issues related to remediation of the Grantor's Muskogee Site and other reasons, on January 15, 2002, the Grantor and eight of its subsidiaries filed for bankruptcy protection pursuant to Chapter 11 of the Bankruptcy Code in the United States Bankruptcy Court for the District of Delaware; and

WHEREAS, Amendment Number One to the Standby Trust Agreement was entered into on March 6, 1997; to amend Schedule A to reflect a revised cost estimate for decommissioning activities; and

WHEREAS, payment was made under the aforementioned letters of credit into the Standby Trust Fund by requests of the NRC dated February 27, 2002, and March 1, 2002; and

WHEREAS, upon emergence from Chapter 11, and in accordance with the terms and conditions of a confirmed Plan of Reorganization, a wholly-owned subsidiary of the Grantor, FMRI Inc., herein referred to as "FMRI", will undertake decontamination and decommissioning of the Muskogee Site; and

WHEREAS, FMRI will become the Nuclear Regulatory Commission, herein referred to as "NRC", licensee for License SMB-911 and will undertake full responsibility for decontamination and decommissioning of the Muskogee Site; and

WHEREAS, the Grantor and the NRC have agreed to a decommissioning funding mechanism for FMRI's remediation of the Muskogee Site which provides that the proceeds of the Standby Trust Fund will provide a portion of the amount of financial assurance for decommissioning of the Muskogee Site; and

WHEREAS, the Agreement executed by Grantor and Trustee must be amended to reflect the license transfer and the concomitant transfer of responsibility for the decommissioning funding mechanism agreed to by the Grantor and the NRC.

- 2 -

NOW, THEREFORE, the Grantor and the Trustee agree as follows:

1. In accordance with Section 15 of the Agreement, the Agreement is amended and reissued in its entirety and renamed as set forth in Attachment 1 (herein referred to as the "Amended Agreement"), hereto, to reflect the assumption of the obligation of FMRI from the Grantor to remediate the Muskogee Site pursuant to NRC License SMB-911 in accordance with an application to the NRC to transfer the license for the Muskogee Site dated July 24, 2003, as amended. The Trustee also has indicated its agreement to and acceptance of the Amended Agreement by its signature on this Amendment and Attachment 1. In accordance with Section 15 of the Agreement, the NRC has indicated its agreement to and acceptance of the Amended Agreement by its signature on this Amendment. FMRI will execute the Amendment to indicate its agreement to and acceptance of the Amended Agreement on the Effective Date of the "Joint Reorganization Plan of Fansteel Inc. and Subsidiaries."
2. This Amendment shall become effective upon the execution of the Amended Agreement by FMRI. The effectiveness of this amendment substitutes FMRI as Grantor of the Trust Fund and shall relieve Fansteel Inc. of any obligations as original Grantor of this Trust Fund.

IN WITNESS WHEREOF, the parties have caused this Amendment Number Two to be executed by the respective officers duly authorized and the corporate seals to be hereunto affixed, as necessary.

ATTEST: Beverly Chayes

BANK OF WAUKEGAN, as trustee aforesaid and not individually

Its: Asst. Vice President

By: [Signature]

One President

ATTEST: R.M.M. Steu

Fansteel Inc.

Its: Vice President

By: [Signature]

CONSENTED TO:

U.S. NUCLEAR REGULATORY COMMISSION

By: [Signature]

(SEAL)

DECOMMISSIONING TRUST AGREEMENT

The TRUST AGREEMENT is entered into as of ^{January}~~November~~ 23, 200⁴~~7~~ by and between FMRI Inc., a Delaware corporation, herein referred to as the "Grantor," and Bank of Waukegan as trustee under Trust No. 2740 and not individually, of Waukegan, Illinois, the "Trustee."

WHEREAS, the U.S. Nuclear Regulatory Commission (NRC), an agency of the U.S. Government, pursuant to the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, has promulgated regulations in title 10, Chapter I, of the *Code of Federal Regulations*, Part 40. These regulations, applicable to the Grantor, require that a holder of, or an applicant for, a materials license issued pursuant to 10 CFR Part 40 provide assurance that funds will be available when needed for required decommissioning activities.

WHEREAS, the Grantor has, pursuant to the FMRI License and Decommissioning Plan as approved by the NRC and the terms and conditions of the Joint Reorganization Plan of Fansteel Inc. and Subsidiaries, as approved by the United States Bankruptcy Court for the District of Delaware, elected to use the proceeds of this Decommissioning Trust Agreement to provide a portion of the amount of financial assurance for the facilities identified herein; and

WHEREAS, the Grantor, acting through its duly authorized officers, has selected the Trustee to be the trustee under this Agreement, and the Trustee is willing to act as trustee;

NOW, THEREFORE, the Grantor and the Trustee agree as follows:

Section 1. Definitions. As used in this Agreement:

- (a) The term "Grantor" means the NRC licensee who enters into this Agreement and any successors or assigns of the Grantor,
- (b) The term "Trustee" means the trustee who enters into this Agreement and any successor trustee.
- (c) The term "Decommissioning Plan" means the Decommissioning Plan as approved and amended by the NRC.
- (d) The term "FMRI License" means NRC License Number SMB-911 as approved and amended by the NRC.

Section 2. Costs of Decommissioning.

This Agreement pertains to the costs of decommissioning the materials and activities identified in NRC License Number SMB-911 issued pursuant to 10 CFR Part 40, as shown in Schedule A.

Section 3. Establishment of Fund.

The Grantor and the Trustee hereby establish a decommissioning trust fund (the Fund) for the benefit of NRC. The Grantor and the Trustee intend that no third party shall have access to the Fund except as provided herein.

Section 4. Payments Constituting the Fund and Replenishment.

The value of the Fund was initially \$4,456,460.00, based on the deposit of the proceeds of two letters of credit into Trust Account No. 2740 held by the Bank of Waukegan. Such property and any other property subsequently transferred to the Trustee are referred to as the "Fund," together with all earnings and profits thereon, less any payments or distributions made by the Trustee pursuant to this Agreement. The Fund shall be held by the Trustee, IN TRUST, as hereinafter provided. The Trustee shall not be responsible nor shall it undertake any responsibility for the amount of, or adequacy of the Fund, nor any duty to collect from the Grantor, any payments necessary to discharge any liabilities of the Grantor established by NRC.

Grantor shall replenish any withdrawal from the Fund within 30 days of receipt of

- (a) any payments or proceeds intended to provide for replenishment, as provided in the FMRI License and Decommissioning Plan or the terms and conditions of the Joint Reorganization Plan as approved by the United States Bankruptcy Court; or
- (b) any other payments or proceeds that result in a cash balance greater than needed to fund the following six months of activities as shown in the Decommissioning Plan

up to the amount available from such payments or proceeds.

Section 5. Payment for Required Activities Specified in the Decommissioning Plan.

The Trustee shall make payments from the Fund to the Grantor upon presentation to the Trustee of the following:

- (a) Prior to the first withdrawal, a certificate duly executed by the Secretary of the Grantor attesting to the occurrence of the events, and in the form set forth in the attached Certificate of Events and Certificate of Resolution, and
- (b) For each requested withdrawal, a withdrawal certificate executed by Grantor stating the amount requested, the total outstanding amount of withdrawals including the one requested, the activities of the Decommissioning Plan for which the funds will be used, and attesting to the following conditions:
 - (1) that decommissioning is proceeding pursuant to an NRC-approved Decommissioning Plan;
 - (2) that the funds withdrawn will be expended for activities undertaken pursuant to the Decommissioning Plan;

- (3) that Grantor has received all payments and proceeds to which it is entitled under the FMRI License and Decommissioning Plan or the terms and conditions of the Joint Reorganization Plan of Fansteel Inc. and Subsidiaries, as approved by the United States Bankruptcy Court for the District of Delaware;
- (4) that such payments and proceeds received by Grantor are insufficient to fund the decommissioning activities as planned and budgeted in the Decommissioning Plan;
- (5) that all replenishments of the Trust which Grantor was capable of making were in fact made;
- (6) that the total of all outstanding withdrawals will not exceed Two Million Dollars (\$2,000,000.00); and
- (7) that 30 days prior to Grantor's request for withdrawal, NRC received
 - (i) notice of Grantor's intent to withdraw funds from the trust fund, and
 - (ii) a copy of the withdrawal certificate.

Grantor may request the Trustee to release, and the Trustee shall release, up to Two Million and no/100 Dollars (\$2,000,000.00) on a revolving basis (i.e., subject to replenishment) in accordance with the purposes of the Trust and pursuant to the FMRI License and Decommissioning Plan, including Table 15-11, the Closure Cost Estimate, and the terms and conditions of the Joint Reorganization Plan of Fansteel Inc. and Subsidiaries, as approved by the United States Bankruptcy Court for the District of Delaware.

In addition, the Trustee shall make payments from the Fund as the NRC shall direct, in writing, to provide for the payment of the costs of required activities covered by this Agreement. The Trustee shall reimburse the Grantor or other persons as specified by the NRC from the Fund for expenditures for required activities in such amounts as the NRC shall direct in writing. In addition, the Trustee shall refund to the Grantor such amounts as NRC specifies in writing. Upon refund, such funds shall no longer constitute part of the Fund as defined herein.

Section 6. Trust Management.

The Trustee shall invest and reinvest the principal and income of the Fund and keep the Fund invested as a single fund, without distinction between principal and income, in accordance with general investment policies and guidelines which the Grantor may communicate in writing to the Trustee from time to time, subject, however, to the provisions of this section. In investing, reinvesting, exchanging, selling, and managing the Fund, the Trustee shall discharge its duties with respect to the Fund solely in the interest of the beneficiary and with the care, skill, prudence and diligence under the circumstances then prevailing which persons of prudence, acting in a like

capacity and familiar with such matters, would use in the conduct of an enterprise of a like character and with like aims, except that:

- (a) Securities or other obligations of the Grantor, or any other owner or operator of the facilities, or any of their affiliates as defined in the Investment Company Act of 1940, as amended (15 U.S.C. 80a-2(a)), shall not be acquired or held, unless they are securities or other obligations of the Federal or a State government;
- (b) The Trustee is authorized to invest the Fund in time or demand deposits of the Trustee, to the extent insured by an agency of the Federal government, and in obligations of the Federal government such as GNMA, FNMA, and FHLM bonds and certificates or State and Municipal bonds rated BBB or higher by Standard & Poor's or Baa or higher by Moody's Investment Services; and
- (c) For a reasonable time, not to exceed 60 days, the Trustee is authorized to hold uninvested cash, awaiting investment or distribution, without liability for the payment of interest thereon.

Section 7. Commingling and Investment.

The Trustee is expressly authorized in its discretion:

- (a) To transfer from time to time any or all of the assets of the Fund to any common, commingled, or collective trust fund created by the Trustee in which the Fund is eligible to participate, subject to all of the provisions thereof, to be commingled with the assets of other trusts participating therein; and
- (b) To purchase shares in any investment company registered under the Investment Company Act of 1940 (15 U.S.C. 80a-1 et seq.), including one that may be created, managed, underwritten, or to which investment advice is rendered, or the shares of which are sold by the Trustee. The Trustee may vote such shares in its discretion.

Section 8. Express Powers of Trustee.

Without in any way limiting the powers and discretion conferred upon the Trustee by the other provisions of this Agreement or by law, the Trustee is expressly authorized and empowered:

- (a) To sell, exchange, convey, transfer, or otherwise dispose of any property held by it, by public or private sale, as necessary to allow duly authorized withdrawals at the request of the Grantor or NRC or to reinvest in securities at the direction of the Grantor;
- (b) To make, execute, acknowledge, and deliver any and all documents of transfer and conveyance and any and all other instruments that may be necessary or appropriate to carry out the powers herein granted;

- (c) To register any securities held in the Fund in its own name, or in the name of a nominee, and to hold any security in bearer form or in book entry, or to combine certificates representing such securities with certificates of the same issue held by the Trustee in other fiduciary capacities, to reinvest interest payments and funds from matured and redeemed instruments, to file proper forms concerning securities held in the Fund in a timely fashion with appropriate government agencies, or to deposit or arrange for the deposit of such securities in a qualified central depository even though, when so deposited, such securities may be merged and held in bulk in the name of the nominee or such depository with other securities deposited therein by another person, or to deposit or arrange for the deposit of any securities issued by the U.S. Government, or any agency or instrumentality thereof, with a Federal Reserve Bank, but the books and records of the Trustee shall at all times show that all such securities are part of the Fund;
- (d) To deposit any cash in the Fund in interest-bearing accounts maintained or savings certificates issued by the Trustee, in its separate corporate capacity, or in any other banking institution affiliated with the Trustee, to the extent insured by an agency of the Federal government; and
- (e) To compromise or otherwise adjust all claims in favor of or against the Fund.

Section 9. Taxes and Expenses.

All taxes of any kind that may be assessed or levied against or in respect of the Fund and all brokerage commissions incurred by the Fund shall be paid from the Fund. All other expenses incurred by the Trustee in connection with the administration of this Trust, including fees for legal services rendered to the Trustee, the compensation of the Trustee to the extent not paid directly by the Grantor, and all other proper charges and disbursements of the Trustee shall be paid from the Fund.

Section 10. Annual Valuation.

The Trustee shall annually, at least 30 days before the anniversary date of the establishment of the trust fund, furnish to the Grantor and to NRC a statement confirming the value of the Trust. Any securities in the Fund shall be valued at market value as of no more than 60 days before the anniversary date of the establishment of the Fund. The failure of the Grantor to object in writing to the Trustee within 90 days after the statement has been furnished to the Grantor and NRC shall constitute a conclusively binding assent by the Grantor, barring the Grantor from asserting any claim or liability against the Trustee with respect to the matters disclosed in the statement.

The Trustee shall include in its annual valuation an itemization of all withdrawals and replenishments by the Grantor, the maximum amount of outstanding withdrawals that occurred during the reporting period, and the total of all outstanding withdrawals as of the date of statement.

Section 11. Advice of Counsel.

The Trustee may from time to time consult with counsel with respect to any question arising as to the construction of this Agreement or any action to be taken hereunder. The Trustee shall be fully protected, to the extent permitted by law, in acting on the advice of counsel.

Section 12. Trustee Compensation.

The Trustee shall be entitled to reasonable compensation for its services as agreed upon in writing with the Grantor. (See Schedule B.)

Section 13. Successor Trustee.

Upon 90 days notice to NRC and the Grantor, the Trustee may resign; upon 90 days notice to NRC and the Trustee, the Grantor may replace the Trustee; but such resignation or replacement shall not be effective until the Grantor has appointed a successor Trustee, the successor accepts the appointment, the successor is ready to assume its duties as trustee, and NRC has agreed, in writing, that the successor is an appropriate Federal or State government agency or an entity that has the authority to act as a trustee and whose trust operations are regulated and examined by a Federal or State agency. The successor Trustee shall have the same powers and duties as those conferred upon the Trustee hereunder. When the resignation or replacement is effective, the Trustee shall assign, transfer, and pay over to the successor Trustee the funds and properties then constituting the Fund. If for any reason the Grantor cannot or does not act in the event of the resignation of the Trustee, the Trustee may apply to a court of competent jurisdiction for the appointment of a successor Trustee or for instructions. The successor Trustee shall specify the date on which it assumes administration of the trust, in a writing sent to the Grantor, NRC, and the present Trustee, by certified mail 10 days before such change becomes effective. Any expenses incurred by the Trustee as a result of any of the acts contemplated by this section shall be paid as provided in Section 9.

Section 14. Instructions to the Trustee.

All orders, requests, and instructions by the Grantor to the Trustee shall be in writing, signed by such persons as are signatories to this Agreement or such other designees as the Grantor may designate in writing. The Trustee shall be fully protected in acting without inquiry in accordance with the Grantor's orders, requests, and instructions. If NRC issues orders, requests, or instructions to the Trustee these shall be in writing, signed by NRC or its designees, and the Trustee shall act and shall be fully protected in acting in accordance with such orders, requests, and instructions. The Trustee shall have the right to assume, in the absence of written notice to the contrary, that no event constituting a change or a termination of the authority of any person to act on behalf of the Grantor or NRC hereunder has occurred. The Trustee shall have no duty to act in the absence of such orders, requests, and instructions from the Grantor and/or NRC, except as provided for herein.

Section 15. Amendment of Agreement.

This Agreement may be amended by an instrument in writing executed by the Grantor, the Trustee, and NRC, or by the Trustee and NRC if the Grantor ceases to exist. All amendments shall meet the relevant regulatory requirements of NRC.

Section 16. Irrevocability and Termination.

Subject to the right of the parties to amend this Agreement as provided in Section 15, this trust shall be irrevocable and shall continue until terminated at the written agreement of the Grantor, the Trustee, and NRC, or by the Trustee and NRC if the Grantor ceases to exist. Termination of the Trust will not occur until after the FMRI License is terminated by the NRC. Notwithstanding the foregoing, the Grantor is authorized to request the Trustee to release, and the Trustee shall release, all of the amounts in the Fund upon termination of the NRC license and completion of all decommissioning activities mandated by the NRC license and the NRC-approved Plan. Upon termination of the trust, all remaining trust property, less final trust administration expenses, shall be delivered to the Grantor or its successor.

Section 17. Immunity and Indemnification.

The Trustee shall not incur personal liability of any nature in connection with any act or omission, made in good faith, in the administration of this trust, or in carrying out any directions by the Grantor or NRC issued in accordance with this Agreement. The Trustee shall be indemnified and saved harmless by the Grantor or from the trust fund, or both, from and against any personal liability to which the Trustee may be subjected by reason of any act or conduct in its official capacity, including all expenses reasonably incurred in its defense in the event the Grantor fails to provide such defense.

Section 18. Choice of Law.

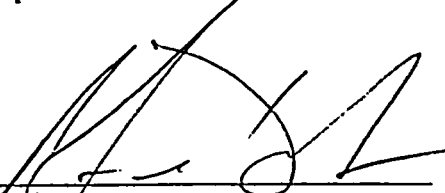
This Agreement shall be administered, construed, and enforced according to the laws of the State of Illinois.

Section 19. Interpretation and Severability.

As used in this Agreement, words in the singular include the plural and words in the plural include the singular. The descriptive headings for each section of this Agreement shall not affect the interpretation or the legal efficacy of this Agreement. If any part of this Agreement is invalid, it shall not affect the remaining provisions which will remain valid and enforceable.

IN WITNESS WHEREOF the parties have caused this Agreement to be executed by the respective officers duly authorized and the incorporate seals to be hereunto affixed and attested as of the date first written above.

FMRI Inc.



Chief Executive Officer
10 Tantalum Place
Muskogee, OK 74403

ATTEST:

[Title]

[Seal]


Vice President

Bank of Waukegan
Trust and Investment Services
1601 N. Lewis Avenue
Waukegan, Illinois 60085



[Title] Vice President

ATTEST:

[Title]

[Seal]

Beverly C Hayas
Asst Vice President


Beverly C Hayas

Trust Agreement Schedule A

Schedule A: Licensee & Cost Estimate

This Agreement demonstrates partial financial assurance for the following cost estimate for the following licensed activities:

U.S. NUCLEAR REGULATORY COMMISSION
LICENSE NUMBER(S)

SMB-911

NAME AND ADDRESS OF LICENSEE

FMRI Inc.
Number Ten Tantalum Place
Muskogee, OK 74403

ADDRESS OF LICENSED ACTIVITIES

Number Ten Tantalum Place
Muskogee, OK 74403

COST ESTIMATE FOR REGULATORY ASSURANCES DEMONSTRATED IN PART BY THIS AGREEMENT

\$41.6 million

The cost estimate listed here was submitted to NRC on July 24, 2003.

Trust Agreement Schedule B

Schedule B: Trustee's Fee

Bank of Waukegan
Trust and Investment Services
1601 N. Lewis Avenue
Waukegan, Illinois 60085
(847) 244-6000

In addition to the fees and expenses of Trustee provided for in the Trust Agreement, the Trustee's annual maintenance fee for the first year ending on the first anniversary of the date the Trust Agreement is entered into shall be payable in advance upon acceptance thereof. Thereafter, said fee shall be charged in accordance with the then current schedule of Trustee's fees on the anniversary date of each succeeding year until the Trust is terminated. All such fees are payable in advance of the year for which the fee is incurred. The full year's fee shall be deemed earned when paid. Current trust fees may be obtained from the trust department of the Bank of Waukegan.

Trustee's annual maintenance fee shall be \$ 28,662 for the first year.

Trust Exhibit 1

Certificate of Events

Bank of Waukegan
1601 N. Lewis Avenue
Waukegan, Illinois 60085

Attention: Trust and Investment Services

Gentlemen:

In accordance with the terms of the Agreement with you dated _____, I, _____, [Position] of FMRI Inc., hereby certify that the following events have occurred:

1. FMRI Inc. is required to commence the decommissioning of its facility located at Number Ten Tantalum Place, Muskogee, Oklahoma (hereinafter called the decommissioning).
2. The plans and procedures for the commencement and conduct of the decommissioning have been approved by the United States Nuclear Regulatory Commission, or its successor, on _____ (copy of approval attached).
3. The Board of Directors of FMRI Inc. has adopted the attached Certificate of Resolution authorizing the commencement of the decommissioning.

[Position] of FMRI Inc.

Date

Trust Exhibit 2

Certificate of Resolution

I, _____, do hereby certify that I am Secretary of FMRI Inc., a Delaware corporation, and that the resolution listed below was duly adopted at a meeting of this Corporation's Board of Directors on _____, 20__.

IN WITNESS WHEREOF, I have hereunto signed my name and affixed the seal of this Corporation this day of _____, 20__.

Secretary

RESOLVED, that this Board of Directors hereby authorizes the Chief Executive Officer, or such other employee of the Company as he may designate, to commence decommissioning activities at the Muskogee site in accordance with the terms and conditions described to this Board of Directors at this meeting and which such other terms and conditions as the President shall approve with and upon the advice of Counsel.

Letter of Acknowledgment

STATE OF Illinois

To Wit: _____

CITY OF Waukegan

On this 13 day of November, before me, a notary public in and for the city and State aforesaid, personally appeared Howard J. Tatar, and he did depose and say that he is the Vice President and Senior Trust Officer of the Bank of Waukegan, Trustee, which executed the above instrument; that he knows the seal of said association; that the seal affixed to such instrument is such corporate seal; that it was so affixed by order of the association; and that he signed his name thereto by like order.

Cynthia M. Jones

My Commission Expires: 8/22/05
[Date]

