SPECIAL EXPOSURE COHORT PETITON

HEMATITE SITE

STATE OF MISSOURI

JUNE 13, 2008

PETITONERS

APPENDIX

SPECIAL EXPOSURE COHORT FORM B FOR HEMATITE SITE

PETITONER AUTHORIZATION FORM

PETITIONERS COHORT ADDENDUM 1-13

A. 1-4 AFFIDAVIT	EMPLOYEE
A.5 AFFIDAVIT	EMPLOYEE
A.6 AFFIDAVIT	EMPLOYEE
A.7 AFFIDAVIT	SURVIVOR
A.8 AFFIDAVIT	SURVIVOR
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Use of this form and disclosure of Social Security Number are voluntary. Failure to use this form or disclose this number will not result in the denial of any right, benefit, or privilege to which you may be entitled.

General Instructions on Completing this Form *(complete instructions are available in a separate packet)*:

Except for signatures, please **PRINT** all information clearly and neatly on the form.

Please read each of Parts A — G in this form and complete the parts appropriate to you. If there is more than one petitioner, then each petitioner should complete those sections of parts A – C of the form that apply to them. Additional copies of the first two pages of this form are provided at the end of the form for this purpose. A maximum of three petitioners is allowed.

If you need more space to provide additional information, use the continuation page provided at the end of the form and attach the completed continuation page(s) to Form B.

If you have questions about the use of this form, please call the following NIOSH toll-free phone number and request to speak to someone in the Office of Compensation Analysis and Support about an SEC petition: **1-800-356-4674.**

If you are:			
	☐ A Labor Organization,	Start at D	on Page 3
	☐ An Energy Employee (current or former),	Start at C	on Page 2
	☐ A Survivor (of a former Energy Employee),	Start at B	on Page 2
	☒ A Representative (of a current or former Energy Employee),	Start at A	on Page 1

A Representative Information — Complete Section A if you are authorized by an Employee or Survivor(s) to petition on behalf of a class.

A.1 **Are you a contact person for an organization?** ☐ Yes (Go to A.2) ☒ No (Go to A.3)

A.2 **Organization Information:**

Name of Organization

Position of Contact Person

A.3 **Name of Petition Representative:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

A.4 **Address:**

Street Apt. # P.O. Box

City State Zip Code

A.5 **Telephone Number:**

A.6 **Email Address:**

A.7 ☒ *Check the box at left to indicate you have attached to the back of this form written authorization to* petition by the survivor(s) or employee(s) indicated in Parts B or C of this form. An authorization

If you are representing a Survivor, go to Part B; if you are representing an Employee, go to Part C.

Name or Social Security Number of First Petitioner:

B Survivor Information — Complete Section B if you are a Survivor or representing a Survivor.

B.1 **Name of Survivor:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

B.2 **Social Security Number of Survivor:** _____

B.3 **Address of Survivor:**

Street Apt # P.O. Box

City State Zip Code

B.4 **Telephone Number of Survivor:** (___) ___-_____

B.5 **Email Address of Survivor:** _____

B.6 **Relationship to Employee:** ☐ Spouse ☐ Son/Daughter ☐ Parent ☐ Grandparent ☐ Grandchild

Go to Part C.

C Employee Information — Complete Section C UNLESS you are a labor organization.

C.1 **Name of Employee:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

C.2 **Former Name of Employee** (e.g., maiden name/legal name change/other):

Mr./Mrs./Ms. First Name Middle Initial Last Name

C.3 **Social Security Number of Employee:**

C.4 **Address of Employee** (if living):

Street Apt # P.O. Box

City State Zip Code

C.5 **Telephone Number of Employee:**

C.6 **Email Address of Employee:**

C.7 **Employment Information Related to Petition:**

C.7a Employee Number (if known):

C.7b Dates of Employment: Start 1967 End 1971

C.7c Employer Name: UNITED Nuclear CORPORATION

C.7d Work Site Location: Aka Mallinckrodt Chemical Works (an atomic Weapons Employer) Hematite, Missouri

C.7e Supervisor's Name:

Go to Part E

D Labor Organization Information — Complete Section D ONLY if you are a labor organization.

D.1 ***Labor Organization Information:***

_____
Name of Organization

_____
Position of Contact Person

D.2 **Name of Petition Representative:**

_____

D.3 **Address of Petition Representative:**

_____
Street Apt # P.O. Box

_____
City State Zip Code

D.4 **Telephone Number of Petition Representative:** (____) ____-_____

D.5 **Email Address of Petition Representative:** _____

D.6 ***Period during which labor organization represented employees covered by this petition*** (please attach documentation): Start _____ End _____

D.7 **Identity of other labor organizations that may represent or have represented this class of *employees*** *(if known)*:

_____

Go to Part E.

E Proposed Definition of Employee Class Covered by Petition — Complete Section E.

E.1 **Name of DOE or AWE Facility:** United Nuclear Corporation

E.2 **Locations at the Facility relevant to this petition:**

Entire Site; all buildings, all locations

E.3 **List job titles and/or job duties of employees included in the class. In addition, you can list by name any individuals other than petitioners identified on this form who you believe should be included in this class:**

Any and all employee's that reported to this site for employment during 1958-1969 and due to residual contamination from 1969-2008

E.4 **Employment Dates relevant to this petition:**

Start 1958 End 1969

Start 1970 End Present

Start _____ End _____

E.5 **Is the petition based on one or more unmonitored, unrecorded, or inadequately monitored or recorded exposure incidents?:** ☒ Yes ☐ No

If yes, provide the date(s) of the incident(s) and a complete description (attach additional pages as necessary):

See attached documents

Go to Part F.

F Basis for Proposing that Records and Information are Inadequate for Individual Dose — Complete Section F.

Complete **at least one** of the following entries in this section by checking the appropriate box and providing the required information related to the selection. You are not required to complete more than one entry.

F.1 [X] I/We have attached either documents or statements provided by affidavit that indicate that radiation exposures and radiation doses potentially incurred by members of the proposed class, that relate to this petition, were not monitored, either through personal monitoring or through area monitoring.

(Attach documents and/or affidavits to the back of the petition form.)

Describe as completely as possible, to the extent it might be unclear, how the attached documentation and/or affidavit(s) indicate that potential radiation exposures were not monitored.

See attached

F.2 [X] I/ We have attached either documents or statements provided by affidavit that indicate that radiation monitoring records for members of the proposed class have been lost, falsified, or destroyed; or that there is no information regarding monitoring, source, source term, or process from the site where the employees worked.

(Attach documents and/or affidavits to the back of the petition form.)

Describe as completely as possible, to the extent it might be unclear, how the attached documentation and/or affidavit(s) indicate that radiation monitoring records for members of the proposed class have been lost, altered illegally, or destroyed.

See attached

Part F is continued on the following page.

F.3 ☐ I/We have attached a report from a health physicist or other individual with expertise in radiation dose reconstruction documenting the limitations of existing DOE or AWE records on radiation exposures at the facility, as relevant to the petition. The report specifies the basis for believing these documented limitations might prevent the completion of dose reconstructions for members of the class under 42 CFR Part 82 and related NIOSH technical implementation guidelines.

(Attach report to the back of the petition form.)

F.4 ☐ I/We have attached a scientific or technical report, issued by a government agency of the Executive Branch of Government or the General Accounting Office, the Nuclear Regulatory Commission, or the Defense Nuclear Facilities Safety Board, or published in a peer-reviewed journal, that identifies dosimetry and related information that are unavailable (due to either a lack of monitoring or the destruction or loss of records) for estimating the radiation doses of *employees covered by the petition.*

(Attach report to the back of the petition form.)

Go to Part G.

G Signature of Person(s) Submitting this Petition — Complete Section G.

All Peti[illegible] ee persons may sign the petition.

6-12-08
Date

11-4-07
Date

11-4-07
Date

Notice: Any person who knowingly makes any false statement, misrepresentation, concealment of fact or any other act of fraud to obtain compensation as provided under EEOICPA or who knowingly accepts compensation to which that person is not entitled is subject to civil or administrative remedies as well as felony criminal prosecution and may, under appropriate criminal provisions, be punished by a fine or imprisonment or both. I affirm that the information provided on this form is accurate and true.

Send this form to:

SEC Petition
Office of Compensation Analysis and Support
NIOSH
4676 Columbia Parkway, MS-C-47
Cincinnati, OH 45226

If there are additional petitioners, they must complete the Appendix Forms for additional petitioners. The Appendix forms are located at the end of this document.

Name or Social Security Number of First Petitioner: _____

Public Burden Statement

Public reporting burden for this collection of information is estimated to average 300 minutes per response, including time for reviewing instructions, gathering the information needed, and completing the form. If you have any comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, send them to CDC Reports Clearance Officer, 1600 Clifton Road, MS-E-11, Atlanta GA, 30333; ATTN:PRA 0920-0639. Do not send the completed petition form to this address. Completed petitions are to be submitted to NIOSH at the address provided in these instructions. Persons are not required to respond to the information collected on this form unless it displays a currently valid OMB number.

Privacy Act Advisement

In accordance with the Privacy Act of 1974, as amended (5 U.S.C. § 552a), you are hereby notified of the following:

The Energy Employees Occupational Illness Compensation Program Act (42 U.S.C. §§ 7384-7385) (EEOICPA) authorizes the President to designate additional classes of employees to be included in the Special Exposure Cohort (SEC). EEOICPA authorizes HHS to implement its responsibilities with the assistance of the National Institute for Occupational Safety (NIOSH), an Institute of the Centers for Disease Control and Prevention. Information obtained by NIOSH in connection with petitions for including additional classes of employees in the SEC will be used to evaluate the petition and report findings to the Advisory Board on Radiation and Worker Health and HHS.

Records containing identifiable information become part of an existing NIOSH system of records under the Privacy Act, 09-20-147 "Occupational Health Epidemiological Studies and EEOICPA Program Records. HHS/CDC/NIOSH." These records are treated in a confidential manner, unless otherwise compelled by law. Disclosures that NIOSH may need to make for the processing of your petition or other purposes are listed below.

NIOSH may need to disclose personal identifying information to: (a) the Department of Energy, other federal agencies, other government or private entities and to private sector employers to permit these entities to retrieve records required by NIOSH; (b) identified witnesses as designated by NIOSH so that these individuals can provide information to assist with the evaluation of SEC petitions; (c) contractors assisting NIOSH; (d) collaborating researchers, under certain limited circumstances to conduct further investigations; (e) Federal, state and local agencies for law enforcement purposes; and (f) a Member of Congress or a Congressional staff member in response to a verified inquiry.

This notice applies to all forms and informational requests that you may receive from NIOSH in connection with the evaluation of an SEC petition.

Use of the NIOSH petition forms (A and B) is voluntary but your provision of information required by these forms is mandatory for the consideration of a petition, as specified under 42 CFR Part 83. Petitions that fail to provide required information may not be considered by HHS.

Name or Social Security Number of First Petitioner: _____

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Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Special Exposure Cohort Petition — Form B **Appendix — Petitioner 2**

Use of this form and disclosure of Social Security Number are voluntary. Failure to use this form or disclose this number will not result in the denial of any right, benefit, or privilege to which you may be entitled.

Use this Appendix for Petitioner 2.

This appendix form is to be used as needed. Petitioner 2, or his or her representative, should complete the parts applicable to him or her.

Refer to the General Instructions on completing petitioner information for Parts A, B, or C.

If you need more space to provide additional information, use the continuation page provided at the end of the form and attach the completed continuation page(s) to Form B.

Except for signatures, please **PRINT** all information clearly and neatly on the form.

If you are:	☒ An Energy Employee (current or former),	Start at C
	☐ A Survivor (of a former Energy Employee),	Start at B
	☐ A Representative (of a current or former Energy Employee),	Start at A

A Representative Information — Complete Section A if you are authorized by an Employee or Survivor(s) to petition on behalf of a class.

A.1 **Are you a contact person for an organization?** ☐ Yes (Go to A.2) ☐ No (Go to A.3)

A.2 **Organization Information:**

Name of Organization

Position of Contact Person

A.3 **Name of Petition Representative:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

A.4 **Address:**

Street Apt # P.O. Box

City State Zip Code

A.5 **Telephone Number:**

A.6 **Email Address:**

A.7 ☒ Check the box at left to indicate you have attached to the back of this form written authorization to petition by the survivor(s) or employee(s) indicated in Parts B or C of this form. An authorization form for this purpose is provided.

If you are representing a Survivor, go to Part B; if you are representing an Employee, go to Part C.

Name or Social Security Number of First Petitioner: _____

Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Special Exposure Cohort Petition — Form B **Appendix — Petitioner 2**

B Survivor Information — Complete Section B if you are a Survivor or representing a Survivor.

B.1 **Name of Survivor:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

B.2 **Social Security Number of Survivor:** _____

B.3 **Address of Survivor:**

Street Apt # P.O. Box

City State Zip Code

B.4 **Telephone Number of Survivor:** (____) _____ - _____

B.5 **Email Address of Survivor:** _____

B.6 **Relationship to Employee:** ❑ Spouse ❑ Son/Daughter ❑ Parent ❑ Grandparent ❑ Grandchild

Go to Part C.

C Employee Information — Complete Section C.

C.1 **Name of Employee:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

C.2 **Former Name of Employee** (e.g., maiden name/legal name change/other):

Mr./Mrs./Ms. First Name Middle Initial Last Name

C.3 **Social Security Number of Employee:** _____

C.4 **Address of Employee** (if living):

Street Apt # P.O. Box

City State Zip Code

C.5 **Telephone Number of Employee:**

C.6 **Email Address of Employee:**

C.7 **Employment Information Related to Petition**

C.7a Employee Number (if known): _____

C.7b Dates of Employment: Start 1968 End 1971

C.7c Employer Name: United Nuclear Corporation

C.7d Work Site Location: AKA Mallinckrodt Chemical Works (an atomic weapons employer) Hematite, MO

C.7e Supervisor's Name: _____

Sign Part G

Name or Social Security Number of First Petitione

Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Special Exposure Cohort Petition — Form B

Appendix — Petitioner 3

Use of this form and disclosure of Social Security Number are voluntary. Failure to use this form or disclose this number will not result in the denial of any right, benefit, or privilege to which you may be entitled.

Use this Appendix for Petitioner 3.

This appendix form is to be used as needed. Petitioner 3, or his or her representative, should complete the parts applicable to him or her.

Refer to the General Instructions on completing petitioner information for Parts A, B, or C.

If you need more space to provide additional information, use the continuation page provided at the end of the form and attach the completed continuation page(s) to Form B.

Except for signatures, please **PRINT** all information clearly and neatly on the form.

If you are:	☐ An Energy Employee (current or former),	Start at C
	☐ A Survivor (of a former Energy Employee),	Start at B
	☐ A Representative (of a current or former Energy Employee),	Start at A

A Representative Information — Complete Section A if you are authorized by an Employee or Survivor(s) to petition on behalf of a class.

A.1 **Are you a contact person for an organization?** ☐ Yes (Go to A.2) ☒ No (Go to A.3)

A.2 **Organization Information:**

Name of Organization

Position of Contact Person

A.3 **Name of Petition Representative:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

A.4 **Address:**

Street Apt # P.O. Box

City State Zip Code

A.5 **Telephone Numbe**

A.6 **Email Address:**

A.7 ☐ Check the box at left to indicate you have attached to the back of this form written authorization to petition by the survivor(s) or employee(s) indicated in Parts B or C of this form. An authorization form for this purpose is provided.

If you are representing a Survivor, go to Part B; if you are representing an Employee, go to Part C.

Name or Social Security Number of First Petitioner: _____

Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Special Exposure Cohort Petition — Form B **Appendix — Petitioner 3**

B Survivor Information — Complete Section B if you are a Survivor or representing a Survivor.

B.1 **Name of Survivor:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

B.2 **Social Security Number of Survivor:** _____

B.3 **Address of Survivor:**

_____ _____
Street Apt # P.O. Box

_____ _____
City State Zip Code

B.4 **Telephone Number of Survivor:**

B.5 **Email Address of Survivor:**

B.6 **Relationship to Employee:** Spouse Son/Daughter Parent Grandparent Grandchild

Go to Part C.

C Employee Information — Complete Section C.

C.1 **Name of Employee:**

_____
Mr./Mrs./Ms. First Name Middle Initial Last Name

C.2 **Former Name of Employee** (e.g., maiden name/legal name change/other):

_____
Mr./Mrs./Ms. First Name Middle Initial Last Name

C.3 **Social Security Number of Employee:** _____

C.4 **Address of Employee** (if living):

_____
Street

_____
City State Zip Code

C.5 **Telephone Number of Employee:** ( ) _____

C.6 **Email Address of Employee:** _____

C.7 **Employment Information Related to Petition:**

C.7a Employee Number (if known): _____

C.7b Dates of Employment: Start _____ End _____

C.7c Employer Name: Mallickrodt, to Gulf to UNC to ABB to Westinghouse

C.7d Work Site Location: Hematite Site Hematite Mo.

C.7e Supervisor's Name: _____

Sign Part G of the original petition.

Name or Social Security Number of First Petitioner: _____

I hereby authorize
as an Authorized Representative
as a
to represent the class
of employees of the Hematite Site.

6-12-08

Name or Social Security Number of First Petitioner: _____

Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Petitioner Authorization Form

Use of this form is voluntary. Failure to use this form will not result in the denial of any right, benefit,

Instructions:

If you wish to petition HHS to consider adding a class of employees to the Special Exposure Cohort and you are NOT either a member of that class, a survivor of a member of that class, or a labor organization representing or having represented members of that class, then 42 CFR Part 83, Section 83.7(c) requires that you obtain written authorization. You can obtain such authorization from either an employee who is a member of the class or a survivor of such an employee. You may use this form to obtain such authorization and submit the completed form to NIOSH with the related petition. **Please print legibly**.

For Further Information: If you have questions about these instructions, please call the following NIOSH toll-free phone number and request to speak to someone in **the Office of Compensation Analysis and Support** about an SEC petition: **1-800-356-4674**.

Authorization for Individual or Entity to Petition HHS on Behalf of a Class of Employees for Addition to the Special Exposure Cohort

I, _____
Name of Class Member or Survivor

_____
Street Address of Class Member or Survivor Apt. # P.O. Box

_____
City, State, Zip Code of Class Member or Survivor

do hereby authorize:

_____
Name of Petitioner

_____
Address of Petitioner Apt. # P.O. Box

_____
City, State and Zip Code of Petitioner

to petition the Department of Health and Human Services on behalf of a class of employees that includes:

_____
Name of [illegible] employee's survivor)

for the addition of the class to the Special Exposure Cohort, under the Energy Employee's Occupational Illness Compensation Program Act (42 U.S.C. §§ 7384-7385).

In providing this authorization, I recognize that the petitioner named above will have all the rights of a petitioner as provided for under 42 CFR Part 83.

_____ 11-4-07
Signature of Class Member or Survivor Date

Name or Social Security Number of First Petitioner: _____

Public Burden Statement

Public reporting burden for this collection of information is estimated to average 3 minutes per response, including time for reviewing instructions, gathering the information needed, and completing the form. If you have any comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, send them to CDC Reports Clearance Officer, 1600 Clifton Road, MS-E-11, Atlanta GA, 30333; ATTN:PRA 0920-0639. Do not send the completed petition form to this address. Completed petitions are to be submitted to NIOSH at the address provided in these instructions. Persons are not required to respond to the information collected on this form unless it displays a currently valid OMB number.

Use of this form is voluntary. Failure to use this form will not result in the denial of any right, benefit, or privilege to which you may be entitled.

Name or Social Security Number of First Petitioner: _____

PETITON FOR A SPECIAL EXPOSURE COHORT
HEMATITE SITE
IN THE GREAT STATE OF MISSOURI

PETITONERS

UNITED STATES DEPARTMENT OF LABOR
UNITED STATES DEPARTMENT OF HEALTH AND HUMAN SERVICES
NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH

RESPONDENTS

INTRODUCTION

This is a petition for a "Special Exposure Cohort" designation for the Hematite Site, in the State of Missouri, which is a covered facility as an Atomic Weapons Employer as defined in Section 3621 (4) of the Act which was contracted by the United States Atomic Energy Commission and operated under the corporate name: United Nuclear Corporation during the time frame of 1958-1969.

FACTUAL and PROCEDURAL BACKGROUND

1) In compliance with the Energy Employees Occupational Illness and Compensation Program Act (42 U.S.C. 7384-7385), Public Law 106-398, that was enacted by congress in 2000 establishes a program to provide compensation to individuals who developed illnesses as a result of their employment in nuclear weapons production related activities

and certain other federally-owned facilities in which radioactive materials were used.

The named Representativ has been authorized with signature by the "Class" which is petitioning, with all rights as provided under 42 CFR Part 83, Section 83.7 (c)

2) As part of the Energy Employees Occupational Illness Compensation Act, on December 7, 2000 the President of the United States issued Executive Order No. 13179, and the Radiation Dose Reconstruction Rule (42 CFR 82); Although, the National Institutes for Occupational Safety and Health's (NIOSH) office of Compensation Analysis and Support (OCAS) has the responsibility of completing dose reconstructions using the methods described in the Radiation Dose reconstruction Rule (42 CFR 82) it is the Department of Labor who makes the compensation decisions.

3) The Energy Employees Occupational Illness and Compensation Program Act (42 U.S.C.$$ 7384-7385 (EEOICA) authorizes the President to designate additional classes of employees to be included in the (SEC).

HISTORICAL Background

As quoted in the Hematite Engineering Evaluation and Cost Analysis Response Action for off site Groundwater Dated January 2003 page 3-4, section 2.1.1 *site.*

"The facility was opened in the mid 1950's by Mallinckrodt Chemical Works and through the mid 1970's was owned and operated by a variety of entities, including United Nuclear Corporation and Gulf Nuclear Fuels Company. Until the early 1970's, the site was heavily involved in producing uranium for the United States Navy and the Atomic energy Commission. In the mid 1970's Combustion Engineering Inc. acquired the

property and began commercial nuclear fuel production. Westinghouse purchased the facility in April 2000. There are currently no manufacturing operations at the site."

"Primary functions at the site throughout its history have included the manufacture of uranium metal and uranium compounds from natural to enriched uranium for its use as nuclear fuel. Specifically, operations included the conversion of uranium hexafluoride gas of various uranium 235 enrichments to uranium oxide, uranium carbide, uranium dioxide pellets, and uranium metal. These products were manufactured for use by the federal Government, government contractors, and for use in commercial and research reactors, approved by the Atomic Energy Commission. Research and development was also conducted at the site, as were uranium scrap processes." { **EXHIBIT A21-22**}

At times during the plants history the powder was made into pellets, which where then stacked into hollow metal tubes, that is the uranium fuel rods for reactors. Some of the fuel rods were shipped to commercial nuclear power plant reactors.

The uranium hexafluoride gas processed at the Hematite site was trucked in from the U.S. governments uranium enrichment plant in Paducah, Kentucky. Some may have came from Oak Ridge, Tennessee and/or Piketon, Ohio enrichment plants.

Much of the uranium that was processed at Hematite was from the "front end" of the uranium fuel cycle. That is, it was naturally radioactive uranium that had been mined, milled, chemically converted, and enriched, but had not been fissioned in a reactor. (To quote from Daniel F. Ford's book, Three Mile Island -Thirty Minutes to Meltdown, 1982: "in a controlled nuclear reaction [In a reactor vessel], uranium nuclei fission--split apart--with a consequent release of thermal energy..." [page 24].

Mr. Ford defined fission products as "radioactive waste produced by a nuclear chain reactions...[page214]

In a March 2001 report, the U.S. Department of Energy (DOE) announced that some of the uranium that was enriched at Paducah, Oak Ridge, and Piketon had already been fissioned in reactors used for the production of plutonium for nuclear weapons. This uranium was called reprocessed or recycled uranium. Therefore, it is suspected that some of the enriched uranium trucked into the Hematite plant may have contained neptunium, plutonium, and other transuranic's (extremely hazardous man made elements that are heavier than uranium), as well as fission products, including technetium-99. (U.S. Department of Energy, "A Preliminary Review of the Flow and characteristics of Recycled Uranium Throughout the DOE Complex, 1952-1999.")

No one had even admitted that Paducah and other enrichment plants had worked with materials from the back end of the fuel cycle (post-reactor fuel). In 2002 when residents were notified about off site Twenty two private drinking water wells were identified as being contaminated with volatile organic chemicals that had migrated from the Hematite uranium plant via groundwater.

In addition to offsite hazardous chemical contamination, radioactive technetium-99 was detected in the evaporation ponds on site at the uranium plant in approximately 1976.

{EXHIBITA. 23-30 Letter}

Technetium-99, is a man made fission product created in nuclear reactor with a half life of 211,000 years and is notoriously dangerous. "Technetium-99 has a specific activity of

62,000,000 Becquerel per gram. Activity of this level must not be allowed to spread. Technetium-99 is a contamination hazard and should be handled in a glove box. **"CRC Handbook of Chemistry and Physics, 82nd edition, 2001-2002 page 4-30)**

The presence of technetium-99 at the Hematite site is proof that the Paducah materials had already been in a reactor because Technetium-99 does not exist in nature. Plutonium and other transuranics were no doubt also present in the uranium hexafluoride that was received at Hematite from Paducah..

Many of the workers at the Hematite site worked bare handed without proper protective masks, clothing, gloves, and other protective equipment etc.

{EXHIBIT A-2, A-34}

Quoting from a NIOSH Report of Dose Reconstruction approved on 4-8-2008 from the Office of Compensation Analysis and Support (OCAS) prepared for

page 2 of 8 states as follows:

"Even in instances when radiation dosimetry data are available, they rarely specify dose to an organ and are often based on monitoring \procedures that do not meet modern standards." ***{EXHIBIT A-11}***

Quoting from the Remedial Investigation Report for the Westinghouse Hematite Site Rev 1, Vol 1 : text, January 2007, Executive Summary page xvii, paragraph 4,states as follows:" evaporation ponds and the burial pits include strong mineral acids (hydrochloric, hydrofluoric, and nitric)) and chlorinated organic solvents perchloroethylene (PCE) and trichloroethylene (TCE). A number of potential "areas of

concern" have been identified at the Hematite Site and include those locations where these (and other) potential contaminants were **stored, used, and/or disposed.**"

{EXHIBIT'S A-39-61}

CONCLUSION

Uranium and its daughter products have spilled, blown, been stored and been released into the Hematite environment since 1956. No matter where the material has landed, it will continue giving off (emitting) radioactive particles and rays for 4.5 billion years times ten.

Most of the radioactive materials at the hematite Site give off alpha particles. If these particles are inhaled or swallowed, they are at least 20 times more harmful than beta or gamma emitters, **(See the Nuclear regulatory Commissions table 1004(B).1 on "Quality Factors" in Title 10, part 20 of the Code of Federal Regulations.**

The workers at the Hematite site were also exposed non radioactive substances, such as extremely hazardous volatile organic chemicals including but not limited to, Trichloroethylene, perchloroethylene, and other volatile organic chemicals and were used as cleaning agents sometimes to mop the shop floors.

Workers worked without protective clothing, monitoring, working equipment such as hoods etc. and often wore their work clothes home thus, contaminating their homes and families. **{EXHIBIT A1-2, A-6, A-7 AFFIDAVITS and A-34}**

States that "*Residual radioactivity was assumed to remain at the site until 2006.*"

The fact that the presence of technetium-99 was not identified announced to the public **{EXHIBIT A23-30 Kappler letter Nov 24, 1978},** or detected in the evaporation ponds until 1976.

Some 50 years later it is clear and concise evidence that all workers from 1958-present should be included in this special exposure cohort due to residual contamination from nuclear weapons activities, given the half life of Technetium alone Is 211,000.000 billion years, and NIOSH Omission of residual radioactivity until 2006 **{EXHIBIT A-13}**

Although the Hematite Site is designated as an AWE facility and not a BE, beryllium was very much present at the Hematite Site as noted in a report presenting the results of the (RI) Remedial Investigation Report prepared for Westinghouse Electric Company (WEC) by Science Applications International Corporation (SAIC) under contract to (WEC) Page 1-4 states as follows:

"*During the period prior to the purchase of the property in 1971 by Gulf United Nuclear Fuels Corporation, classified government projects dominated Hematite facility operations. As such, specific details regarding the exact nature of production processes prior to 1974 are not known. The following are examples of known projects during this time (section 2.2,page 4 of (LBG 2003);*

- *Production of uranium metal for use in the US navy's nuclear-powered submarines and destroyers;*
- *Production of specialized uranium oxides for use in the US army's army package power reactor;*
- *Production of highly enriched uranium oxides for a general atomics gas-cooler*

reactor;

- *Production of highly enriched uranium metal for materials test reactors utilized by the US Navy;*
- ***Production of uranium-beryllium pellets*** *for use in the SL-1, and experimental US military nuclear power reactor that was part of the army nuclear power program;*
- *Production of high enrichment uranium zirconia pellets for a naval reactor; and*

Production of highly enriched oxides for use in general atomics nuclear rocket projects.

Although uranium material production was the primary function at the Hematite facility, records indicate secondary activities such as uranium scrap recovery and a limited amount of work with thorium compounds as part of early research into the use of thorium in the fuel cycle. **A detailed list of radioactive feed materials historically used for production is not available.**" **[EXHIBIT A-51]**

In 1990 the Environmental Protection Agency asked the National Academy of Sciences to do a study on the health risks from exposure to low levels of ionizing radiation. In 2006 the National Research Council published a report "BEIR VII" Biological Effects of Ionizing Radiation which concluded that; "NO LEVEL OF RADIATION IS SAFE"

was a security guard at the Hematite Site for approximately 21 years. One cold night when all skilled plant personnel was scheduled off, a criticality occurred. Apparently an anhydrous ammonia tank had leaked. Because was the only employee on duty he was instructed by plant management to go and shut off valve, in attempt to find shut off valve he was overtaken by toxic fumes. Because this direct order was not an area of expertise or his normal job duties did not have any protective clothing, masks, respirators, etc also made his daily rounds of

security without proper protective clothing, handling of doors, knobs, etc. and also handled exposed employee monitoring badges that were turned in by employees at the end of each shift on a daily basis. pulmonary fibrosis diagnosis is consistent With exposure to beryllium, he also having every symptom except one.

The Missouri Department of Health and Human services learned about off site groundwater contamination as early as December 2000 but the current owner Westinghouse did not notify the residents of off site contamination had migrated beyond the plant site until March of 2001.

The fact that there was off site contamination is evidence of a severe lack of quality controls. There has been a lack of disclosure of information to the public, workers, and subcontractors by the NRC, licensee, and its contractors..

During the cold war everything seemed justified and if you were against it you were labeled "unpatriotic". The cold war basic motto was "**war is hell**" and in order to protect National Security a lot of people must die and get hurt.

The workers as I have been told, were unaware of the toxicity and lethal activities/operations they so blindly performed under the Atomic Energy Commission. The federal government knew the effects of radiation since the early 1940's. Although the workers drew a salary while working on the Atomic Energy contract, you can bet if they were told they may become terminally ill or even die, they would have thought twice about working there...They were their own "Manchurian candidate". With the absence of records, safety equipment, and proper monitoring of their work

environment, this concludes the Agencies demonstrated a fundamental disregard for the devalue of human life, and a devalue of the employee's families' quality of life.

Can we really soundly, justify medical atrocities? We then justified this with the need to protect the rest of us....

Can we now escape the responsibility to the workers of their personal safety, and security of much needed medical treatments and compensatory remedies?

If so, it will be apparent the harm incurred by these nuclear workers to be an intentional, deliberate, malicious aforethought if this petition is denied.

My final question is can your conscience, soundly escape them today having the authority to right the wrongs that they themselves cannot? Or can you too justify it, knowing we have and are "killing our own?"

We should make an honest effort to compensate these workers/victims of our nuclear weapons production. They did their part to be faithful to us in the name of our national security it is now our turn to be faithful to them.

It was the cold war workers who allowed us as a nation to maintain our safety and because of that we gained, but with our gain they have lost. Lost their lives, quality of life, health, and personal safety.

I as an American cannot forgo a scripture in Ecclesiastes viii that clearly reminds me of our responsibility to them; "In the day of prosperity be joyful, but in the day of adversity, consider."

Please consider them now and grant this special exposure cohort.

THE FORMER WORKERS' CLAIM FOR RELIEF

1.No site profile of the Hematite facility has been performed.

{EXHIBIT A-19} without a site profile an accurate dose reconstruction cannot be obtained.

2.The workers were exposed to highly radioactive materials (natural and Man-made) and toxic (including volatile organic chemicals).workers were not given proper protective clothing and working equipment. **{EXHIBITS A1-3,A-6,A-7,A-34}**

A photo of deceased employee/Claimant as shown in the issue who was working with highly enriched uranium without any protective gear. lied 2001 of stomach cancer, his surviving spouse filed a claim in which has also been denied. {EXHIBIT A-8, A-34}

3.The employees did not receive routine internal monitoring such as bio assays, blood Samples, and breath test. Some did not even have urinalysis.

{EXHIBITS-A1-3,A-5,A-6 AFFIDAVITS}

4.The former Atomic Energy Commission, the Department of Energy, the Nuclear regulatory Commission nor NIOSH has thorough personnel or environmental monitoring Data **{EXHIBIT A-9}** states

"your claim that was not involved in dosimetry or dose reconstruction in the site represented in your claim".

5.As far as we know, NO Hematite personnel radiation dose records have been provided To NIOSH and possibly do not exist therefore, it is quite conceivable that a fair and accurate dose reconstruction cannot be obtained with sufficient accuracy because data is

lacking for this site. NIOSH had informed that the only dosimetry and whole body counts were the record ıad furnished himself. **{EXHIBIT A-3 #8 ıffidavit, EXHIBIT A-19 UNITED NUCLEAR CORP'S "NO" RESPONSE AS STATED ON DOSE ACTIVITY REPORT JANUARY 2007, EXHIBIT A-9 LETTER FROM DEPT. OF HEALTH AND HUMAN SERV. TC MARCH 27,2008}**

6..Because the Hematite site was so contaminated as early as 1956, In a letter dated 1973 the Hematite site was to be decommissioned **{EXHIBITS A31-32 GULF UNITED DECEMBER 27 LETTER DATED 1973, FEBRUARY 6, 1974}** and dismantled but instead remained active as a commercial manufacturer until 2000 without a proper decommissioning. Residual contamination is evidently present and just as radioactive today.

7. Employees- both salary and hourly, union and nonunion, during the time frame of 1958 to the present, should be included in the special exposure cohort due to the residual contamination that presently remains at this site as of 2006 and beyond. **{EXHIBITA-13**

8.A report sent from Westinghouse dated 11-14-2006 including an "alleged" bioassay of dated January 1967-Dec. 1971 could in fact be a falsified document as claims he never participated in giving a urine sample with the exception of initial hiring. **{EXHIBIT A-3 #8 AFFIDAVIT}**

9. "Beryllium metal has been an important material for atomic weapons production, and it was used at many places throughout the production system". Federal register Vol. 66, No. 11/Wednesday, January 17, 2001/Notices. **{EXHIBIT A63-64}**

10. Past records indicate that beryllium was present at the Hematite Site. **January 2007 Remedial Investigation Report Rev 1, Volume 1{EXHIBIT A-51}**

11.There is belief that an investigation that an inclusion of a Be designation is warranted for the Hematite Site. The Petitioners respectfully request the Department of Energy and the Department of Labor to add a Be designation to the present AWE.

12. Petitioners respectfully request the National Institute of Occupational Health give a favorable evaluation and award this Special Exposure Cohort Petition for the Hematite Site.

13. Petitioners respectfully request that the above named agencies provide any further and other relief that Jurisdiction, Act, Orders, or new information can allocate to completely make provisions for all employees of the Hematite Site that deem just and proper.

Respectfully Submitted this 13th day of June, 2008

To

15-08

I have received the final dose reconstruction report from NIOSH (NIOSH). There are assumed statements in this report that I do not agree with.

#1 The assumption that I had routine urine samples taken quarterly is not true. The only time that I had a urine sample taken was at the beginning of my employment which was a prerequisite for being hired. Included was a routine CBC, Chest X-ray and urine analysis, all performed @ Jefferson Memorial Hospital.

#2 Blood tests were run only once a year during my employment at United Nuclear Corp. This also was taken and analyzed by Jeff. Memorial Hospital.
A whole-body count was run only once, to my knowledge, during my employment at United Nuclear between 1967 and 1971.

#3 For external radiation monitoring, we wore one dosimetry badge, There was no other Radiation monitoring done in addition to this. There was much speculation as to the accuracy of these badges.

#4 There were times when we were running analysis under the hoods when the blowers did not work. However we were required to continue running the analysis.
I also performed sieve analysis w/o a hooded box despite the fact that these sieve trays opened and dust escaped into lab.
I and other workers had to go outside lab to get plastic bags which contained filters and containers of uranium to be gamma counted.

Quite often, these plastic bags had broken open and when they were brought into the lab. ore dust spilled out. I would then have to clean up the dust without any protective clothing, and I do not recall any air monitoring done during this procedures,

#5 The location of the lab where we performed analysis on 99.97% high-enriched uranium became so "HOT" that it had to be relocated to another area.

JANA MORRIS
COMMISSION # 05487005
NOTARY PUBLIC-NOTARY SEAL
STATE OF MISSOURI
COUNTY OF NEW MADRID
My Commission Expires: October 31, 2009

Above statements are all true to the best of my Knowledge

Subscribed and sworn to before me this
16 day of APRIL 2008
Jana Morris Notary Public
In and for the county of New Madrid
State of Missouri

#6 In addition, since we were not furnished with rubber gloves we had to pass through a geiger counter outside the locker room before exiting the plant. If the alarm sounded on the Hand Geiger counter, I often had to scrub my Hands with Sodium Carbonate until I could pass thru Counter. Also there were no breathing Tests Taken for Thorium & Radon while I was employed at United Nuclear

#7 I Received a letter from (Niosh) dated March 27, 2008 informing me that sufficient information is available to begin dose Reconstruction for my claim. I called (Niosh) Mon. 4-7-08 and left a message since I didn't get to speak to anyone. I then called again on Tue. 4-8-08 and was Told by the woman I Talked to that my dose Reconstruction had been Completed. She said a letter would be sent out within 2 or 3 days. Then on Wed. 4-9-08 at 10:00 A.M a person named (Tonia) called me from (Niosh) to tell me that dose Reconstruction had been Completed that Morning. In the course of our conversation she also Told me that my Results were less than 50% and that I could appeal my Claim. However she said of those who had Previously appealed, only 2 or 3 had any success in overturning this decision.

On 4-16-08 the pending interview with (WIOSH) on my dose Reconstruction was with (Sherry) The interviewer. She stated that the only Records of the dosimetry and whole body Counts were the Records which I furnished them. However, a letter from Westinghouse dated NOV. 14-06 Containing a report of a body Count was sent to Robyn Thogmartin Claim Examiner, DOL Denver Co. This Report was dated MAY 23 1972 the Results of the URINARY bio-ASSAY were FROM JAN 1967-DEC 1971 I believe these Records to be falsified Readings because no URINE SAMPLES WERE TAKEN FOR this Bio-ASSAY.

Subscribed and sworn to before me this
16 day of APRIL, 2008
Jana Morris Notary Public
in and for the county of New Madrid
State of Missouri

JANA MORRIS
COMMISSION # 05487005
NOTARY PUBLIC-NOTARY SEAL
STATE OF MISSOURI
COUNTY OF NEW MADRID
My Commission Expires: October 31, 2009

GULF UNITED
NUCLEAR FUELS CORPORATION

ROUTE 21-A
HEMATITE, MISSOURI 63047
314-296-5640

In Reply Refer to
NLS:DGD-72-55

May 23, 1972

In accord with the provisions of the Atomic Energy Commission Regulations entitled "Standards for Protection Against Radiation" (10 CFR Part 20), this letter will inform you of your exposure to radiation and radioactive material while employed by or assigned to Gulf United Nuclear Fuels Corporation (formerly United Nuclear Corporation), Hematite, Missouri facility licensed under AEC License SNM-33. You should preserve this report for future reference.

Name (of record):
Social Security Number:
Period of Employment
or Assignment:

Exposure to External Radiation

Period of Exposure	Whole Body Exposure	Exposure, Skin of Whole Body
57 - 71	0.330 Rem.	0.330 Rem.

Internal Exposure to Radiation

Urinary bio-assay has been used to measure internal exposure to radiation. Your average urinary bio-assay level for the above listed period of exposure was 9 dpm/liter. This may be compared to the plant action level of 100 dpm/liter. No standards for interpretation of bio-assay levels have been adopted by radiation protection authorities.

Other methods for assessing internal exposure may have been used. In this case, the results and estimate of exposure may be found in Attachment I. Attachment I is [ ], is not [X] attached.

Very truly yours,

David G. Darr

David G. Darr
Health Physics Specialist

DGD/jf

April 21, 2008

To whom it may concern:

This statement is to explain how my employer monitored my exposure to radioactive material during the time I was employed at the United Nuclear Facility at Hematite, Missouri. Though my employment was from 1968 to 1971, I will hereby address the period from 968 throug 969.

I was provided with a dosimeter which I wore pinned to the front of my coveralls. The patch it contained was collected periodically (possibly once a month.) I was never informed of the results from testing of these patches.

At the end of each workweek I took home a specimen bottle, which I returned at the beginning of the next workweek with a urine sample. I was never informed of the results of those samples, if, indeed they were analyzed.

I was never tested for thorium or radon. I was never given a breath test.

I was sent to the company doctor for a routine physical exam annually.

personally appeared before me

on 4-21-08

ERIKA NEWELL
Notary Public - Notary Seal
State of Missouri
Commissioned for Cape Girardeaus County
My Commission Expires: July 01, 2011
07167815

Erika Newell
Notary Public for
the State of Missouri

4/20/08

I WAS EMPLOYED BY UNITED NUCLER. WAS A EMPLOYEE AT HEMATITE PLANT FROM 1962 - 1995. HAD ANNUAL PHYCIAL BY COMPANY DOCTOR. BUT RECIEVED NO RESULTS THAT I RECALL. TO MY KNOWLEDGE WAS NEVER CHECK FOR RADIUN ARE THORIUM. NO BREATH TESTS ARE INTERNAL MONITORING. DID HAVE URINE TEST. HAD WHOLE BODY COUNT YEARLY. HAD HANDS CHECK UPON LEAVEING PLANT. SOME MONTHLY EMPLOYEES HAD PANTS POCKET CHECK AND HAD HIGH READINGS. HAD TO WEAR COMPANY CLOTHES HOME.

4/21/08

EMILY ADLER NOTARY PUBLIC NOTARY SEAL COMMISSION #07350610 MY COMMISSION EXPIRES 11/06/2011 JEFFERSON COUNTY STATE OF MISSOURI

Emily Adler 4/21/08
Notary Public
Jefferson County Missouri
Commission Expires 11/06/2011

Report
Death of
An employee of Hematite Nuclear Plant

am writing this report in reference to the death of my husband, died as a result of exposure to a toxic substance he inhaled while on duty as a security guard at the Hematite Nuclear plant. worked there twenty one years and two weeks before his retirement.

The incident which caused the exposure occurred as he was making his rounds of the plant and discovered a leaking anhydrous ammonia tank was told to find the shutoff valve and to turn it off. In his attempt to find the valve, he was overcome by toxic fumes.

doctors have stated that his lungs were irreversibly scarred by these toxins and that he died from this exposure about ~~five~~ several years after the incident. He was on oxygen the last two years of his life.

Workers were not informed of the dangerous materials to which they were exposed. They were not furnished masks or other protective devices when working in those high risk areas.

retired on 1988 and died 2002. An autopsy was performed and it confirmed that death was due to inhalation of a toxic substance causing scarring of lung tissues.

I have his x-rays and medical records which show the deterioration of his lungs from the exposure to the toxins and his death.

It is my belief that more could have been done to keep my husban as well as other employees of the Hematite Nuclear Plant safe, that the company was negligent in this regard and that my husband died because of this negligence.

Sincerely Yours

June 11th, 2008

6/12/08

MICHELLE PRATT
Notary Public - Notary Seal
State of Missouri
Jefferson County
My Commission Expires Jan. 7, 2010
Commission # 06552589

A-7

AFFIDAVIT

I im the survivin who was an employee of United Nuclear and had worked at the Hematite Site from 1957-2000 as a

worked with highly enriched uranium as part of the special projects that were performed there as part of government contracts as well as commercial.

worked at this facility for many years without proper protective gear (gloves, respirators, etc.) as you may see in the company's f
photo working bare handed, that was taken of him.

died of stomach cancer 2001

As a surviving spouse, I had filed a claim with the EEOICA May 5, 2003.

As of this day, June 6, 2008 my claim has not been paid.

meets all requirements as part of this compensation program having worked 250 days, in the covered time frame, and has a diagnosis of a covered cancer.

I myself also have been diagnosed with multiple myeloma which may have been caused secondary exposure.

NOTARY:
State of MISSOURI
County of JEFFERSON
Subscribed and sworn to before me this 13 day of June in the year 2008.

Deborah K. Guenther
Deborah K Guenther

DEBORAH K. GUENTHER
Notary Public - Notary Seal
STATE OF MISSOURI
Jefferson County
My Commission Expires: 6-29-08

A-8

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

National Institute for Occupational
Safety and Health
Robert A Taft Laboratories
4676 Columbia Parkway
Cincinnati, OH 45226-1998
Phone: 513-533-8426
Fax: 513-533-6840

March 27, 2008

As the Public Health Advisor assigned to your case, I would like to update you on the current status of the claim you filed under the Energy Employees Occupational Illness Compensation Program Act (EEOICPA). The National Institute for Occupational Safety and Health (NIOSH), Office of Compensation Analysis and Support (OCAS), has recently reviewed your claim file and determined that sufficient information has been gathered from the available records sources and we can now begin the dose reconstruction for your claim.

To avoid the potential for actual or perceived conflict or bias issues in our dose reconstruction effort, we have established a policy of selecting a Health Physicist(s) to work on the dose reconstruction for your claim that was not involved in dosimetry or dose reconstruction in the site(s) represented in your claim. A copy of our Statement of Policy, its implementation plan, and staff Conflict or Bias Disclosure Statements can be found on our Web site at http://www.cdc.gov/niosh/ocas/ocascobs.html, or can be obtained by calling me at the number listed below.

Once the dose reconstruction report is completed, you will receive a copy of the report for your review and have an opportunity to comment on the report at that time.

If you have any additional questions regarding your claim, please feel free to contact me or my team at 513-533-8426. I can also be contacted through the NIOSH OCAS email address: ocas@cdc.gov. Additional information on OCAS can also be found on our Web site at http://www.cdc.gov/niosh/ocas.

Sincerely yours,

April Jenkins
Public Health Advisor
National Institute for Occupational Safety and Health (NIOSH)
Office of Compensation Analysis and Support
1-800-232-4636

A-9

NIOSH OCAS

NIOSH Report of Dose Reconstruction under the Energy Employees Occupational Illness Compensation Program Act (EEOICPA)

NIOSH ID:	Social Security No.	DOL District Office
		Denver

Energy Employee Name:

Covered Employment: 1967 - 1971 — United Nuclear Corp. Hematite, MO

Cancer:

Calculations Performed By:	Joseph N. Dickey	03/18/2008
Peer Review Completed By:	David Allen	03/28/2008
Dose Reconstruction Approved By:	Peter A. Darnell, CHP, RRPT	4/8/2008

Introduction

The Energy Employees Occupational Illness Compensation Program Act of 2000 (EEOICPA), Executive Order No. 13179, and the Radiation Dose Reconstruction Rule (42 CFR 82)[1]

EEOICPA established a compensation program to provide a lump sum payment of $150,000 and medical benefits as compensation to covered employees suffering from designated illnesses incurred as a result of their exposure to ionizing radiation, beryllium, or silica while in the performance of duty for the Department of Energy and certain of its vendors, contractors, and subcontractors. This legislation also provided for payment of compensation to certain survivors of these covered employees.

In Presidential Executive Order No. 13179, the President designated the U.S. Department of Labor to administer this program for claims by current and former employees of nuclear weapons production facilities and their survivors who seek compensation for cancers caused by radiation exposures sustained in the performance of duty. The Executive Order also directed the Department of Health and Human Services to estimate (reconstruct) the radiation doses received by these employees. The Department of Labor uses the reconstructed radiation dose in evaluating whether the employee's cancer was at least as likely as not related to employment at the facilities covered by EEOICPA. To fulfill the responsibilities assigned to the Department of Health and Human Services, the National Institute for Occupational Safety and Health's (NIOSH) Office of Compensation Analysis and Support (OCAS) completes dose reconstructions using the methods described in the Radiation Dose Reconstruction Rule (42 CFR 82)[1] for the Department of Labor's use in making compensation decisions.

The Purpose of Radiation Dose Reconstruction

A radiation dose reconstruction is used to estimate the radiation dose received by the specific organ(s) in which a worker developed cancer, particularly when radiation monitoring data are unavailable, incomplete, or of poor quality. Even in instances when radiation dosimetry data are available, they rarely specify dose to an organ and often are based on monitoring procedures that do not meet modern standards.

The basic principle of dose reconstruction is to characterize the occupational radiation environment to which a worker was exposed using available worker and/or workplace monitoring information. In cases where radiation exposures in the workplace environment cannot be fully characterized based on available data, default values based on reasonable scientific assumptions are used as substitutes.

EEOICPA recognized that the process of estimating radiation doses would require dealing with uncertainties and limited data and thus required that the government establish methods for arriving at reasonable estimates of radiation dose received by an individual who was not monitored or inadequately monitored for exposures to radiation, or for whom exposure records are missing or incomplete. To the extent that the science and data involve uncertainties, these uncertainties are typically handled to the advantage, rather than to the detriment, of the claimant. NIOSH has used the best available science to develop the methods and guidelines for dose

reconstruction. These methods have been reviewed and commented upon by the public, including experts in the field of dose reconstruction, and the Presidentially-appointed Advisory Board on Radiation and Worker Health.

How Radiation Doses Are Reconstructed

NIOSH reconstructs radiation doses by evaluating all available, appropriate data relevant to the employee's radiation exposure. Some examples of data that may be included in the dose reconstruction include, but are not limited to, internal dosimetry (such as results from urinalysis), external dosimetry data (such as film badge readings), workplace monitoring data (such as air sample results), workplace characterization data (such as type and amount of radioactive material processed), and descriptions of the type of work performed at the work location.

Although the specific methods used for each dose reconstruction may vary, after a claim has been referred by the Department of Labor to NIOSH for a dose reconstruction, NIOSH typically requests the worker's personal radiation monitoring information from the Department of Energy. Upon receipt of the requested information, at least one voluntary informational interview with the claimant and/or survivors is conducted and a copy of the interview report is sent for review. After all of the necessary and available information is gathered, a dose is estimated, using the methods in the Radiation Dose Reconstruction Rule. After a NIOSH health physicist reviews the information, methods, and results, the claimant receives a draft copy of the dose reconstruction report followed by a concluding interview, during which the claimant can add any additional relevant information that may affect the dose reconstruction. If the claimant certifies that he/she has completed providing information and that the record for dose reconstruction should be closed, a final dose reconstruction report is sent to the claimant, the Department of Labor, and the Department of Energy.

As applied in the EEOICPA, dose reconstructions must rely on information that can be developed on a timely basis and on carefully stated assumptions. Therefore, the guiding principle in conducting these dose reconstructions is to ensure that the assumptions used are fair, consistent, and well-grounded in the best available science, while ensuring that uncertainties in the science and data are handled to the advantage, rather than to the detriment, of the claim when feasible. When dose information is not available, is very limited, or the dose of record is very low, NIOSH may use the highest reasonably possible radiation dose, based on reliable science, documented experience, and relevant data, to complete a claimant's dose reconstruction. In other instances, NIOSH may not need to complete fully a dose reconstruction because a partial dose reconstruction results in an estimated dose which produces a probability of causation of 50% or greater.

How Radiation Dose Reconstructions Are Used in Final Compensation Determinations

The results of an employee's dose reconstruction are used by the Department of Labor to determine the probability that a worker's cancer was "at least as likely as not" due to his/her occupational exposure to ionizing radiation during employment at a covered facility. Criteria and guidelines for making this determination are established by EEOICPA and the Probability of Causation Guidelines (42 CFR 81).[2] The dose reconstruction is not the final determination of a claim, but rather an interim product that is used by the Department of Labor in making its final

decision. Final determinations are made by the Department of Labor based on standards determined by EEOICPA and its implementing regulations.

Dose Reconstruction Overview

The Office of Compensation Analysis and Support has performed a dose reconstruction for in accordance with the applicable requirements of the Energy Employees Occupational Illness Compensation Program Act (EEOICPA). Information provided by the Department of Labor (DOL) indicates that worked as chemical quality control technician at United Nuclear Corporation fro 1967 throug 1971 and was diagnosed with urinary bladder cancer on 2003. Per the requirements of 42 C.F.R. § 82.10(j),[1] only the dose incurred up to the point of cancer diagnosis was included in this assessment.

From 1958 to 1969, the United Nuclear Corporation processed uranium scrap for the AEC, recovering enriched uranium from it for use in the nuclear weapons complex. Residual radioactivity was assumed to remain at the site until 2006. dose reconstructed under the EEOICPA was 1.120 rem to the urinary bladder. The dose was calculated only for the urinary bladder because of the specific type of cancer associated with this claim.

occupational radiation dose was reconstructed based on current science, documented experience, and relevant data. Under these assumptions, NIOSH has determined that further research and analysis will not produce a level of radiation dose resulting in a probability of causation of 50% or greater. Per 42 C.F.R. § 82.10(k),[1] NIOSH has determined that sufficient research and analysis have been conducted to consider this dose reconstruction complete.

If the facts surrounding this dose reconstruction change (e.g., the date of diagnosis is modified or an additional covered cancer is diagnosed), the measures used to reconstruct the dose may not be applicable.

Information Used

Specific parameters were applied to available site records in order to assign organ dose based on information in the NIOSH External Dose Reconstruction Implementation Guideline,[3] the NIOSH Internal Dose Reconstruction Implementation Guideline,[4] and NIOSH Radiation Exposures Covered for Dose Reconstructions under Part B of the Energy Employees Occupational Illness Compensation Program Act Implementation Guideline.[5] The modeled organs were selected based on information in the Technical Information Bulletin: Internal Dosimetry Organ, External Dosimetry Organ, and IREP Model Selection by ICD-9 Code.[6] The primary sources of information used for this dose reconstruction were dosimetry summary from his employment at United Nuclear Corporation and the Technical Basis Document: Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium, Appendix D, United Nuclear Corp.,[7] prepared for the EEOICPA project.

In addition to the above information, the record of the computer assisted telephone interview was reviewed carefully by the dose reconstructor and considered in the dose estimation process.

Dose Estimate

External Dose

External dose is received from radiation originating outside the body and is typically measured by dosimetry worn on the body. Such radiation doses may have been delivered quickly (acute exposure) or slowly over the period of time that the employee was exposed (chronic exposure).

A dosimetry summary corresponding tc employment at United Nuclear Corporation indicated his total measured whole body dose to be 0.330 rem. An external dose summary for 1970 indicated that 0.120 rem of that exposure was received in 1970. The contract period with the AEC ended in 1969; therefore, the dose from 1970 was subtracted from the total whole body dose with the remainder included in his dose reconstruction. A correction factor of 20% was added to the recorded dose value to account for possible measurement error. For claimant-favorability this exposure value was applied to one monitoring peric 'st year of employment. To maximize the dose assigned, the remaining monitoring periods throughout his employment were treated as if he were not monitored and assigned the values provided in the Technical Basis Document.[7] The maximum external penetrating exposure values during operations and the residual exposure values from Technical Basis Document: *Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium, Appendix D, United Nuclear Corp.*[7] table D.2 were assigned for this dose reconstruction. These values were developed based on the highest dosimeter reading found for a monthly exposure period at United Nuclear Corporation. External electron radiation exposures were not evaluated in this assessment due to the limited range of electrons in tissue.

Organ doses from photons were assigned as constant[7] values in the claimant-favorable energy range of 30-250 keV, with an organ dose conversion factor (DCF) based on the mode value for Exposure to Organ Dose for the Anterior-Posterior exposure geometry for that energy range. For the purpose of estimating probability of causation, the measured photon doses were assumed to be acute and the assigned photon doses was assumed to be chronic.[3]

The total external radiation dose assigned to the urinary bladder was 0.995 rem.

Occupational Medical Dose

The dose received from diagnostic X-ray procedures that were assumed to be required as a condition of employment was evaluated for the urinary bladder. Based on information in the Technical Information Bulletin: Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures,[8] a medical X-ray procedure was assigned for each year of employment during the contract period with the AEC.

The total medical dose assigned to urinary bladder was 0.075 rem.

Internal Dose

Internal dose is caused by radioactive materials that are taken into the body. A chronic intake is an intake of radioactive material that occurs over an extended period of time (typically weeks or longer). An acute intake is an intake of radioactive material that occurs over a short period of time (typically minutes to hours). Regardless of the rate at which the intake occurs, the internal radiation dose received from radioactive materials having long half-lives occurs over an extended period of time, and is therefore, considered chronic.

A dosimetry summary corresponding tc employment at United Nuclear Corporation indicated he participated in the bioassay sampling program with an average urine sample activity of 9 dpm/L. The assumption was made th rovided routine urine samples on a quarterly basis throughout his employment during the AEC contract. This data was applied to a computer code, the Integrated Modules for Bioassay Analysis (IMBA),[9] to determine annual internal intake values that were then used to develop annual organ doses based on those intakes over the intake period. In addition to this calculated value, the residual airborne contamination intake values were also applied to the internal dose reconstruction from the technical basis document.[7] As a claimant-favorable assumption, uranium-234 was assigned for all of the internal uranium activity. Application of solubility class S produced the most claimant-favorable exposure to the urinary bladder and; therefore, was used for this dose reconstruction. The ICRP 66 lung model with default aerosol characteristics in conjunction with ICRP 68 metabolic models were applied to the IMBA internal dose calculations.

The total internal dose assignec inary bladder was 0.049 rem.

Dose from Radiological Incidents

The computer assisted telephone interview was reviewed carefully by the dose reconstructor. expressed concern of Technetium 99 in the ground water at and around the facility. Technetium 99 (Tc-99) is a recycled uranium product. External radiation due to Tc-99 would have been captured c external dosimetry or on the external dosimetry from which the external exposure values in the technical basis document were developed. Internal exposures due to Tc-99 are accounted for by the internal intake assignment of uranium-234 rather than the actual uranium isotopic composition worked with at United Nuclear Corporation.

No additional information affecting the dose reconstruction was identified.

Uncertainty

Dose values were input into IREP[10] using distribution parameters specified in the site technical basis document.[7]

Summary

was assumed to have been exposed to various sources of ionizing radiation during his employment at the United Nuclear Corporation facility. The estimated dose to rinary bladder was 1.120 rem through reconstruction under the EEOICPA. Attachment 1 contains the dose reconstruction summary sheets that will be used by the Department of Labor to make the final probability of causation determination for the claim.

References

1. 42 CFR 82, *Methods for Radiation Dose Reconstruction Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule, Federal Register/Vol.67, No. 85/Thursday, May 2, 2002, p 22314.

2. 42 CFR 81, *Guidelines for Determining the Probability of Causation Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule, Federal Register/Vol.67, No. 85/Thursday, May 2, 2002, p 22296.

3. NIOSH, (2007) *External Dose Reconstruction Implementation Guideline, Rev 3*, OCAS-IG-001, National Institute for Occupational Safety and Health, Office of Compensation Analysis and Support, Cincinnati, Ohio.

4. NIOSH, (2002) *Internal Dose Reconstruction Implementation Guideline, Rev 0*, OCAS-IG-002, National Institute for Occupational Safety and Health, Office of Compensation Analysis and Support, Cincinnati, Ohio.

5. NIOSH, (2007) *Radiation Exposures Covered for Dose Reconstructions under Part B of the Energy Employees Occupational Illness Compensation Program Act, Rev 0*, OCAS-IG-003, National Institute for Occupational Safety and Health, Office of Compensation Analysis and Support, Cincinnati, Ohio.

6. ORAUT (Oak Ridge Associated Universities Team), *Internal Dosimetry Organ, External Dosimetry Organ, and IREP Model Selection by ICD-9 Code, Revision 02 PC-1*. ORAUT-OTIB-0005, February 10, 2006.

7. Battelle-TBD-6001, *Site Profiles for Atomic Weapons Employers that Refined Uranium and Thorium, Appendix D, United Nuclear Corp., March 14, 2008.*

8. ORAUT (Oak Ridge Associated Universities Team), ORAUT-OTIB-0006, *Technical Information Bulletin: Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures, Rev 02*, December 21, 2005.

9. ACJ Associates, Inc., (2004), *User Manual for IMBA Expert, OCAS-Edition*, ACJ Associates, Richland, Washington.

10. SENES Oak Ridge, Inc. (2007), *User's Guide for the Interactive RadioEpidemiological Program (NIOSH-IREP)*, June 2007.

ATTACHMENT 1: IREP Input Tables

National Institute for Occupational Safety and Health
Robert A. Taft Laboratories
4676 Columbia Parkway, MS C-45
Cincinnati, OH 45226-1998
Phone: 513-533-8426
Fax: 513-533-6840

January 25, 2006

This is your January 2006 Dose Reconstruction Activity Report. It has been sent to update you on the current status of your case and dose reconstruction program. No response or action is required from you at this time. **If you do not wish to receive your Activity Report, please contact our office at 513-533-8426 and we will remove your name from our report's mailing list.**

Your Dose Reconstruction Activity Report has two parts. Part 1 contains information on the current status of your case. This part of your report may remain unchanged if your case has not reached the next step in the dose reconstruction process at the time this report was created. Part 2 is updated in each report to provide you with current information about our dose reconstruction program.

Part 1: Individual Dose Reconstruction Case Status

Major Steps of the Dose Reconstruction Process

The major steps of the dose reconstruction process are listed in the left column. The date that each step occurred is listed in the right column. An "N/A" under "Date Step Occurred" means that the step has not occurred yet.

Steps in the Dose Reconstruction Process	Date Step Occurred
• Case Received from DOL: The Department of Labor (DOL) is responsible for this compensation program. Once a claim has been filed, DOL must first determine if the period of energy employee's employment and medical condition are covered under this compensation program. After DOL determines that a claim involves a covered energy employee with cancer, DOL sends the case to NIOSH for dose reconstruction.	04/26/2004
• Acknowledgement Letter Sent: The letter lets claimants know that NIOSH received the case for dose reconstruction. The letter includes the NIOSH Tracking Number and general information on dose reconstruction.	05/03/2004
• Telephone Interview Conducted: The telephone interview provides claimants with the opportunity to inform NIOSH of any additional information regarding the work history of the energy employee. When we reach the point in our process when we are ready to conduct the interview, we will contact the claimant to arrange a convenient date and time for the telephone interview. Prior to the interview, we will send a detailed copy of questions to help the claimant prepare for the interview.	07/02/2004

- Summary Report from Interview Sent: 07/06/2004

  After the telephone interview has occurred, a summary report of the interview is sent to the claimant. The claimant is asked to review the report and provide comments and additions if necessary.

- Conflict of Interest Letter Sent: N/A

  This letter will be sent to the claimant explaining our Conflict of Interest Policy—that a dose reconstruction will not be assigned to a Health Physicist who worked at the same covered facility as the energy employee represented in the case.

- Case Assigned to Health Physicist for Dose Reconstruction: N/A

  This indicates the date that NIOSH assigned the case to a Health Physicist for dose reconstruction. Once the dose reconstruction is completed for a case, a draft report is sent to the claimant. Once the draft dose reconstruction report has been sent, claimants will no longer receive a Dose Reconstruction Activity Report.

Employment and Exposure Information

The table below provides information on when a request for the energy employee's exposure monitoring records was submitted and when NIOSH received a response to the request for records. Under the "Employer Accepts Requests for Exposure Monitoring Information" section, there may be a "No" listed. "No" can mean:

1. The employer does not accept requests because it does not have any exposure monitoring information.
2. A point of contact for obtaining the exposure monitoring information has not or cannot be established with the employer.
3. NIOSH already has possession of all monitoring information.

Employer(s) Verified By DOL	Employer Accepts Request for Exposure Monitoring Information	Date Request for Exposure Monitoring Information Sent	Date Exposure Monitoring Response Received
*United Nuclear Corp.	No	N/A	N/A

*Hundreds of thousands of documents have been collected that may contain information on the worksite(s) indicated above (*). In an effort to sort through this information in a timely manner, NIOSH has hired a contractor specifically dedicated to analyzing these documents over the next year. During this time, if the documents can be used to complete dose reconstructions for the worksite(s) identified with an *, we will begin working on the dose reconstruction. If at any time the contractor or NIOSH determines that there is not enough worksite or personal monitoring information available to complete your case, we will notify you that a dose reconstruction cannot be completed and your case will be referred to DOL for a decision without a dose reconstruction. NIOSH will also discuss with you other options for seeking possible compensation that do not require a completed dose reconstruction.

Medical Information

The table below provides information on the energy employee's cancers that were verified by DOL.

Cancer Description	Diagnosis Date
Papillary Transitional Cell Carcinoma of the Urinary Bladder (both posterior & left lateral wal	2003

DOL is responsible for verifying covered employment and medical information for your case. If you have any questions regarding the employment or medical information stated above, please contact either your case examiner with DOL or the District Office where you filed your case.

Cleveland, Ohio	1-888-859-7211	Jacksonville, Florida	1-877-336-4272
Denver, Colorado	1-888-805-3389	Seattle, Washington	1-888-805-3401

1.0 INTRODUCTION

On behalf of Westinghouse Electric Company, LLC. (Westinghouse), Cabrera Services, Inc. (CABRERA) has prepared this Engineering Evaluation and Cost Analysis (EE/CA) to evaluate potential removal action alternatives to address the presence of volatile organic compounds (VOCs) that have been detected in the local aquifer in the vicinity of the Westinghouse Former Fuel Cycle Facility (FFCF).

2.0 SITE CHARACTERIZATION

Site characterization includes discussion of: the Site description and background information; previous removal actions; the source, nature, and extent of contamination; summary of analytical data; the Site conditions justifying a removal action; and a streamlined risk evaluation.

2.1 Site Description and Background

This section is divided into two parts: a general discussion of the entire FFCF (the "Site") and a discussion specifically about off-site groundwater conditions.

2.1.1 Site

The Site is located in the eastern portion of Missouri in Jefferson County near the town of Hematite. (Figure 1 Site Location Map.) It fronts the eastbound lane of Missouri State Road P, between the hills to the northwest and the terrace and floodplain of Joachim Creek to the southeast. The topography slopes gently to the southeast eventually blending with the alluvial floodplain deposits of the Joachim Creek, which runs along the southeastern edge of the Site property and eventually flows into the Mississippi River.

The area surrounding the Site is mainly suburban residential. Groundwater is widely used within four miles of the Site as the primary source of household water for the community. At least 11,771 people are served by public wells in the area, and an estimated 978 people are served by private wells. The closest wells are located within 1/4 mile of the Site.

The facility was opened in the mid-1950's by Mallinckrodt Chemical Works and through the mid 1970's was owned and operated by a variety of entities, including United Nuclear Corporation and Gulf Nuclear Fuels Company. Until the early 1970's, the site was heavily involved in producing uranium for the United States Navy and United States Department of Energy. In the Mid-1970's Combustion Engineering Inc. acquired the property and began commercial nuclear fuel production. Westinghouse purchased the facility in April 2000. There are currently no manufacturing operations at the Site.

Primary functions at the Site throughout its history have included the manufacture of uranium metal and uranium compounds from natural and enriched uranium for use as nuclear fuel. Specifically, operations included the conversion of uranium hexafluoride gas of various ^{235}U enrichments to uranium oxide, uranium carbide, uranium dioxide pellets, and uranium metal.

These products were manufactured for use by the federal government and government contractors and by commercial and research reactors approved by the Atomic Energy Commission. Research and development was also conducted at the Site, as were uranium scrap recovery processes.

2.1.2 Off-Site Groundwater Impacts

In December 2001, the Missouri Department of Health and Senior Services (DHSS) conducted annual radiological monitoring (gross alpha/gross beta) of four private wells near the Site. Samples were also collected for volatile organic analyses at the request of the Department of Natural Resources. Results of that sampling revealed that one of the private drinking water wells sampled by DHSS exhibited VOC concentrations, including tetrachloroethylene (PCE), and trichloroethylene (TCE), above drinking water standards. This well (i.e., Well #3) is located northeast of the FFCF at a residence situated on Westinghouse property and leased by Westinghouse. This well had been last sampled in 1996 for VOCs, and did not contain VOCs at that time. Once informed of this finding, Westinghouse and the Missouri Department of Natural Resources (DNR) conducted follow-up testing. In March 2002, Westinghouse tested an additional 20 wells, five of which were found to be impacted by VOCs, (bringing the total number of affected wells to six). In April 2002, DNR and DHSS sampled additional private wells, while Westinghouse conducted repeat sampling of those previously sampled. Analytical results of this sampling event in April showed no additional private wells were affected. In July 2002, the first round of quarterly sampling was conducted, and detectable levels of VOCs were found in two more wells, bringing the total number of affected wells to eight. Except for the well #3, all of the affected wells are at residences located in the affected area located southeast of the Site. Figure 2 shows the affected area.

The affected wells are all reportedly open to both the Jefferson City Formation and the underlying Roubidoux Formation. Hydrogeologic evaluations of the Site area *(Leggette, Brashears & Graham, Inc., November 2002)* have concluded that groundwater in the Jefferson City Formation has been impacted by the VOCs of interest, whereas groundwater in the deeper Roubidoux Formation generally has not.

Based on these findings, and in consultation with DNR, Westinghouse determined that a time-critical removal action was appropriate to mitigate potential risks to residents in the vicinity of the Site. Westinghouse prepared an Action Memorandum (*Action Memorandum, Former Fuel Cycle Facility, Off-site Groundwater, June 2002)* to document its response. Components of the Action Memorandum are discussed in Section 2.2.

2.2 Previous Removal Actions

Previous investigations are described in detail in the *Action Memorandum, June 2002*. Actions taken subsequent to those investigations are presented below.

Major components of the Action Memorandum that Westinghouse has implemented include the following:

These products were manufactured for use by the federal government and government contractors and by commercial and research reactors approved by the Atomic Energy Commission. Research and development was also conducted at the Site, as were uranium scrap recovery processes.

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Major components of the Action Memorandum that Westinghouse has implemented include the following:

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

Tc pp. 6-7

November 24, 1978

excerpt

Mrs. Leo Drey
515 West Point Avenue
University City, MO 63130

Dear Mrs. Drey:

This is in response to your letters dated October 13 and 18, 1978, requesting additional information about our inspection program for the Combustion Engineering uranium fuel fabrication plant at Hematite, Missouri.

Enclosed with this letter is a copy of our most recent confirmatory measurements inspection of September 20 and October 17, 1978. Included in that report are results of environmental and effluent samples which were collected in May of 1978. Additionally, we are enclosing a copy of the final Environmental Impact Appraisal as requested in your letter.

The NRC has accepted the invitation of the Missouri Clean Water Commission to participate in a public hearing regarding public concerns over Combustion Engineering's radioactive effluent discharges. The meeting is tentatively scheduled for 1:00 p.m. on November 30, 1978, in Hillsboro, Missouri.

We hope the enclosed information will be helpful in resolving your concerns about this facility.

Sincerely,

James G. Keppler

James G. Keppler
Director

Enclosures:
1. Responses to questions
2. Final Environmental Impact Appraisal
3. IE Inspection Rpt No. 70-36/78-07

cc w/encl 1:
W. Lamar Miller, Ph.D., USEPA Region VII
Richard F. Rankin, MCWC
J. G. Davis, Acting Director, IE
J. H. Sniezek, IE
J. B. Martin, NMSS

(1)

A-23

re Hematite [redacted] from [redacted] Keppler - NOV. 24, '78

during 1975 (the values in the EIA), and is well within the 25 mrem per year environmental dose limit for uranium fuel cycle facilities to be imposed by the USEPA (40 CFR 190) on December 1, 1979.

Question 4.b

b. *According to your letter of July 19, 1978, Combustion Engineering was discharging an average of 35 gallons per day of radioactive waste water into its two evaporation ponds at that time. A year earlier when the draft EIA was published (February 14, 1977), apparently 100 gallons were being discharged per day into the ponds. Is there a limit on the number of gallons CE is allowed to discharge per day or year to the ponds - - or may any number of gallons be discharged as long as the concentration level in each gallon (in microcuries per milliliter of gross alpha or gross beta) is kept within the limits you mention? Would an increase in the number of gallons per day not cause an increase in the buildup of radioactivity accumulating in the pond? If there is a limit to the number of gallons allowed for the present plant, will this limit be increased when the plant's capacity is doubled as planned?*

Answer 4.b

There is no limit to the number of gallons that may be discharged to the evaporation ponds. An increase in gallons would result in an increase in radioactivity in the ponds, assuming concentrations remained unchanged.

Question 4.c

c. *According to the formula on page 3-13 of the EIA, it seems that the concentration limits of gross beta and gross alpha must each be reduced if both beta and alpha emitters are present in the wastes. The method mentioned is to keep the waste "quarantined in 55-gallon drums until the contained radionuclides decay to acceptable levels," before discharging the wastes to the ponds. With the half-lives of uranium and thorium lasting for millenia, I cannot imagine how many drums would be needed to store the radwaste until sufficient decay has taken place. Do you know how many drums are at the Hematite site now, and how many more are planned for the expanded facility? Is there a limit?*

Answer

The situation that you are referring to in your question has been resolved. An elevated gross beta activity in waste solution from UF_6 cylinder heel washing was discovered in early 1976. At that time, the licensee believed the source of the activity to be coming from Th-234 (first daughter of U-238). It was expected that this activity (half-life of 24 days) present in the wash solution would decay to acceptable levels in less than one year. Therefore, the licensee planned to store approximately 5000 gallons of this waste solution in 55 gallon drums. The first 600 gallons were stored for six months and the expected decay did not take place. The

licensee then sent samples to a consultant laboratory for analysis. The results indicated that the elevated gross beta activity was due to Tc-99 (half life of 2.1×10^5 years).

The licensee pursued this matter with NRC's Office of Nuclear Material Safety and Safeguards to clarify authorization to possess and process this waste. NRC granted permission to dispose of this waste. The waste was filtered through an ion exchange column and disposed of via the site evaporation ponds. All discharges were within the limits of 10 CFR 20, Appendix B, Table II. No credit was taken for adsorption on the soil beneath the ponds or for dilution in the ground water.

Question 4.d

d. *Would you please tell me what levels of beta and alpha the NRC inspectors have found when they have tested the liquid radwaste discharge prior to its release into the ponds? When were these tests last performed?*

Answer

We did not collect a sample of radwaste discharge to the evaporation ponds. Samples were collected from the laundry waste tank and the site pond for comparison with the licensee's results. These comparisons are presented in Table II of the attached inspection report.

Samples were taken from these sources because they represent the majority of radwaste liquid discharge directly to the environment. Comparative samples of radwaste discharges to the evaporation ponds will be collected during a future inspection.

Question 4.e

e. *Is fresh water used to dilute the liquid radwaste prior to its being measured for discharge to the ponds? If so, what is the ratio of fresh-to-contaminated water?*

Answer

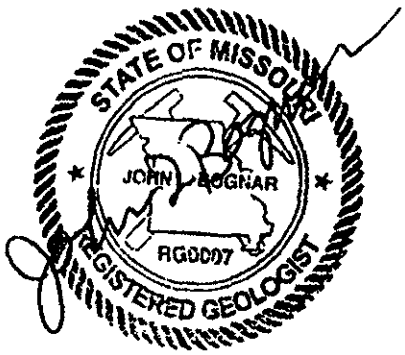
Effluents from the wet scrubber system and UF_6 cylinder heel washing and processing operations in Building 240 are discharged to evaporation ponds located within the fenced plant area. Prior to discharge, this waste water is analyzed to ensure that uranium concentrations are within 10 CFR 20, Appendix B, Table II limits. There is no fresh water added for dilution purposes to the discharges to the evaporation ponds.

excerpts -

Investigation to Determine the Source of Technetium-99 in Groundwater Monitoring Wells 17 and 17B

Prepared for

Combustion Engineering
Hematite, Missouri



Prepared by

Gateway Environmental Associates, Inc.

September 1996

2088 Craigshire Drive, St. Louis, Missouri 63146, 314/205-8053, FAX: 314/434-7071

A-26

1.0 INTRODUCTION

Combustion Engineering (CE) operates a nuclear fuel rod manufacturing plant near Hematite, Missouri. A topographic site figure showing the general location of the site along with generalized topographic features is included as figure 1-1. A review of figure 1-1 shows that the site is located between the bluffs and floodplain of Joachim Creek. General site topography dips gently to plant south throughout the site. The ground elevation drops sharply into the existing flood plain of Joachim Creek, approximately 400 feet plant south of the plant. Additionally the topographic gradient drops sharply into a tributary of Joachim Creek approximately 200 feet plant east of the plant. Joachim Creek drains into the Mississippi River near Herculaneum.

The facility currently contains a groundwater monitoring network; located predominantly along the plant south and plant east edges of the manufacturing facility. Monitoring well WS17 formerly known as burial pit well number 4 was found to contain groundwater concentrations of Technetium - 99 (^{99} Tc) during previous monitoring events beginning in 1990. Previously, (1982) increased beta activity was detected in a nearby well by an NRC contractor. WS17 may have had a poor surface seal and was located in an area of intermittent standing surface water, therefore it was properly abandoned and replaced with a monitoring well designated as WS17B during June of 1996. WS17B also was found to contain concentrations of ^{99} Tc; indicating the occurrence of ^{99} Tc was not confined to WS17.

This study was conducted to satisfy the Nuclear Regulatory Commission (NRC) who requested additional information concerning the source of the ^{99}Tc as a condition of CE's 1994 licence. An initial assessment identified the evaporation ponds as a potential source of the ^{99} Tc concentration in WS17. However, recent groundwater contour maps developed by Gateway Environmental Associates, Inc. (Gateway) indicate the evaporation ponds are an unlikely source for the ^{99} Tc in WS17 due to the direction of groundwater flow. Additionally, the direction of groundwater flow indicates the likely source for the ^{99} Tc in WS17 is located plant north of WS17. Plant records indicate that areas of scrubber gravel storage, a uranium recovery area and a former ring storage all of which are located plant north of WS17 are likely candidates for the source area.

Scrubber gravel is limestone (calcium carbonate) which is used to neutralize hydrofluoric acid off gasses from the uranium conversion process. Currently large piles of scrubber gravel are located plant south of the former ring storage area. The piles are outside the old fence line.

In order to determine the source of the ^{99} Tc contained in WS17, CE contracted with Gateway. In July, 1996, Gateway formulated a work plan to investigate the source. Based upon historical information provided by CE and recently obtained groundwater flow data, Gateway focused the investigation on the area of the plant located plant north of WS17, plant east of the south vault, plant west of the storage pits and plant south of the building 256 and the loading docks. The results of the investigation are included in this report.

A-27

(p.1-B)

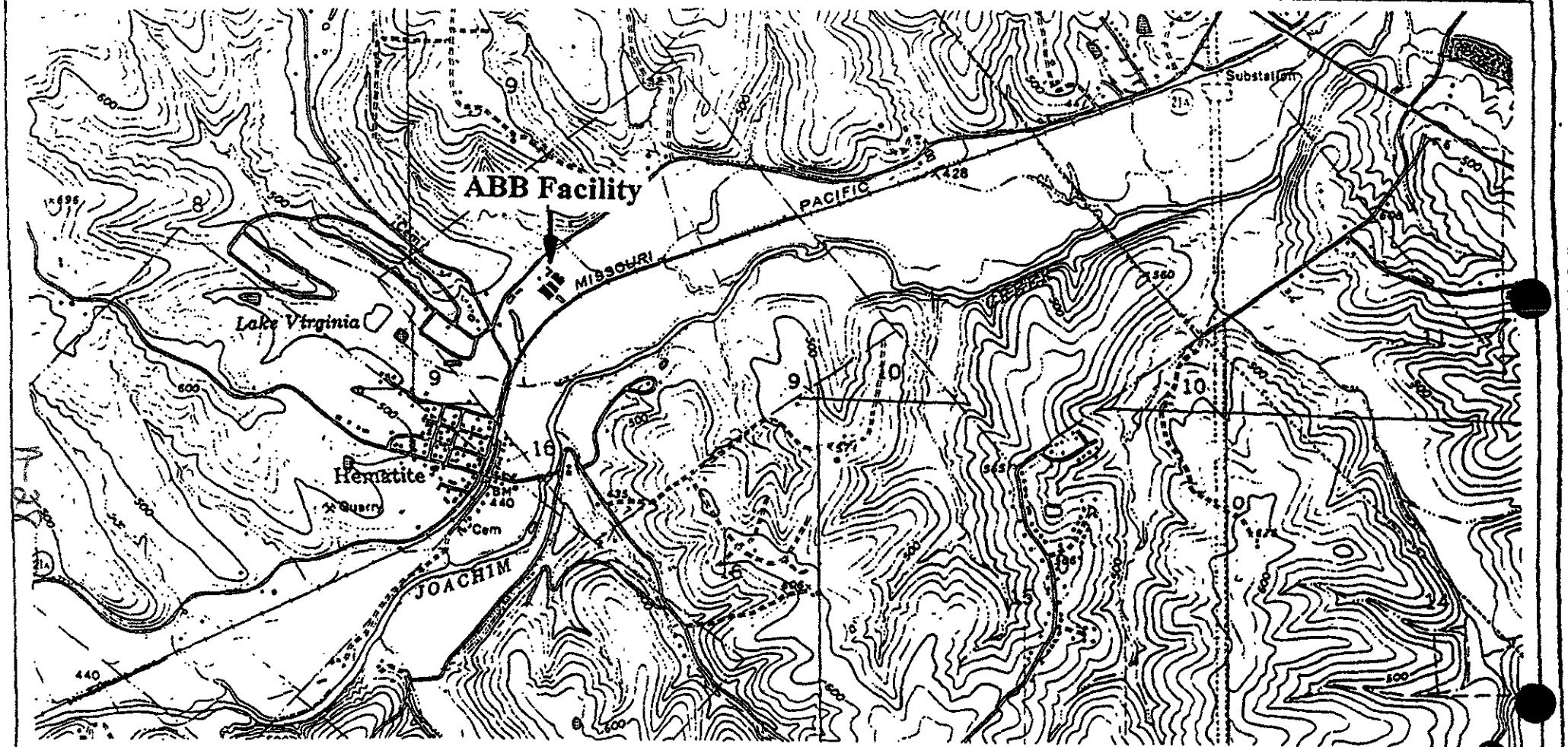


ABB Nuclear Fuels, Hematite

Figure: 1-1

Regional Site Location
Topographic Map
(after USGS)

Gateway Environmental Associates

Scale: 1:24,000 | Date: Sept.11,1996

Prepared by:

Missouri Registered Geologist Seal

0.2

z:\environmental associates, inc. files\maps-figures\1-1

5.0 CONCLUSIONS

In 1982, increased beta activity was detected in groundwater monitoring well RMC 9 by an NRC contractor. In 1996 it was determined that the increased beta activity in WS17 which had replaced RMC-9 was due to ^{99}Tc. It was speculated that surface water accumulations of ^{99}Tc around the vicinity of WS17 during high rainfall events may have introduced ^{99}Tc into the well since the construction details of that particular monitoring well is not known. In June, 1996, WS17 was properly abandoned and replaced with a properly installed monitoring well designated as WS17B. WS17B contained concentrations of ^{99}Tc; indicating the occurrence of ^{99}Tc in WS17 was not confined to WS17..

In August, 1996, Gateway performed a field investigation to assist CE in determining the source of the ^{99}Tc detected in monitoring well WS17/WS17B. This investigation revealed the following:

- An examination of the groundwater contour map (Figure 4-1) and the groundwater iso-concentration map (Figure 4-3) indicates that ^{99}Tc (indicated by gross beta activity) entered the groundwater system within the vicinity of the former ring storage area and traveled down-gradient toward monitoring wells WS17 (abandoned) and WS17B (replacement well). The groundwater mound observed beneath the former ring storage area transmitted a small quantity of the contamination in the direction of plant north (as observed in GWE 2, GWE 8 and WS13). However, the majority of the contaminant migration has been directed to the plant south.

- The center of the plume indicated by highest concentrations of gross beta activity in groundwater is located beneath the former ring storage area.

- The highest concentrations of ^{99}Tc (of the wells that were analyzed for ^{99}Tc) in groundwater is located slightly plant south of the former ring storage area.

- The soils beneath the former ring storage area, with the exception of surface soil samples at GWE-1, GWE-10, and GWE-5, appear to display no residual effects of the contamination above CE's established background concentration (assuming that the contamination was introduced from the surface and that highly soluble forms of ^{99}Tc would still be present.)

- The average surface soil gross beta concentration of 41 pCi/gm in the area of former WS17 and WS17B does not appear to be the cause of the groundwater contamination in that area. The gross beta iso-concentration map (Figure 4-3) indicates that the area beneath WS17/WS17B is located down-gradient of the center of the contamination plume which originates at the former ring storage area. Additionally, a concentration of 41 pCi/gm is only slightly greater than CE's background concentration. Gross Beta concentrations in soil at this level are unlikely sources of groundwater contamination.

- The piles of scrubber gravel are unlikely to be the source of ^{99}Tc contamination in the WS17/WS17B area since they were placed there after the contamination was discovered in RMC 9. Additionally, CE reports that facility personnel have performed leaching tests on the recently placed scrubber gravel. The scrubber gravel appears to leach quantities of ^{99}Tc which are significantly less than those found in the groundwater.

- The source area does not appear to be from a constricted point source, rather is covers a relatively large area. Therefore the area used to extract uranium from the cuno filters is not a likely source.

- The beta activity in the groundwater appears to be from a large area containing a soluble source of ^{99}Tc.

5.1 POTENTIAL EFFECT of ^{99}Tc in GROUNDWATER

- Results of this subsurface and surface investigation indicate the location of the former scrubber gravel storage and former ring storage area as the source of ^{99}Tc found in WS17(B). Because beta activity in WS17B is less than 1/3 of that found in GWE-10, which is located in the former ring storage area, it is apparent that the beta activity in groundwater diminishes rapidly away from the ring storage area.

- Single well hydraulic conductivity analysis performed by Gateway on WS17 B, combined with groundwater hydraulic gradient information as, as well as, as specific stratigraphic and lithologic information, strongly indicate that a hypothetical particle of groundwater has an average linear velocity of approximately two feet per year in the vicinity of WS17B. Even though it is 16 times less than the gross beta activity in WS17B, there is elevated gross beta contamination concentration in GWE-6, which is some two hundred feet plant south of GWE-10.

    - This indicates that ground water transporting the agent of gross beta activity is moving faster than the average liner velocity would suggest, implying that the agent of gross beta activity is probably being transported in a discrete hydrostratigraphic unit of higher relative permeability, perhaps a silt or sand lens.

- Even if the discrete flow path hypothesis factual, surrounding properties are protected by the Joachim Creek. It is located plant south of WS17B and serves as, as a constant head boundary; which acts as a shallow groundwater drain thus protecting surrounding properties from migrating groundwater with remote potential of containing elevated gross beta activity.

- Based upon site specific groundwater flow information and groundwater quality data, Gateway holds the opinion, that it is doubtful that elevated gross beta concentrations sourced at the former ring storage area would reach Joachim Creek before diluting to background concentrations.

GULF UNITED
NUCLEAR FUELS CORPORATION

GRASSLANDS ROAD
ELMSFORD, NEW YORK 10523
914-592-9000

December 27, 1973
In reply, refer to MRA-73-298

U. S. Environmental Protection Administration
1735 Baltimore
Kansas City, Missouri 64108

Attention: Permit Branch

Reference - Application No. MO-LMS-OXL-2-000166

Gentlemen:

This is to advise you that Gulf Oil Corporation is divesting itself of Gulf United Nuclear Fuels Corporation, a wholly-owned subsidiary. As a result, it is our intention to shut-down the Company's plant at Hematite, Missouri in April 1974 and subsequently to decommission it. No liquid effluents are anticipated to be discharged from the plant into Joachim Creek following cessation of operations.

We believe it may be unnecessary, therefore, for you to process our application for a permit. When operations actually cease next year, I shall advise you accordingly.

Sincerely,

Peter Loysen, Manager
Regulatory Administration

PL:am

bc: J. Brennan
D. Darr
J. Rosser

A-31

APR 1975

GULF

NUCLEAR FUELS COMPANY

A DIVISION OF GULF OIL CORPORATION

GRASSLANDS ROAD
ELMSFORD, NEW YORK 10523
914-592-9000

Hematite, Missouri 6304

eply refer to
NIS:DGD-74-23

February 6, 1974

Missouri Clean Water Commission
Post Office Box 154
Jefferson City, Missouri 65101

Attn: Mr. James P. Odendahl

Dear Mr. Odendahl:

Pursuant to our telephone conversation of December 21, 1973, enclosed find an executed application for renewal of the operating permit for our septic system and a check for the permit fee.

As you were advised, Gulf Oil Corporation is divesting itself of Gulf Nuclear Fuels Company (formerly Gulf United Nuclear Fuels Corporation), a wholly owned subsidiary. This will result in shutdown of the Hematite, Missouri, plant in April 1974 and subsequent decommissioning, which is expected to be complete about late 1974.

We will inform you when these operations are completed, and respectfully request that the permit fee be pro-rated and the unused portion refunded.

Additionally, I am returning, uncompleted, the application form for a permit to discharge process liquids into surface waters that was requested by letter from the Clean Water Commission dated November 29, 1973. Termination of our operations will negate the need for this permit.

For your information, I am also enclosing copies of correspondence with EPA on this subject. You may wish to retain this for your file. I believe the above information conforms to your suggested response. Should you have questions, please contact me.

Very truly yours,

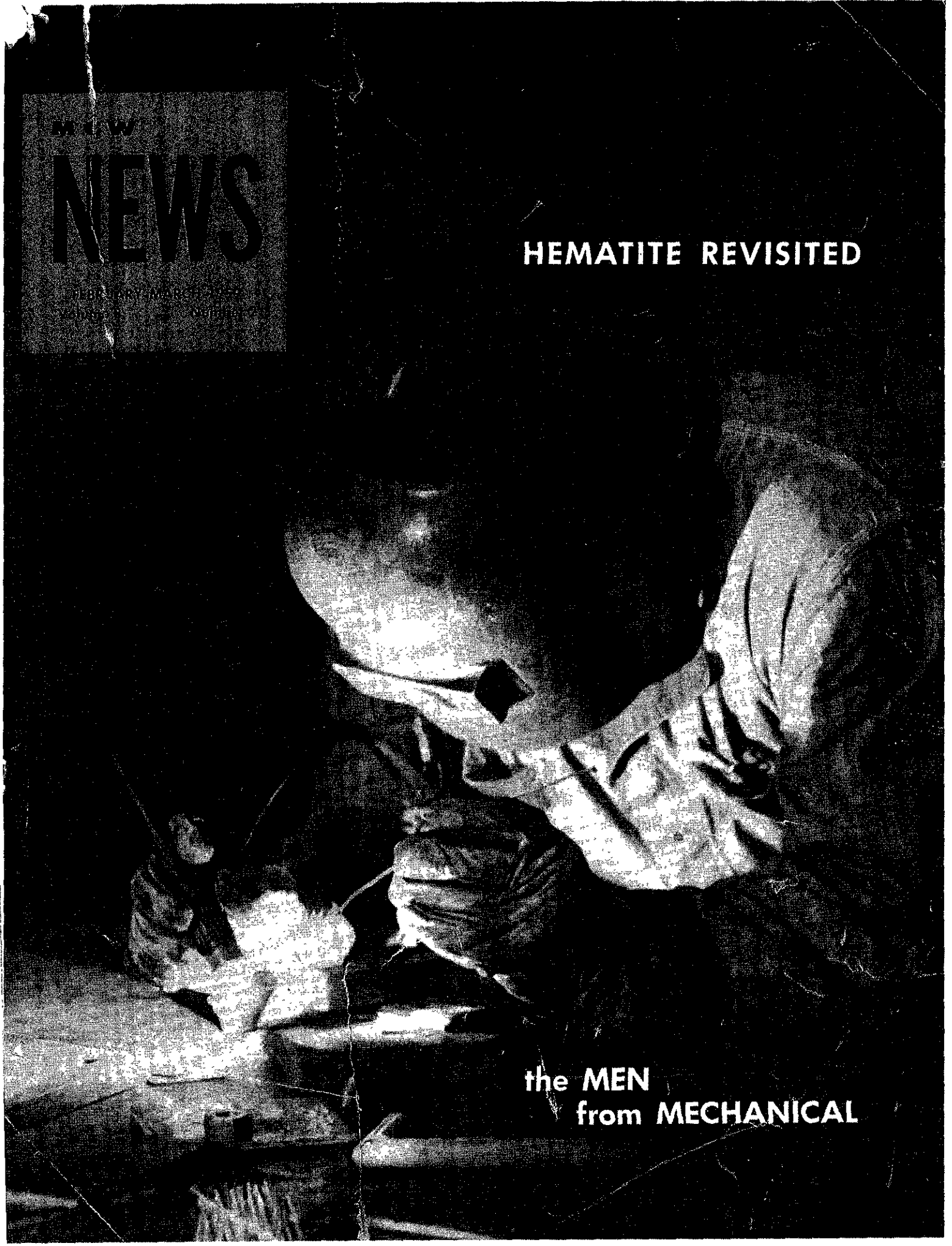
David G. Darr

David G. Darr
Senior Nuclear and Industrial
Safety Representative

DGD/jf

cc: Mr. P. Loysen, Elmsford

A-32


NEWS
HEMATITE REVISITED
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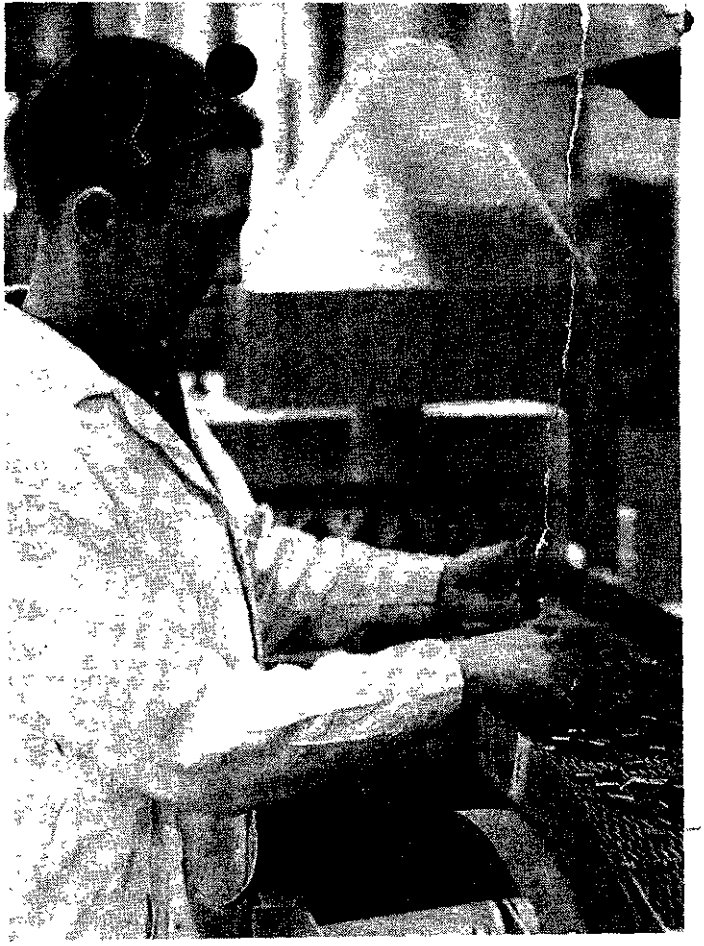
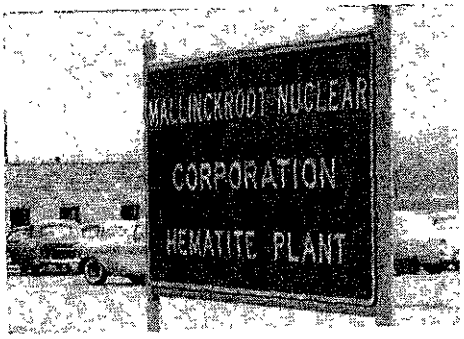


NEW PRODUCT, uranium pellets, is inspected by technician Glenn Frankenbach.



A NEW SIGN with the operation's new name illustrates the changes at our Hematite plant.

HEMATITE REVISITED

DURING STARTUP of the new pelleting plant, engineer Joe Clumpner checks temperature sight tube on sintering furnace.

MONSIEUR Raymond Hauser was amazed. Three years ago, MCW's Lou Horton was telling him, this 150 acres lying in this picturesque valley forty miles from St. Louis was a dairy farm.

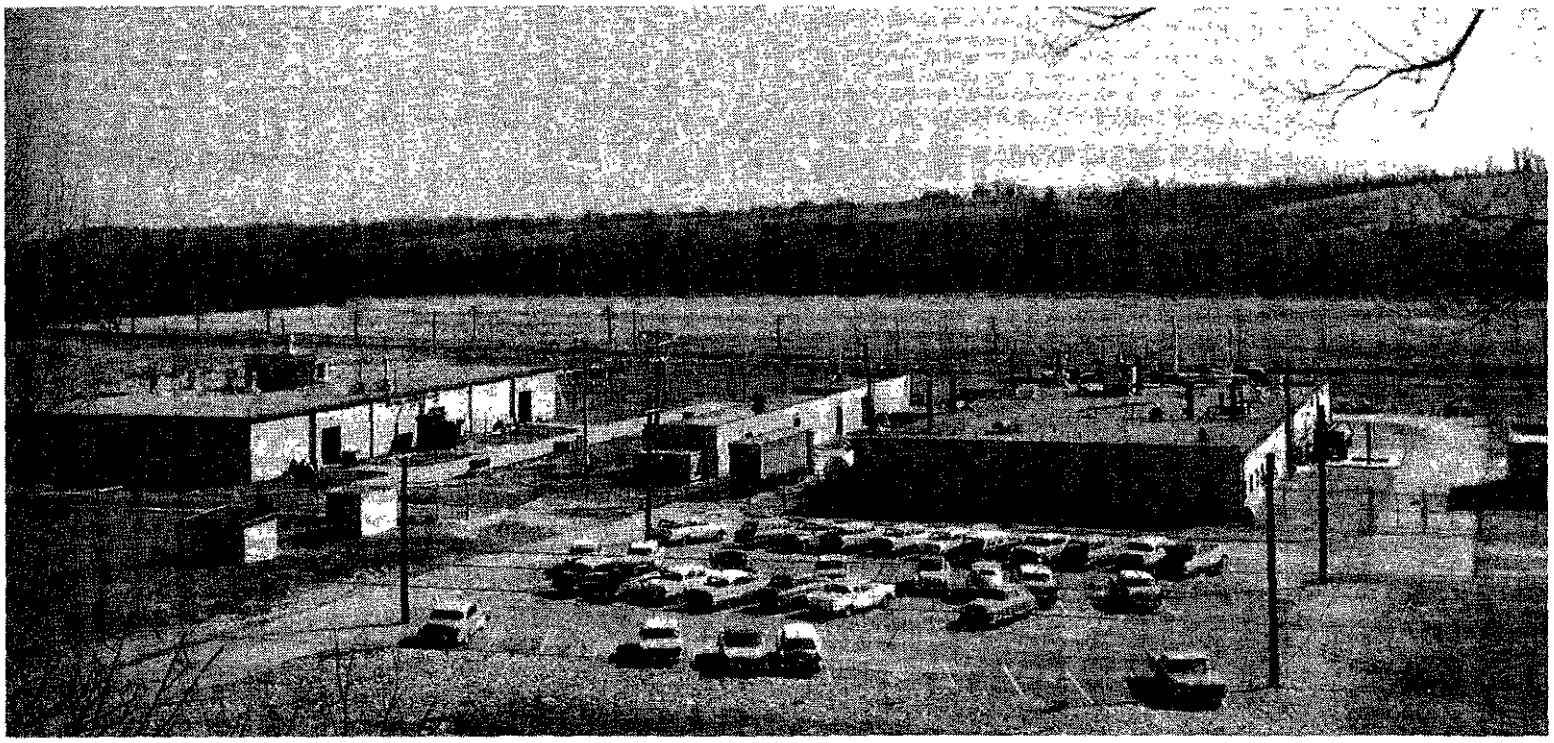
Hauser, an industrial engineer with Cie Industrielle des Ceramiques, Electroniques of Orsay, France, had come to look over the world's first commercial uranium plant. But this pastoral scene seemed far from such industrial distinction.

The winding blacktop road straightened out along the bottom of the ridge. The Frenchman could see the old and new in a glance—the new yellow and blue sign "Mallinckrodt Nuclear Corporation" against the big dairy barn in the background. Back from the road was MCW's Hematite plant, a fast-growing "infant" in a new industry.

Horton, administration and sales manager of the corporation, turned the car off the county road into the plant area. Hauser saw four modern buildings set down in a pasture with thirty-three thousand square feet of space in them, almost three times the 12,500 square feet of the original plant. Horton tells him that, with equipment, here was a two-million-dollar Mallinckrodt investment in the commercial nuclear power industry. Some sixty people are employed here. Eleven more at the St. Louis office are connected with the operation.

MCW entered the commercial uranium industry in January 1956 with the formation of the Special Metals

MCW'S TWO-MILLION-dollar investment in the commercial nuclear industry nestles among foothills forty miles from St. Louis.



division. (This became the Mallinckrodt Nuclear Corporation this year.) In September of '56 the Hematite plant completed the world's first private industry production of enriched uranium oxide for commercial electrical power. (MCW NEWS, November-December, 1956.) Let's go along with the visiting Frenchman to see how this MCW "baby" has grown since we saw it launched more than two years ago.

In the office we meet Dr. Ed North, plant manager. Since the first run in the fall of '56, he tells us, the plant has processed some 200,000 pounds of enriched uranium compounds for some eighty customers. This has fueled nuclear reactors in the United States and fifteen countries around the world — Argentina, Australia, Austria, Belgium, Brazil, Canada, Denmark, Italy, Japan, Norway, South Korea, Sweden, Switzerland, West Germany and Vietnam.

From this plant, Horton adds, came all the fuel for the Pacific Gas and Electric Company's prototype power plant outside San Francisco. Hematite has processed fuels for experimental uses in connection with the power projects of the Yankee Atomic Power Company at Rowe, Mass., Consolidated Edison, New York, and Detroit Edison.

It is now processing all of the fuel for the first core of the Commonwealth Edison full-scale power plant at Dresden, Ill., near Chicago. It is producing pellets for the Northern States Power Company experimental reactor being built by Allis-Chalmers.

And it is shipping enriched uranium dioxide for fueling the world's first nuclear merchant ship, the N. S. (Nuclear Ship) Savannah. The Savannah, a keystone of President Eisenhower's atoms-for-peace program, will be launched this spring and commissioned in the summer of 1960 for world-wide maritime service.

Our plant visit starts in the locker room of the main building where we put on the customary long white coats and rummage through assorted overshoes to find the right size. First stop is the Red Room. (Areas are designated by color to help prevent cross mixing of various enrichments.) High enrichment uranium is processed here to make metal or oxides.

We watch the operators start with green salt (uranium tetrafluoride). With other compounds, this is loaded in a crucible which goes into a reduction bomb. The bomb is fired in an induction furnace, and the uranium metal settles to the bottom of the crucible.

In here, too, are small areas for production of uranium dioxide, uranyl sulfate and for processing scrap with high enrichment uranium.

Down the hall is the Green Room. This is strictly for production of low enrichment compounds. This is where the main volume of production is now coming from.

On into the Blue Room we go. Here is the middle enrichment processing line and another recovery unit for low enrichment scrap. The section over to the right contains facilities for research and development.

We head outside now. The spring air is crisp. Dr. North points out the fringe of trees in the distance. Little Joachim Creek wanders through there. You wonder if the fish are biting.

Next stop is a long, narrow building. Here is stored the plant's main raw material—UF_6, or uranium hexa-

(Continued on next page)

Hematite Revisited

PLANT MASCOT, "George White," jockeys to get in the door ahead of Dr. Jim Carpenter. Guard Francis Holtmeyer watches fun from inside.

DR. ED NORTH, plant manager (right), and George Brown, plant engineer, work on a problem in North's office in the main building.

AGGLOMERATION, or "gathering together," of UO_2 powder, starts the pelleting. Checking is Jan Ericson, chemical engineer.

fluoride. This gas comes from the AEC's Oak Ridge plant in cylinders, held firmly in intricate "bird cages."

In the newest building is the pelleting equipment. We walk into the proverbial beehive of activity. Engineers and chemists are checking out the equipment, making last-minute changes, getting ready to put the plant onstream.

"We should be ready to go early in March," says Dr. Bill Tompkin, the corporation's research and development manager, who is overseeing startup. Here the uranium dioxide will be pressed into pellets at about fifty tons of pressure per square inch. They will be fired at about 3000 degrees Fahrenheit into finished shapes. These shapes may then be ground to close tolerances and loaded into tubes. These tubes later are fabricated into fuel elements which go into reactor cores.

"We had more experience than anyone else in using the powder," explains Lou Horton, "so applying this to pelleting was a natural step. But to do it we had to learn new techniques and develop skills entirely new to Mallinckrodt."

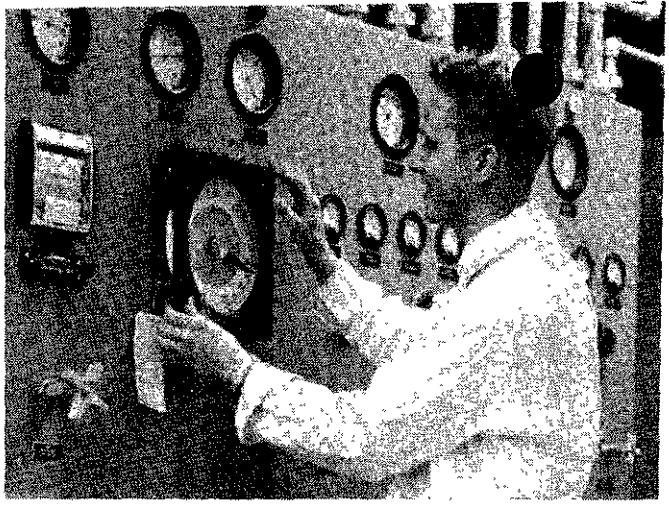
The first pellets from this new building will go to the Northern States reactor. At Hematite they will be placed in aluminum tubes, about eighteen inches long. The tubes then will be shipped to the Universal Match Corporation where they will be closed.

Horton explains, "Uranium is just another fuel—another source of heat. Its big problem now is competing with other fuels for generating electric power."

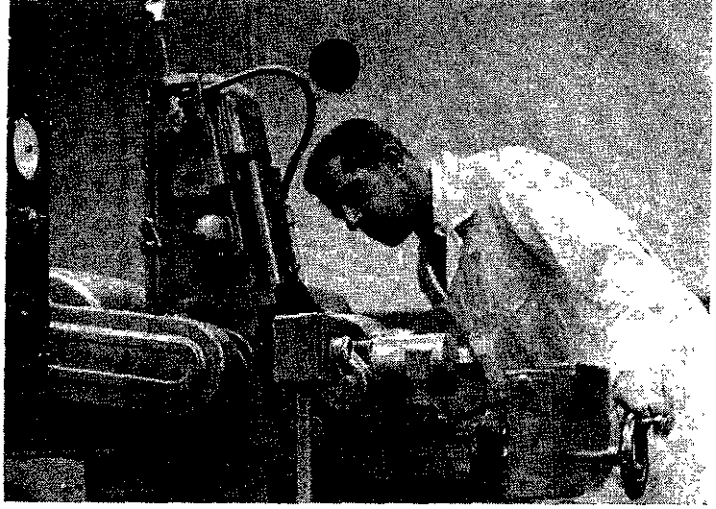
Costs of electric power vary, of course, from area to area—mainly because of distance from coal fields. In St. Louis, power is relatively cheap—about four or five mills per kilowatt hour—because southern Illinois coal fields are close. But at places far from coal fields, the cost of generating power may be twelve to fifteen mills. At this rate, nuclear power is practically competitive.

This, then, is where the Hematite operation stands today—serving an industry which is just beginning to realize its potential. In this service Mallinckrodt has recorded many firsts—beginning with the basic decision to convert enriched uranium hexafluoride to uranium metal and compounds for nuclear reactors. Mallinckrodt also was first to:

... develop processes meeting requirements for safety and criticality.



JIM RODE, assistant manager of research and development, checks an instrument panel in the pelleting plant.



THIS MACHINE, inspected by Dr. Bill Tompkin, research and development manager, grinds pellets to five ten-thousandths of an inch.

IN THIS sintering furnace pellets are heated at 3000 degrees Fahrenheit. Tom Knox (left), a chemical engineer, watches young Bill Taylor, also a C. E., carefully pull out a tray of the hot pellets. The facility's first production will go to a new experimental reactor.

- ... receive a license from the AEC to convert uranium hexafluoride.
- ... receive a permit from the Bureau of Explosives covering the design of shipping containers acceptable to the Bureau and Interstate Commerce Commission.
- ... manufacture and ship uranium metals and compounds both domestically and in export.
- ... develop processes for materials with special physical characteristics such as uranium dioxide "shot," tiny pieces of uranium dioxide fired at a high temperature.

Now, after some two and a half years and with the industry's most modern and automated facility for producing uranium pellets, Mallinckrodt Nuclear Corporation looks to the industry's future.

"The long range picture is good," says Horton. "It's primarily a question of time until improvements cut costs. Especially interesting now, as a weathervane for the future, is the performance of the Commonwealth Edison plant near Dresden. This is the first big reactor built by private industry and it may point the way the industry will go in the important years ahead."

Mallinckrodt will play a big part in the way the industry goes. With our entry into fuel fabrication, the Company as a whole is now involved in four of the six steps in atomic fuel production.

In step one, we furnish some crude uranium, extracted from euxenite ores.

At Weldon Spring, in step two, we refine a large portion of all the uranium used in this country by reactors.

This refined uranium is enriched at one of the AEC's specialized plants (chiefly Oak Ridge) in step three.

Mallinckrodt comes in again on the fourth step with fuel preparation at Hematite and on the fifth step with fuel fabrication.

The sixth step is reactor design, construction and operation, which others do.

As President Fistere said, "The Hematite plant attests Mallinckrodt's confidence in the future of the commercial nuclear power industry. Although the industry is still in its infancy, rapid expansion should materialize after experience proves the economy of nuclear power. Mallinckrodt is prepared to meet this expansion at Hematite and is committed to a policy of constructing additional facilities when the demand warrants such expansion."

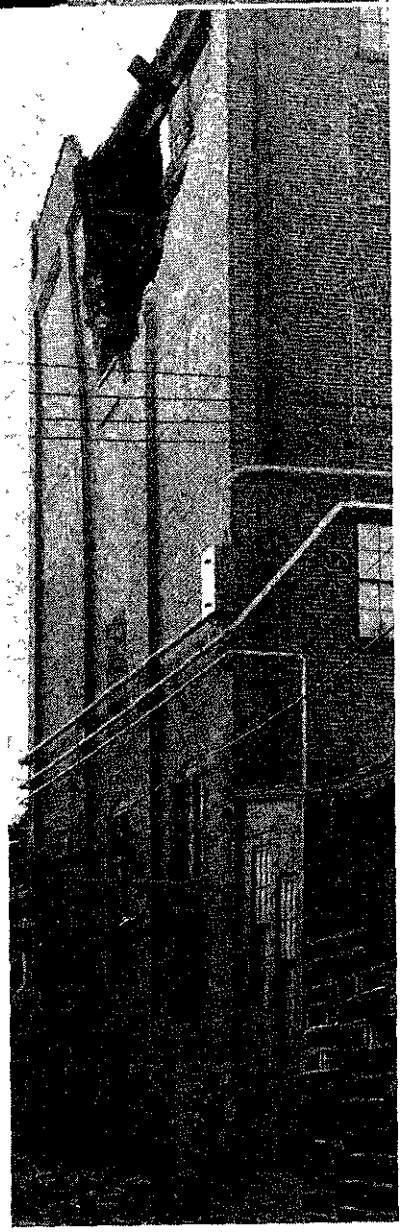
MCW
NEWS
from here and there

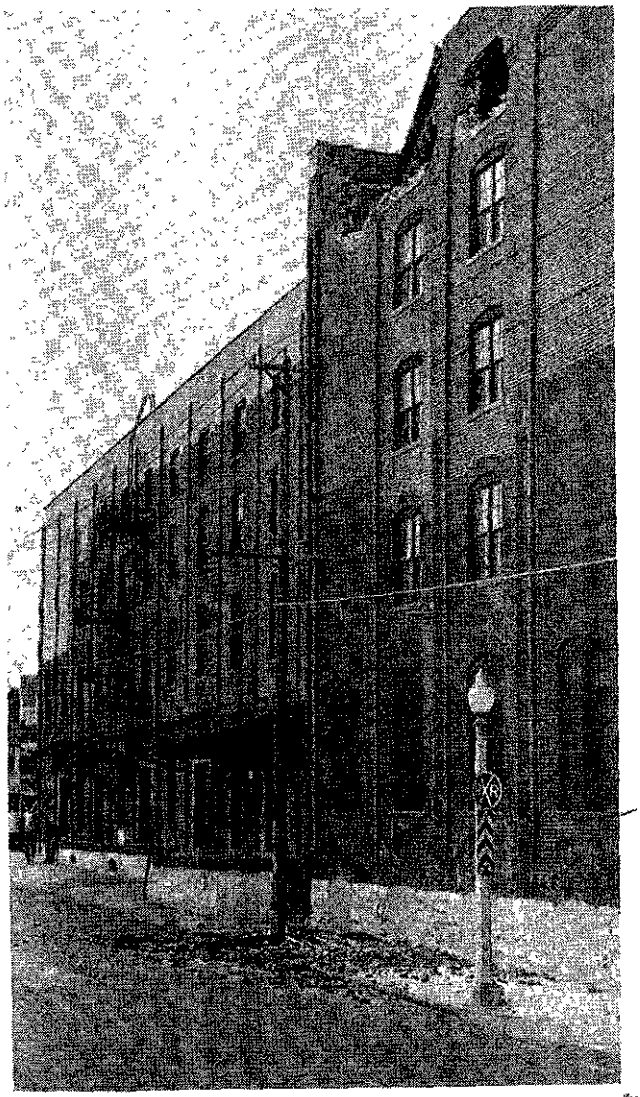
Editor Bill Nunn | Ass't. Editor Orval Heflin | Photographer Charlie Grauer

Editorial Advisory Board: S. H. Anonsen, C. M. Bemis, D. M. Davis, M. I. Gould, O. M. Langenberg, L. H. Paxton

GAPING HOLE in Building 44 was blown out of the east wall.

HARDEST HIT was Building 44 warehouse. These views from Destrehan street show the south wall and window near the west end where the tornado ripped into the fifth floor.





TORNADO!

THE TORNADO which hit St. Louis on Feb. 10 left its scars on many MCW buildings — and a long list of damages.

More than fifty buildings sustained at least minor damage. Hardest hit was Building 44. (See pictures)

In other buildings windows were broken, roofs and doors were damaged, guy wires were broken, wall coping blown off.

Also much material was damaged when the sprinkler system broke in Building 43.

Luckily, rain preceded the tornado instead of following it or material damage would have been much higher.

The MCW NEWS is published bimonthly by the Mallinckrodt Chemical Works for all personnel and their families.

497-32-6694
GLENN E. FRANKENBACH

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FESTUS, MO.

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St. Louis 7, Missouri

Return Postage Guaranteed

Tomorrow's jobs

are being decided by today's profits

MALLINCKRODT has invested two million dollars in the Hematite plant for supplying fuel to the commercial nuclear power industry. (See page 2)
To do this there had to be—profits after taxes.
That modern plant has provided sixty new jobs. And the materials to keep it fed provide more jobs outside of Mallinckrodt. No new plant—*no new jobs*; no profits saved—no new plant. It's just as simple and just as serious as that.
For "Hematite plant" substitute "machine shop," "laboratory" or any other aggregation of buildings and equipment in which you are interested. The same principle applies — growth, expansion, *jobs* can come only *from profits saved and invested.*

EO-05-002

excerpts -

Remedial Investigation Report For the Westinghouse Hematite Site

Rev 1, Volume 1: Text

Prepared for:

Westinghouse

Westinghouse Electric Company
Hematite Facility
3300 State Road P
Festus, MO 63028

Prepared by:

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An Employee-Owned Company

Science Applications International Corporation
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St. Louis, MO 63114
314-770-3000

and

GEO Consultants, LLC

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January 2007

EO-05-002

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Final Draft for Regulatory Review Rev 1, Volume 1: Text

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January 2007

Approved by:
James T. Calhoun
Missouri C.P.G. No. 2003012172

Approved by:
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Missouri P.E. No. 2003025983

ACRONYMS

ABB	Asea Brown Boveri
AMSL	above mean sea level
AOC	area of concern
^{241}Am	americium-241
BGS	below ground surface
BNA	base-neutral-acid extractable organic
CCOPC	chemical contaminant of potential concern
CE	Combustion Engineering Inc.
COC	chain-of-custody
CSM	conceptual site model
DCE	dichloroethylene
DNAPL	dense, nonaqueous-phase liquid
DO	dissolved oxygen
DOE	U.S. Department of Energy
DPT	direct-push technology
DSCC	deeper silty clay/clay
ECD	electron capture detector
EM	electromagnetic
EPA	U.S. Environmental Protection Agency
F&T	fate and transport
FID	flame ionization detector
FS	feasibility study
GAC	General Atomic Company ——————?
Gulf	Gulf Oil Corporation
GM	Geiger-Mueller ——————?
gpd	gallons per day
gpm	gallons per minute
HDPE	high-density polyethylene
HSA	hollow-stem auger
HSU	hydrostratigraphic unit
ID	inside diameter
IDW	investigation-derived waste ——— ?
KOH	potassium hydroxide
LBG	Leggette, Brashears & Graham, Inc.
MDC	minimum detectable concentration
MDL	method detection limit
MDNR	Missouri Department of Natural Resources
MIP	membrane interface probe
mL/min	milliliters per minute
MS	matrix spike
MSD	matrix spike duplicate
NaI	sodium iodide
^{237}Np	neptunium-237
NPDES	National Pollutant Discharge Elimination System
NSSSC	near surface silt/silty clay
NTU	nephelometric turbidity unit
O.D.	outer diameter
ORP	oxidation-reduction potential

PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	perchloroethylene
pCi/g	picoCuries per gram
pCi/L	picoCuries per liter
PGDP	Paducah Gaseous Diffusion Plant
PID	photoionization detector
ppb	parts per billion
ppm	parts per million
PRG	preliminary remediation goal
^{238}Pu	plutonium-238
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
QC	quality control
^{226}Ra	radium-226
RI	remedial investigation
RCOPC	radiological contaminant of potential concern
SAIC	Science Applications International Corporation — Research
s.u.	standard unit
SVOC	semivolatile organic compound
^{99}Tc	technetium-99
TCE	trichloroethylene
^{232}Th	thorium-232
TSWP	task-specific work plan
UF_6	uranium hexafluoride
UNC	United Nuclear Corporation
USCS	Unified Soil Classification System
USGS	U.S. Geological Survey
UTL	upper threshold limit
VOC	volatile organic compound
WEC	Westinghouse Electric Company, LLC

ALC = Missouri Aquatic Life Criteria

LT = results < MDC but > than sample-specific MDC.

Background rad = 4-26.

Radionuclides - p.6-3

Devil's Mountain

A-42

RIR
Vol. 1
Jan 2007

EXECUTIVE SUMMARY

INTRODUCTION

This Report presents the results of the remedial investigation (RI) conducted at a former fuel cycle facility that is located within 228 acres of property in Hematite, Missouri, and is currently owned by the Westinghouse Electric Company, LLC (WEC). WEC ceased facility operations in June 2001 and is proceeding with Site characterization, remediation, and facility decommissioning. This Report was prepared by Science Applications International Corporation (SAIC) under contract to WEC.

As used throughout this document, the "Hematite Facility" refers to the central portion of the property, encompassing the historic primary operations area, Site Pond and burial pits area (approximately 18 acres) s, while the "Hematite Site" refers to the "Hematite Facility," and other areas which were the focus of this investigation based on potential impacts by previous Facility operations. The term "Property" refers to the entire 228 acres of land owned by Westinghouse.

The objective of this RI is to establish an understanding of the geology, hydrology, and the nature and extent of contamination in surface water, soils, sediment, and groundwater for the Hematite Site. Characterization data collected during the RI are being used in risk assessment studies that will quantify the impact of contamination associated with previous operations on human health and the ecological environment. The results of the baseline risk assessment will be covered under a separate report. Data obtained during this investigation will be used to facilitate development of feasibility studies for selection of appropriate alternatives for remediation. Coupled with process knowledge for the Hematite Facility and known potential source areas for contaminants, this evaluation has led to the development of a conceptual site model (CSM) from which the fate and transport of contaminants in groundwater have been assessed. Finally, the CSM has become the basis from which a groundwater flow and transport model has been constructed and calibrated against empirical data.

The Hematite Facility was originally constructed as the Mallinckrodt Chemical Works in 1955. The Facility became operational in July 1956, producing uranium metals for the nuclear fuel program of the U.S. Navy. Throughout its history, the manufacture of uranium metal and compounds from natural and enriched uranium was the primary activity at the Facility. Operations included the conversion of uranium hexafluoride gas of various ^{235}U enrichments to uranium oxide, uranium carbide, uranium dioxide pellets, and uranium metal. Although uranium material production was the primary function at the Hematite Facility, records indicate secondary activities such as uranium scrap recovery and a limited amount of work with thorium compounds as part of early research into the use of thorium in the fuel cycle. In addition to the nuclear materials processed at the Hematite Facility, there was a variety of non-nuclear chemical products stored on-Site and used in many of the processes. Those with the greatest potential for contaminating surface water, soils, and groundwater at the Hematite Facility because of leaks (from storage tanks or process pipelines) or waste disposal activities (e.g., Evaporation Ponds and the Burial Pits) include strong mineral acids (hydrochloric, hydrofluoric, and nitric) and chlorinated organic solvents [perchloroethylene (PCE) and trichloroethylene (TCE)]. A number of potential "areas of concern" have been identified at the Hematite Site and include those locations where these (and other) potential contaminants were stored, used, and/or disposed.

SUMMARY OF GEOLOGIC AND HYDROLOGIC CONDITIONS

The geologic framework of the Hematite Site is dominated by two key bedrock formations, the Jefferson City-Cotter Dolomite and the Roubidoux Formation (sandy dolostone and sandstone) that underlie the Hematite Site. These formations dip gently toward the northeast. The regional landscape is highly dissected by streams yielding topographic relief in excess of 150 ft locally. The Hematite Facility is built upon terrace/alluvial flood plain sediments overlying bedrock within the valley carved by Joachim Creek, which is located approximately 1000 ft south of the Facility. These sediments include 10 to 20 ft of fine-grain material underlain by 5 to 20 ft of coarser-grain sands and gravels.

In the unconsolidated terrace/alluvial flood plain sediments (herein referred to as the overburden), groundwater flow is chiefly confined to the basal, coarse-grain unit and is in a southeastward direction from the Hematite Facility toward Joachim Creek where it discharges. A groundwater mound is associated with the northeast corner of the Hematite Facility and has a significant impact on the potentiometric surface. Groundwater flow in the upper Jefferson City-Cotter Dolomite appears to be affected by the mounding, and components of flow radiate from the Hematite Facility toward the northeast (along bedding planes) and toward the southeast (in a transmissive zone) within this bedrock unit. Below the Jefferson City-Cotter Dolomite, the current direction of groundwater flow appears to reflect a northeasterly direction, which is consistent with the regional groundwater flow direction in the Roubidoux Formation.

In this RI report, several hydrostratigraphic units (HSUs) in bedrock have been defined. In descending order of depth, these are the Jefferson City-Cotter, Jefferson City-Roubidoux contact zone, and Roubidoux HSUs, respectively.

Vertical head gradients are downward from the shallow to deep overburden. Between the deep overburden, and Jefferson City-Cotter HSU, gradients are downward in the vicinity of the Hematite Facility and generally upward near Joachim Creek. Vertical gradients tend to be upward from the Jefferson City-Cotter HSU and deeper HSUs. However, until approximately mid-2004, this gradient was reversed (i.e., downward) as a result of the significant lowering of heads in the Roubidoux Formation. A possible reason for lower heads in the deeper HSUs was the pumping of groundwater from the Roubidoux Formation by water supply wells in the city of Festus.

SUMMARY OF CONTAMINATION AT THE HEMATITE SITE

Most constituents (radionuclides, metals, and organics) at the Hematite Site are closely associated with the footprint of the Hematite Facility and disposal sites within the Hematite Facility.

Inorganic constituents were elevated in surface soil, soil and groundwater at known waste areas/areas of concern within the Hematite Site. These include: the Evaporation Ponds, Deul's Mountain, soils under the buildings, outdoor areas adjacent to buildings, the Burial Pits and the Site Pond. Because the elevated metals concentrations in the groundwater are localized, this suggests that groundwater migration of inorganics is limited and not as extensive as that of chlorinated solvents. There was no indication of metals contamination in the bedrock groundwater.

Sediment data indicate the presence of some inorganics in the Site Pond, Site Creek and Northeast Site Creek. However, the inorganics were generally not detected in the surface water samples from the Site, suggesting that migration of inorganics through surface water is limited or does not occur.

Technetium-99 (^{99}Tc) and, to a lesser extent, uranium is evident in soils, but contamination is also associated with known waste disposal areas (the Evaporation Ponds, Deul's Mountain, Site Pond, Burial

Pits) and soil underneath process buildings, and even where migration to the subsurface has occurred, there is little or no evidence of lateral migration away from these areas. Comparison of the uranium and ^{99}Tc groundwater data with chlorinated volatile organic compound (VOC) results indicates that the radionuclides have not migrated as extensively as the VOCs.

Several sediment samples from Site Pond were found to contain significant contamination with uranium and ^{99}Tc. However, ^{99}Tc was not detected in any of the surface water samples from the Site. Furthermore, uranium activities in surface water are elevated in the Site Pond but decrease significantly in the Site Creek downstream of the Site Pond dam. These data suggest that there is no to minimal migration of these radionuclides via surface water.

The principal organic contaminants in sediment and soil are PCE and TCE. The distribution of PCE and TCE in the groundwater and soil samples appear to reflect one or more source areas associated with the Hematite Facility and nearby disposal areas, although contaminated soils extend southeastward from the Hematite Facility toward Joachim Creek and probably reflect migration of contaminated groundwater from which sorption to soil organic matter has occurred. Dense, nonaqueous-phase liquid (DNAPL) was confirmed at one location under a building at the Hematite Facility based on elevated concentrations of PCE.

Contamination of groundwater with VOCs is widespread. PCE, TCE, and their degradation products are commonly observed. A number of locations have sufficiently elevated PCE or TCE concentrations to suggest the nearby presence of DNAPL. PCE and TCE plumes in the overburden originate at the Hematite Facility and extend southeastward toward Joachim Creek. One component of contamination in the Jefferson City-Cotter HSU has migrated in a southeasterly direction beneath Joachim Creek; a second component has migrated down dip from the Hematite Facility towards the northeast. Deeper contamination in bedrock only has been confirmed in association with private wells PW-19, PW-16, and PW-06 in a residential community to the southeast of the Hematite Facility across Joachim Creek and with PW-03 located east-northeast of the Hematite Facility. PW-06, PW-16, and PW-19 are no longer used as domestic water supply wells and have been converted to dual-completion groundwater monitoring wells as part of this RI.

Polycyclic aromatic hydrocarbons also are commonly found in surface and subsurface soil samples from on-Site locations. They are common products of combustion of coal and other fuels, and also frequently are associated with asphalt-paving material. Their presence is likely from one or a combination of these sources. Localized occurrences of dioxin, polychlorinated biphenyls, and petroleum contamination also were observed.

The presence of organic constituents in surface water is rarely encountered except for several low-level detections of PCE and TCE downstream from the Hematite Facility. Methylene chloride was also detected in a number of surface water samples but these detections were associated with method blanks, suggesting that the results represent common laboratory contaminants rather than Site conditions.

Biological degradation of PCE and TCE is occurring at the Hematite Site, but appears not to have proceeded past the production of 1,1-dichloroethylene (DCE); *cis*-1,2-DCE; and *trans*-1,2-DCE, except in relatively few samples.

CONCEPTUAL SITE MODEL AND NUMERICAL MODELING

The CSM that was developed for this RI focuses on the following key conclusions:

- Flow and transport in a southeasterly direction within the overburden is facilitated by a hydraulic gradient caused by groundwater mounding under the Hematite Facility and discharge to the surface in Joachim Creek

- With increasing depth below the surface, flow/transport directions gradually shift from southeasterly (overburden), to a blend of southeasterly and a regionally imposed northeasterly component (Jefferson City-Cotter HSU), and finally to a regional northeasterly direction (Jefferson City-Roubidoux contact zone and Roubidoux HSUs)

- Contaminant transport in all geologic units projects back to the footprint of the Hematite Facility (and associated disposal areas) as the ultimate source area

Flow and contaminant migration in bedrock at the Hematite Site may have been potentially impacted by pumping in deep production wells operated by the city of Festus. These wells were operational until the summer of 2003 and caused regionally extensive drawdown in the Roubidoux Formation of up to 50 ft in the vicinity of the Hematite Site. In August 2003, the Jefferson County Water Authority brought online a new production facility that draws water from the sediments marginal to and underlying the Mississippi River using horizontal wells and now provides nearly all of the water needs for the city of Festus and other surrounding communities. Startup of this well permitted Festus to place its four production wells located on the west side of the city on standby. These wells had been pumping approximately 1 million gpd from the lower Roubidoux Formation. Currently, they are used only during periods of peak demand in mid- to late summer, or when the collector well is off-line. When supplementing production from the collector well, the pumping rate on these wells is much less than before August 2003.

In the residential community southeast of the Hematite Facility, a number of private wells were completed open hole, which provided a hydraulic connection between the Jefferson City Dolomite and Roubidoux Formation. Full-capacity pumping of the Festus production wells before the new water facility was brought on line in August 2003 probably impacted contaminant distribution at the Hematite Site in several ways. First, hydraulic stresses in the Roubidoux Formation were transferred to the upper Jefferson City-Cotter Dolomite through these wells (e.g., PW-06, PW-16, and PW-19) and facilitated flow and contaminant migration in the Jefferson City-Cotter HSU from the Hematite Facility to the location of the wells. Secondly, downward flow of groundwater and contaminants in these wells spread contaminants to deeper zones at lower heads imposed by pumping of the Festus production wells. A similar mechanism is responsible for vertical migration of contaminants at PW-03.

Once the Festus wells were placed on stand by, rebound of water levels in the Roubidoux Formation progressed rapidly and the potential for downward flow through the private wells declined. The changes in the hydrologic regime since the Festus production wells were no longer pumping at full capacity will likely eventually eliminate future downward vertical migration of contamination once water levels stabilize in the Roubidoux Formation.

A numerical model was constructed for the Hematite Site by: (1) using the CSM to identify hydraulic boundaries, (2) defining a suite of five layers corresponding to the shallow and deep overburden and the three HSUs in bedrock, and (3) establishing the geometric (e.g., thickness and orientation) and

hydraulic properties for each layer. The flow model was calibrated against water level data obtained during the RI (i.e., following shutdown of both the private residential and Festus city wells). The principal conclusions from the modeling investigation include:

- The shallow groundwater mound in a localized area (northeastern corner) of the Hematite Facility plays a major role in flow/transport in both layers of the overburden as well as in the Jefferson City-Cotter HSU.

- The assignment of reasonable downhole flow rates to the open boreholes in the vicinity of PW-19 is essential for creating the observed transport to the southeast in the Jefferson City-Cotter HSU and is supportive of the CSM.

- Particle tracking suggests that contaminant transport directions for layers responding to either the locally imposed or regional flow systems can be rationalized with observed contaminant distribution patterns. Backward particle tracking from contaminated bedrock wells (BR-08-JC, BR-09-JC, and BR-04-JC) suggest that the Burial Pits are the source of contamination in these wells. Particle travel times vary depending on the location of their release points within the Hematite Facility. Particles "released" within the southwestern part of the Hematite Facility (i.e., the process buildings) tend to have longer travel times towards their discharge point (Joachim Creek) when compared to particles "released" within the northeastern part of the Hematite Facility (i.e., the Burial Pits). This is due to the mounding in the northeastern corner of the Hematite Facility that causes downward migration in this area to the transmissive bedrock formations that are conductive and were assumed to have lower porosities than the overburden.

- Contaminant transport modeling of PCE and TCE in groundwater indicates that sorption and degradation can significantly attenuate contaminant migration such that organic contamination levels can decrease by one to two orders of magnitude within close proximity of the source areas.

- Contaminant transport modeling of uranium in groundwater indicates very limited spreading of contamination from source areas, consistent with what was observed in groundwater sample data. The site-specific partition coefficient for uranium is two orders of magnitude higher than the sorption coefficient for organics, resulting in significantly less migration for uranium in groundwater at the Hematite Site when compared to PCE and TCE.

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1. INTRODUCTION

This Report presents the results of the remedial investigation (RI) conducted at a former fuel cycle facility that is located within 228 acres of property in Hematite, Missouri, and is currently owned by the Westinghouse Electric Company, LLC (WEC). WEC ceased facility operations in June 2001 and is proceeding with Site characterization, remediation, and facility decommissioning. This Report was prepared by Science Applications International Corporation (SAIC) under contract to WEC.

As used throughout this document, the "Hematite Facility" refers to the central portion of the property, encompassing the historic primary operations area, Site Pond and burial pits, while the "Hematite Site" refers to the "Hematite Facility," and other areas that were the focus of this investigation based on potential impacts by previous Facility operations. "Property" refers to the 228 acres of land owned by Westinghouse.

1.1 GOALS AND OBJECTIVES OF THE REMEDIAL INVESTIGATION

The overall goals of the RI are to characterize the nature and extent of contamination resulting from previous operations at the Hematite Facility and to reasonably predict contaminant fate and transport (F&T) in the surface and subsurface environment. Characterization data collected during the RI are being used in risk assessment studies that will quantify the impact of contamination associated with previous operations on human health and the ecological environment. The results of the RI will also be used in subsequent feasibility studies (FSs) to determine suitable remedial alternatives for the Hematite Site.

To achieve the goals of the RI, characterization and modeling activities were designed with the following specific objectives:

- To establish a conceptual model for hydrogeologic conditions at the Hematite Site that will be used as a framework for assessing contaminant migration pathways.

- To obtain information necessary for developing a conceptual site model (CSM), including lithologic characteristics and hydraulic conductivities for the overburden and bedrock formations, potentiometric surfaces in the overburden and bedrock groundwater, hydraulic gradients between hydrogeologic units, and interactions between groundwater and surface water features at the Hematite Site.

- To determine whether historic operations have impacted surface water and sediment, and whether contaminants are migrating off-Site through surface water and sediment migration pathways.

- To assess the impact of historic operations on surface and subsurface soils, including the identification of potential sources for groundwater and surface water contamination.

- To define the sources of contamination and characteristics of these source areas that are important to the evaluation of remedial alternatives.

- To assess the nature and extent of contamination in the shallow (i.e., overburden) groundwater, and to determine potential contaminant migration pathways from possible source areas within the Hematite Facility to surface water and deeper (i.e., bedrock) groundwater.

- To assess the nature and determine the horizontal and vertical extent of contamination in bedrock formations where contaminants have been detected during previous investigations.

- To develop a groundwater and contaminant transport model for the Hematite Site that can be used to predict long-term fate of contaminants, to guide future sampling programs, and to evaluate remedial alternatives.

- To address data gaps identified during previous investigations.

A technical approach for achieving the goals and objectives of the RI was presented in a RI/FS Work Plan (LBG 2003) submitted by WEC to the Missouri Department of Natural Resources (MDNR) in May 2003. In response to the conditional approval of the RI/FS Work Plan (MDNR 2003), a series of task-specific work plans (TSWPs) were prepared and submitted to MDNR. The TSWPs, which were reviewed but not formally approved by MDNR, were aligned with the aforementioned RI objectives and provided additional details regarding the following field activities:

- Sampling and analysis of Site and upstream (background) surface water and sediment for radiological contaminants of potential concern (RCOPCs) and chemical contaminants of potential concern (CCOPCs), including the installation of surface water gauging stations (SAIC 2004a).

- Sampling and analysis of surface soil for RCOPCs and CCOPCs (SAIC 2004b).

- Sampling and analysis of subsurface overburden soil, including the installation of temporary monitoring wells that enabled sampling and analysis of overburden groundwater for volatile organic compound (VOC) and radiological contamination detected during previous investigations (SAIC 2004c).

- Drilling and installation of bedrock wells to supplement the pre-RI monitoring network, including (1) discrete interval sampling and analysis of groundwater for VOCs in the new bedrock boreholes and select domestic supply wells, and (2) slug testing at selected wells to measure hydraulic conductivities of the overburden and bedrock formations (SAIC 2004d).

- Sampling and analysis of surface and near-surface soil for RCOPCs and CCOPCs in locations remote from the Hematite Site (SAIC 2004e) to obtain characteristics of soil not likely to have been impacted by previous operations (i.e., local background).

- Baseline groundwater sampling and analysis for RCOPCs, CCOPCs, and basic water quality parameters at pre-RI, newly installed bedrock and temporary overburden groundwater monitoring wells at the Hematite Site, including groundwater level measurements at these wells (SAIC 2004f).

As a result of a detailed review of the RI/FS Work Plan, modifications were made to the original technical approach. These modifications and the technical basis for making these changes were presented in the TSWPs and were based on input from the RI Contractor (SAIC and its subcontractors), WEC, and MDNR.

1.2 SCOPE AND ORGANIZATION OF THE REPORT

This Report presents the results of RI field activities performed from April 2004 through January 2005 in accordance with the aforementioned RI/FS Work Plan and TSWPs. It also provides a summary of the results of the gamma survey conducted in April 2003 and sampling and analyses conducted in December 2003 of soils underneath buildings at the Hematite Facility (SAIC 2003a).

Following the RI field activities, the data were integrated with available information from previous investigations to develop:

- a CSM,
- an evaluation of the nature and extent of environmental contamination associated with historical operations, and
- an assessment and prediction of contaminant F&T in the vicinity of the Hematite Site.

The Report is organized as follows:

- The remainder of Chapter 1 contains a history of operations at the Hematite Facility, descriptions of the various buildings and areas on the Hematite Facility, a summary of previous investigations conducted at the Hematite Site, and the areas of concern (AOCs) identified during these previous studies.
- Chapter 2 describes Site characterization activities performed during the RI.
- Chapter 3 presents the physical characteristics of the Hematite Site, including geology and hydrogeology.
- Chapter 4 discusses the chemical characteristics of the Hematite Site, including nature and extent of contamination.
- Chapter 5 describes likely sources of contamination, possible mechanisms for migration of contaminants, a summary of groundwater and contaminant transport modeling results, and a screening level assessment of monitored natural attenuation.
- Chapter 6 concludes the Report with a summary of major RI findings relevant to future feasibility studies, remedial design and implementation, as well as long-term monitoring of surface water and groundwater conditions in and around the Hematite Site.
- Appendices A through L provide supplemental and supporting information.

The groundwater and contaminant transport modeling conducted as part of the RI is described in more detail in a separate report entitled *Groundwater and Contaminant Transport Modeling for the WEC Hematite Site* (SAIC 2007); the full report is included in Appendix A of this report. Baseline health and ecological risk assessment studies also will be covered in a separate document not included in this report.

1.3 FACILITY LOCATION AND HISTORY OF OPERATIONS

The Hematite Facility is located at 3300 Missouri State Road P in Jefferson County, Missouri, near the town of Hematite (Fig. 1.1). The Westinghouse Hematite Property consists of 228 acres of land with primary operations historically being conducted within the central portion of the property. Figure 1.2 shows the approximate boundary of the Hematite Facility, encompassing the historic primary operations area, Site Pond and burial pits.

Nuclear-related operations at the Hematite Facility began with the purchase of the Property (then consisting of farmlands) by Mallinckrodt Chemical Works in 1955. The Hematite Facility became operational in July 1956, producing uranium metals for the nuclear fuel program of the U.S. Navy.

Mallinckrodt Chemical Works and related entities operated the Hematite Facility until 1961, when ownership was transferred to a joint venture called United Nuclear Corporation (UNC). UNC continued to produce uranium products for the Federal government. In 1971, UNC and Gulf Oil Corporation (Gulf) entered into a joint venture forming the Gulf United Nuclear Fuels Corporation, which owned and managed the Hematite Facility until January 1974. General Atomic Company (GAC), a partnership involving Gulf, owned the Hematite Facility from January 1974 through May 1974, when Combustion Engineering Inc. (CE) purchased the Hematite Facility from GAC. Asea Brown Boveri (ABB) purchased the stock of CE in 1989, and CE began operating the Hematite Facility as ABB Combustion Engineering. In April of 2000, WEC purchased the nuclear operations of ABB, which included the Hematite Facility. WEC ceased operations in June 2001 and is proceeding with Site investigation activities in preparation for Site remediation, including decommissioning.

Throughout its history, the manufacture of uranium metal and compounds from natural and enriched uranium was the primary activity at the Hematite Facility (Section 2.2, page 4 of LBG 2003). Operations included the conversion of uranium hexafluoride (UF_6) gas of various ^{235}U enrichments to uranium oxide, uranium carbide, uranium dioxide pellets, and uranium metal. During the period prior to the purchase of the Property in 1971 by Gulf United Nuclear Fuels Corporation, classified government projects dominated Hematite Facility operations. As such, specific details regarding the exact nature of production processes prior to 1974 are not known. The following are examples of known projects during this time (Section 2.2, page 4 of LBG 2003):

- production of uranium metal for use in the U.S. Navy's nuclear-powered submarines and destroyers;
- production of specialized uranium oxides for use in the U.S. Army's Army Package Power Reactor;
- production of highly enriched uranium oxides for a General Atomics gas-cooled reactor;
- production of highly enriched uranium metal for materials test reactors utilized by the U.S. Navy;
- production of uranium-beryllium pellets for use in the SL-1, an experimental U.S. military nuclear power reactor that was part of the Army Nuclear Power Program;
- production of high-enrichment uranium zirconia pellets for a naval reactor; and
- production of highly enriched oxides for use in General Atomics nuclear rocket projects.

Although uranium material production was the primary function at the Hematite Facility, records indicate secondary activities such as uranium scrap recovery and a limited amount of work with thorium compounds as part of early research into the use of thorium in the fuel cycle.

A detailed list of radioactive feed materials historically used for production is not available. However, previous investigators have compiled a list of chemicals (Table 1.1) used at the Hematite Facility during active operations (Section 3.2.6.2, page 26-27 of LBG 2003).

1.4 DESCRIPTION OF THE WESTINGHOUSE HEMATITE FACILITY AND SITE

The Hematite Site and Facility contain features shown on Figs 1.2 and 1.3, respectively, and briefly described below (based on Section 3.2, pages 20-31 of LBG 2003). The "fence line" as used in this Report refers to the "old" fence line, and not the new security fence installed in 2004. The old fence line is shown on all the figures in this report.

- **Buildings.** Several buildings were used for various production operations and material storage. Brief descriptions of the buildings, including historical and current use (as of the date this Report was published), are given in Table 1.2, while building locations are shown on Fig. 1.3. In September 2004, WEC prepared an Engineering Evaluation/Cost Analysis (EE/CA, WEC 2004a) to evaluate potential removal action alternatives for buildings and equipment at the Hematite Facility. The focus of this EE/CA was on buildings that are radioactively contaminated or that can interfere with the future characterization and, if necessary, remediation of impacted soil and/or groundwater beneath the buildings.A Non-Time Critical Action Memorandum was issued in October 2005 documenting the selection of equipement removal and building demplition as the preferred alternative for remediation.

  In advance of building demolition, the former process and storage buildings have been emptied of equipment and materials involved in nuclear fuel production. The removed equipment and materials have been packaged for shipment and sent off-Site for disposal or for metals reclamation. At the conclusion of the equipment removal operations, Westinghouse conducted a final cleaning of the buildings as needed to remove loose dust, dirt, and debris. This cleaning was performed by vacuuming with units fitted with HEPA filtration systems. Following the cleaning, building surfaces were surveyed and, a chemical fixative ("lock down" agent) was applied to the interior surfaces of the radioactively contaminated buildings.

- **Spent Limestone Pile and Fill Areas.** Hydrogen fluoride gas, a byproduct in the UF_6 conversion process, was captured in limestone scrubbers during part of the plant history. Spent limestone was generated from 1968 through 1998, when the limestone scrubbers were replaced with a more efficient wet absorber system. Currently, the spent limestone is stored in surface piles within the fenced area of the Hematite Facility. The spent limestone was also used as fill in at least two areas, one near the Site Spring and the other northeast of the Burial Pits. The spent limestone was also used historically as fill for building and road foundations. Figure 1.3 shows known locations of spent limestone pile and fill areas.

- **Deul's Mountain.** An outdoor pile of potentially radiologically contaminated soil was located southeast of Building 256 (Fig. 1.3). The pile of soil, referred to as Deul's Mountain, came from excavations during construction of Building 256. An EE/CA for removal alternatives was prepared for this material in August 2004 (WEC 2004b) and approved by MDNR in January 2005. A Non-Time Critical Action Memorandum approving excavation and off-Site disposal was signed in June 2005, and the material has been removed from the Facility.

- **"Red Room" Roof Burial Area.** The roof of the "Red Room" of Building 240 was buried in an area located south of Building 101 (the Tile Barn, Fig. 1.3). As noted in Table 1.2, Building 240 was used for UF_6 conversion and the "Red Room" within this building was used for processing highly enriched uranium. Soil contamination was discovered in 1993 during renovations to the Tile Barn and was thought to be from use of this area for temporary scrap storage (Section 3.2.8, page 29 of LBG 2003). Results of a geophysical survey performed in February 2005 detected magnetic and conductivity anomalies in this area, indicative of a trenched or filled area. Details of the investigation can be found in the document *Geophysical Survey at the Westinghouse Hematite Facility, Festus, MO* (Geophex 2005), and the results are summarized in Sect. 2.8 of this RI report.

- **Cistern Burn Pit Area.** The Cistern Burn Pit Area, also located south of Building 101 (Fig. 1.3), was historically used to burn contaminated wood and pallets. Radiological contamination within the cistern was reportedly removed in 1993 (Section 3.2.15, page 31 of LBG 2003) to less than 30 pCi/g of uranium.

- **Burial Pit Area.** The Burial Pit Area is located to the east-northeast of the Hematite Facility (Figs. 1.2 and 1.3). Unlined pits were actively used by previous owners from 1965 to 1970 for disposal of uranium-contaminated materials and other wastes. Other undocumented excavations prior to 1965 may exist. Burial pit logbooks contain entries recorded during the operational period from July 16, 1965 to August 24, 1970 (Section 1.3, page 8 of WEC 2006). According to the logbook, 40 pits were created and filled between 1965 and 1970. The primary waste types disposed of on-site included various solids such as trash, empty bottles, floor tile, rags, drums, bottles, glass wool, lab glassware, acid insolubles, and filters. Chemical wastes were also disposed of in the pits including hydrochloric acid, hydrofluoric acid, potassium hydroxide (KOH), trichloroethene (TCE), alcohols, oils, and wastewater. Based upon the logbook, the mass of uranium disposed in each pit varied, ranging from 178.08 grams to 801.8 grams.

- **Evaporation Ponds.** The Evaporation Ponds are located on the southeast side of the Hematite Facility, south of the process buildings and directly adjacent to and west of the Limestone Storage Pile within the security area on the Site (Fig. 1.3). The ponds were historically used for the disposal of water from cylinder washing potentially contaminated with TCE and technetium-99 (^{99}Tc) (Section 2.6.2, page 15 of LBG 2003). These ponds also received effluent streams for the wet conversion processes being performed in Building 240 (Section 3.2.6.1, page 23 of LBG 2003). Based on aerial photography review, the Evaporation Ponds were constructed sometime after 1966 and before 1971. In 1992, soil was removed from the Evaporation Pond Area as described in Sect. 1.5.3.

- **Sanitary Sewage and Storm Water Systems, including the Former Leach Field.** The current sanitary system (Fig. 1.3) consists of drain lines from buildings, a sewage treatment plant, and a pipeline that carries treated water from the sewage treatment plant to a permitted discharge point into the Site Creek immediately below the Site Pond (Outfall No. 1, Fig. 1.3). The discharge is authorized under a National Pollutant Discharge Elimination System (NPDES) permit issued by MDNR. Sewage sludge is routinely dewatered and disposed of at the Envirocare of Utah low-level waste disposal facility. Due to reduced operations at the Facility, sewage sludge has not accumulated significantly and removal has not been necessary for quite some time. The sanitary system receives water from sinks, toilets, showers, and drinking fountains. It also received pre-treated laundry water, wastewater from a process water demineralization system, and water from laboratory sinks when the Facility was operating. Prior to 1977, wastewater from the sewer pipelines drained into a septic tank and leach field (see Fig. 1.3 for location); the latter is no longer in use since the new sanitary treatment plant was installed. The storm water system consists of lines that collect water from the roof and ground surface drains and then channel the collected water to a NPDES-permitted discharge point upstream of the Site Pond dam (Outfall No. 3, Fig. 1.3). The Site Pond dam is considered as Outfall No. 2 in the Hematite Facility's NPDES permit.

- **Site Pond and Site Creek.** The Site Pond and Site Creek are located west and southwest of the Hematite Facility and receive NPDES-permitted discharge water from sanitary sewage and storm water systems (Fig. 1.3). The Site Pond is also fed by a natural spring located on the north tip of the Site Pond (Fig. 1.2). The Site Creek merges with the Lake Virginia tributary, and the combined stream discharges to Joachim Creek (Fig. 1.3).

- **Northeast Site Creek.** This is an intermittent stream that runs parallel to the northeast boundary of the Hematite Facility (Fig. 1.2).

- **Former Gas Station.** This abandoned gas station is within the Hematite Site Property boundary located approximately 1500 ft east of the Hematite Facility along Missouri State Road P (see Fig. 1.2). A 550-gallon single-walled steel underground storage tank was removed in May 2003 (Civil and

Environmental Consultants, Inc. 2003). No associated soil removal was required based on analytical results being below MDNR cleanup guidelines for benzene, toluene, xylene, methyl-t-butyl ether, and total petroleum hydrocarbons. No groundwater was encountered during excavation.

- **Railroad and Gas Pipeline.** Railroad tracks and a high-pressure gas pipeline (approximately 4 to 5 ft deep) cut through the Hematite Site southeast of the Hematite Facility. It has been suggested that the pipeline may be acting as a conduit for contamination transport in the subsurface. During the RI field investigation, excavations to expose the pipeline indicated that the pipeline was not buried in a gravel bed. The materials surrounding the pipeline consisted of native soil. The pipeline depth ranged for 3 to 5 ft below ground surface (BGS).

- **Joachim Creek and Bridge.** This perennial stream runs approximately 800 ft southeast of the Hematite Facility (Figs. 1.1 and 1.2) and eventually discharges into the Mississippi River near the city of Herculaneum, approximately 9 to 10 miles from the Hematite Facility. There were verbal reports of third-party waste disposal activities in the vicinity of Joachim Creek Bridge (Section 3.2.16, page 31 of LBG 2003).

1.5 PREVIOUS ENVIRONMENTAL INVESTIGATIONS AND ONGOING MONITORING PROGRAMS

Brief descriptions of previous investigations are given below, while more details can be found in the referenced reports. Note that additional investigations may have been conducted previously at the Hematite Site. However, reports are only available for the investigations described in the following sections. Comparisons are made between the results of these previous studies and the RI in Chaps. 3 through 5 of this report.

1.5.1 Radiological Survey of the Combustion Engineering Burial Site, July 1983

Radiation Management Corporation, under contract to the Nuclear Regulatory Commission, conducted a radiological survey of the Burial Pits in the spring and summer of 1982 (RMC 1983). External radiation levels were measured and samples were collected to determine radionuclide concentrations in air, groundwater, and surface water. Results of the external radiation surveys indicated detectable levels above background in the northwest corner of the Burial Pit Area adjacent to the old security fence. It was determined that these levels were due to containers of UF_6 routinely stored in an area next to the fence line rather than buried material. Results of surface soil sampling indicated low-level surface contamination that may have resulted from past burial activities or from airborne (i.e., stack) releases. Activities for ^{234}U ranged from 2 to 47 pCi/g, as estimated from ^{238}U activity that ranged from 1.7 to 4.9 pCi/g, and assuming an activity ratio of 10. The activity ratio was estimated from a 4% average enrichment in five samples that were analyzed for isotopic uranium using alpha spectroscopy. Results of subsurface soil sampling (deepest sample at 13 ft) showed the highest ^{234}U activity in the Burial Pits was approximately 400 pCi/g, as estimated from measured ^{238}U activity of 38 pCi/g and a $^{234}U/^{238}U$ activity ratio of 10. In the groundwater and surface water samples, only one groundwater sample collected from a borehole showed gross alpha activity exceeding 15 pCi/L (the drinking water limit at the time). Gross beta activity exceeding 50 pCi/L was found in 5 of the 22 samples, 3 of which came from a borehole near the Evaporation Ponds. High volume air samples collected in the vicinity of the Burial Pits showed no unusual or elevated levels.

1.5.2 Preliminary Assessment Hematite Radioactive Site, Hematite, Jefferson County, Missouri, Ecology and Environment, Inc., April 1990

Ecology and Environment, Inc. prepared a report for Region 7 of the U.S. Environmental Protection Agency (EPA) that discusses the Hematite Site's physical characteristics, potential waste sources, surrounding residential areas and water sources, and groundwater and surface water characteristics (Ecology and Environment 1990). The groundwater assessment was based on regional data and no new field studies were conducted in preparation of this report.

1.5.3 Removal Action: Former Evaporation Ponds

Quadrex performed a radiological characterization of the former Evaporation Ponds in 1992 (Bicehouse 1992). Information gathered from this study was used to develop a source term for risk evaluation. Because of the residual contamination present in the ponds, CE decided to remove soil from the Evaporation Pond area. The material from the retention ponds was disposed at a low-level waste disposal facility.

1.5.4 Investigation to Determine the Source of Technetium-99 in Groundwater Monitoring Wells WS-17 and WS-17B, September 1996

Gateway Environmental Associates, Inc. conducted an investigation to determine the source of ^{99}Tc in overburden monitoring wells WS-17 and WS-17B (GEA 1996). Prior to this investigation, WS-17 had been abandoned due to concerns that the well had a poor surface seal. WS-17B was installed in its place, and subsequent groundwater sampling showed ^{99}Tc activities to be consistent with activities measured in WS-17.

A previous assessment had identified the Evaporation Ponds as a potential source of ^{99}Tc contamination in WS-17 and WS-17B. However, updated groundwater contour maps showed groundwater flow directions that were inconsistent with this hypothesis, and that the more likely source would be located north of WS-17 and WS-17B. Potential sources in this area were the spent limestone pile, the uranium recovery area, and a former ring storage area (located immediately east-northeast of Building 252, refer to Fig. 1.3). Twelve probe holes were drilled to approximately 15 ft deep in the vicinity of these suspected sources. Subsurface soil samples from the probe holes and co-located surface samples were analyzed for gross beta activity. Temporary groundwater monitoring wells were installed in the probe holes, which enabled groundwater level measurements and the collection of groundwater samples for gross beta and ^{99}Tc analysis via liquid scintillation counting. These monitoring wells were abandoned upon completion of the field investigation. Slug tests were conducted in WS-7 and WS-17B to measure hydraulic conductivities.

Soil encountered in all the boreholes (approximately 15 ft deep) consisted of clayey silt overlying silty clay. A highly plastic clay was encountered at the bottom of a few of the boreholes. Hydraulic conductivities were measured at 0.33 ft/day (11.5×10^{-5} cm/sec) in WS-17B, and 0.06 ft/day (2.2×10^{-5} cm/sec) in WS-7. The field hydrogeologist performing the slug test noted the presence of a more conductive discrete zone within WS-17B at 8 to 10 ft BGS.

Based on the groundwater contour map constructed from water levels in the temporary wells, Gateway Environmental Associates concluded that the ^{99}Tc may have entered the groundwater system within the former ring storage area and traveled downgradient toward WS-17/WS-17B. The distribution of gross beta activity in the temporary wells generally supported this hypothesis, with gross beta activity being highest directly underneath the former ring storage area. Gross beta activity in a few surface soil samples from this area were also elevated; however, gross beta activity in the subsurface soil samples

gradual, or the potential presence of fat clay lenses in the deeper silty clay layer. LBG concluded that the fat clay layer could not be considered an aquitard because of its discontinuous nature. The clayey/silty/sandy gravel unit was encountered (thickness ranging from 4 to 6 ft) in all boreholes that were drilled to refusal or auger-drilled to bedrock. Note that all of these boreholes were drilled outside the old fenced area of the Hematite Facility (see Fig. 1.2). Visual examination of the core from one of the boreholes (WS-31, see Fig. 1.2 for location) drilled through shallow bedrock showed gray/tan, fine-grained dolomite. No vertical fractures or joints were intersected by this borehole and bedding planes appeared to be well-sealed. LBG concluded that storativity and transmissivity of the dolomite was from bedding planes and fractures rather than the matrix. A potentiometric surface constructed for the deeper silty clay/sandy-gravel layer indicated a groundwater flow direction generally toward Joachim Creek. A separate potentiometric surface was developed for the near-surface silty clay layer, which indicated multiple groundwater flow directions depending on location within the Hematite Facility.

Average hydraulic conductivities measured in the different HSUs were: (1) 3×10^{-5} cm/sec for the near-surface silty clay, (2) 80×10^{-5} cm/sec for the deeper silty clay layer, (3) 600×10^{-5} cm/sec for the sandy gravel layer (result from one well), (4) 1×10^{-5} cm/sec for unfractured bedrock, and (5) 80×10^{-5} cm/sec for fractured bedrock.

With the exception of one blind duplicate sample, results of VOC analyses in soil samples showed concentrations of perchloroethylene (PCE) that were near the detection limit (5 µg/kg). TCE was not detected in any of the soil samples. The inconsistency between the duplicate samples (the blind duplicate exhibited elevated levels of TCE and PCE) was attributed to sample heterogeneity or laboratory error. In groundwater, TCE and PCE were detected at levels above 50 µg/L in one bedrock well (WS-30, 430 and 350 µg/L, respectively; the piezometer wells were not sampled), and in one well screened within the deeper silty clay and sandy gravel layers (WS-32, 20,000 and 4,400 µg/L, respectively). TCE and PCE in the rest of the groundwater samples were either below the detection limit of 5 µg/L or were less than 50 µg/L. The measured radiological activities were deemed to be approximately at background levels, although a statistical analysis of the data was not conducted. VOCs were below the quantitation limit (4 µg/kg) and radionuclide activity was not detected at levels above background in stream sediment samples collected from two locations (one from the Site Creek downstream of the Site Pond dam and the other from the Northeast Site Creek). PCE was detected near the detection limit (5 µg/L) in the surface water sample collected from the Site Creek. VOCs were not detected in the other surface water samples collected from Joachim Creek and the Northeast Site Creek. Polychlorinated biphenyls (PCBs) were not detected in any of the surface water samples. The surface water samples did not exhibit levels of alpha, beta, or gamma activities above background.

1.5.7 Interim Hydrogeologic Investigation to Support the Engineering Evaluation and Cost Analysis for Response Actions for Off-Site Groundwater Quality, November 2002

In the summer of 2002, WEC retained LBG to perform an interim hydrogeologic investigation (LBG 2002b) to address the detection of VOCs in a number of private water wells near the Hematite Site. Contamination in these private wells was detected in December 2001, when the Missouri Department of Health and Senior Services, upon request from MDNR, added VOCs to the suite of radiological analytes that were normally included in their annual radiological monitoring program. The purpose of the interim hydrogeologic investigation was to evaluate the extent and degree of impacted groundwater on an expedited basis. The results of the study were used to evaluate and, ultimately, select a time-critical removal action to address the detection of VOCs in nearby private domestic water supply wells. The investigation also addressed monitoring for future off-Site and vertical contaminant migration by installing sentry wells.

Bedrock cores were collected from the formations underlying the Hematite Site including the Jefferson City-Cotter Formation, the Roubidoux Formation, and the top of the Gasconade Formation (in order of increasing depth, more details regarding Site geology are presented in Chapter 3). The bedrock borehole locations (BR-01 through BR-04) are shown in Fig. 1.2. The geology and hydrogeologic properties of the bedrock underlying the Site were evaluated through various geophysical tests and video-logging. Vertical profiling of groundwater quality was accomplished by collecting discrete groundwater samples from packer-isolated intervals within the bedrock boreholes. In addition, two overburden boreholes were drilled at two locations along the natural gas pipeline (OB-01 and OB-02) to address concerns that this pipeline was acting as a conduit for off-Site contaminant migration. Monitoring wells were installed in the overburden borehole locations (OB-01 and OB-02) and in BR-03, where analysis by a mobile laboratory indicated the presence of PCE in an overburden soil sample from this location. Wells screened in the Jefferson City-Cotter and the Roubidoux Formations were installed in the bedrock borehole locations; bedrock wells were not installed in the Gasconade Formation because contamination was not detected in any of the groundwater samples collected during sampling of packer-isolated intervals. Bedrock monitoring wells were installed in the Jefferson City-Cotter Formation at BR-01, BR-02, and BR-04. Bedrock monitoring wells were installed in the Roubidoux Formation at BR-01 through BR-04 (see Appendix D for well construction data for all wells installed at the site). Potentiometric maps were prepared from water level measurements in the newly installed bedrock wells.

The geologic character of the overburden was consistent with the previous investigation (Section 4.2, pages 9-13 of LBG 1999). An anomalously deep overburden/bedrock interface was noted in BR-04 (~50-ft depth, compared to 30 to 35 ft within the Hematite Facility). Rock quality and permeability showed a wide range of results even within the same formation; no consistent trends or patterns were noted. Based on potentiometric maps developed for the Jefferson City and Roubidoux Formations, groundwater flow was predominantly to the east. Calculated hydraulic conductivities from the slug tests were reported, although some of these values are suspect due to problems with the drawdown analysis or with the drawdown data (see Chapter 3).

VOC analyses by a mobile laboratory indicated low levels (approximately 4 µg/L of TCE, approximately 12 µg/L of PCE) in groundwater from the overburden well at BR-03. TCE and PCE were not detected in the other overburden wells (OB-01 and OB-02) and in an overburden groundwater sample collected from BR-04. During groundwater sampling from packer-isolated intervals in bedrock at BR-01 through BR-04, VOC contamination was only detected in BR-04 at the 95- to 105-ft-BGS depth interval (within the Jefferson City-Cotter Formation). This was confirmed by analysis of a groundwater sample collected from the bedrock monitoring well subsequently installed and screened within this interval. Contamination in the deeper Roubidoux and Gasconade Formations was not detected in any of the bedrock borehole locations during this study.

Gross alpha and gross beta activities were measured in soil samples collected from the overburden. The data were presented but not discussed due to the lack of information regarding background activities. Gross alpha, gross beta, total U, and ^{99}Tc activities were measured in groundwater samples from the overburden and bedrock. Technetium-99 was below detection limits (approximately 2 pCi/L) in all groundwater samples. Maximum gross alpha, gross beta, and total uranium activities in filtered groundwater samples were 64.7, 118, and 28.7 pCi/L, respectively.

1.5.8 Gamma Walkover Survey, April 2003

A gamma walkover survey (SAIC 2003a) over the entire Hematite Facility and large areas within the Hematite Site was conducted in April 2003 by SAIC. Areas with elevated gamma count rates were consistent with AOCs that had been previously identified (Section 3.2, pages 20-31 in LBG 2003, and Sect. 1.6 of this report). Thus, the survey did not reveal any new surficial sources of radiological contamination. The gamma

walkover survey results were used to locate surface sample locations for the RI; a comparison between the areas with elevated gamma count rates and radiological analyses of surface samples is presented in Chapter 4 of this RI report.

1.5.9 Determination of Distribution Coefficients for Radionuclides of Concern at the Westinghouse Hematite Facility, July 2003

In July 2003, SAIC conducted a study to measure site-specific distribution coefficients for uranium and ^{99}Tc using soil collected from the Hematite Site (SAIC 2003c). A total of 18 soil samples were collected from 6 borings that were advanced to refusal (assumed to be bedrock). Soil physical properties, as well as isotopic uranium and ^{99}Tc activities, were measured in the soil samples prior to conducting the distribution coefficient tests. The soil samples tested in the laboratory were representative of the brown silty clay typically found in the shallow overburden at the Hematite Site. Uranium activities were detected at elevated levels in samples from the restricted areas adjacent to the process buildings (>200 pCi/g total uranium) and the shallowest sample collected from the Tile Barn/Cistern Burn Area (>34 pCi/g total uranium). Except for one sample from the restricted areas, ^{99}Tc was not detected at concentrations greater than the laboratory reporting limits in the samples collected for the study. Results of this investigation are described in *Determination of Distribution Coefficients for Radionuclides of Concern at the Westinghouse Hematite Facility* (SAIC 2003c).

1.5.10 Wetlands and Surface Water Assessment

In preparation for the RI, a wetland and surface water assessment was conducted in November 2003 to delineate and classify potentially jurisdictional wetlands and surface water bodies at the Hematite Site (SAIC 2004a). The assessment was conducted to identify potential impacts of Site investigation activities (i.e., well installation and road building) with regard to compliance with requirements of Sects. 401/404 of the Clean Water Act. The single potential wetland identified at the Hematite Facility is located in a small depression south of the Hematite Facility between the railroad berm and a gravel road that goes from the vicinity of the Hematite Facility to the south towards Joachim Creek. The wetland is a small isolated forested/scrub shrub wetland that is confined to the south and southwest by the gravel road and to the north by the railroad berm. There were no inputs or outputs at the wetland and hydrology appears to be the result of precipitation, which ponds between the road and railroad. A field survey of surface water bodies within the Property was also conducted, and detailed descriptions of the intermittent streams were performed. Based on the wetland and surface water survey, it was concluded that Site investigation activities can be implemented without significant impact to wetlands and surface water bodies.

1.5.11 Ongoing Environmental Monitoring Programs

Since 2002, quarterly groundwater monitoring samples have been collected from bedrock wells BR-01-RB, BR-02-RB, BR-03-RB, BR-04-RB, and BR-04-JC (see Fig. 1.2 for well locations) and analyzed for VOCs and radiological contaminants. Groundwater samples have also been collected periodically at private wells near the Hematite Facility; these private wells are shown in Figure 1.2 (labels begin with "PW"). A discussion of these monitoring results is provided in Chapter 4 of this RI report.

As mentioned previously, the storm water and sewer water outfalls that discharge into the Site Pond and Site Creek, respectively (Outfalls 1 and 3, see Fig. 1.3), are permitted under NPDES. As part of permitting requirements, both of these outfalls and the surface water at Site Pond Dam (Outfall No. 2, see Fig. 1.3) are monitored regularly for parameters required under the NPDES permit.

The Hematite Facility operates under a Special Nuclear Materials (SNM-33) license from the Nuclear Regulatory Committee (NRC). Following NRC license requirements, samples are routinely

collected for groundwater (nine wells), surface water (four locations), sediment (one location), surface soils (seven locations), vegetation (four locations), and air (from three stack emissions) for gross alpha/gross beta analysis (air samples are analyzed for gross alpha only). The license sampling also includes the effluent sampling conducted under the NPDES permit.

1.6 AREAS OF CONCERN AND POTENTIAL CONTAMINANTS OF CONCERN

Records of historical operations at the Hematite Facility and results of previous investigations were used to develop the following list of AOCs and associated RCOPCs and CCOPCs (Tables 1 and 2 of LBG 2003, see Fig. 1.4 for map of AOCs):

- AOC #1 Groundwater (PCE, TCE and associated degradation products, fluoride, ^{238}U, ^{235}U, ^{234}U, and ^{99}Tc),
- AOC #2 Surface Water Features (PCE, TCE and associated degradation products, fluoride, ^{238}U, ^{235}U, ^{234}U, ^{99}Tc, and ^{232}Th),
- AOC #3 Burial Pits (PCE, TCE and associated degradation products, fluoride, ^{238}U, ^{235}U, ^{234}U, ^{99}Tc, and ^{232}Th),
- AOC #4 Evaporation Ponds (PCE, TCE and associated degradation products, fluoride, ^{238}U, ^{235}U, ^{234}U, ^{99}Tc, and ^{232}Th),
- AOC #5 Former Leach Field/Sanitary Sewer System (^{232}Th, PCE, TCE and associated degradation products, fluoride, ^{238}U, ^{235}U, ^{234}U, and ^{99}Tc),
- AOC #6 Soil Beneath Buildings (PCE, TCE and associated degradation products, fluoride, ^{238}U, ^{235}U, ^{234}U, ^{99}Tc, and ^{232}Th),
- AOC #7 Limestone Storage and Limestone Fill Areas (^{238}U, ^{235}U, ^{234}U, ^{99}Tc, ^{232}Th, and fluoride),
- AOC #8 Outdoor and Shallow Surface Area (PCE, TCE and associated degradation products, fluoride, ^{238}U, ^{235}U, ^{234}U, ^{99}Tc, and ^{232}Th),
- AOC #9 Former Gas Station [PCE, TCE and associated degradation products, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons, and metals],
- AOC #10 Gas Pipeline (PCE, TCE and associated degradation products, fluoride, ^{99}Tc, and ^{232}Th),
- AOC #11 Red Room Roof Burial Area (^{238}U, ^{235}U, ^{234}U, ^{232}Th, and fluoride),
- AOC #12 Domestic Well #3 (PCE and TCE and associated degradation products),
- AOC #13 Deul's Mountain (^{238}U, ^{235}U, ^{234}U, ^{232}Th, and fluoride),
- AOC #14 Cistern Burn Pit Area (PCE, TCE and associated degradation products, SVOCs, metals, dioxin, fluoride, ^{238}U, ^{235}U, ^{234}U, and ^{232}Th), and

- AOC #15 Joachim Creek Bridge. This area was included as an AOC to investigate if materials were buried at this location. No sampling was planned for this AOC (LBG 2003). A geophysical survey was conducted to investigate the AOC (Geophex 2005, also summarized in Sect. 2.8).

The AOCs generally align with the Hematite Site features that are described in Sect. 1.4 of this RI report. With the exception of Joachim Creek Bridge, which was addressed through a geophysical survey (Geophex 2005), the RI field activities were conducted such that soil, sediment and/or groundwater samples were collected from each of the AOCs.

announces a change to a closed session meeting.

DATES: The meeting will be held at 0900, Wednesday, February 14, 2001.

ADDRESSES: The meeting will be held at Palisades Institute for Research Services, 1745 Jefferson Davis Highway, Suite 500, Arlington, VA 22202.

FOR FURTHER INFORMATION CONTACT: Elise Rabin, AGED Secretariat, 1745 Jefferson Davis Highway, Crystal Square Four, Suite 500, Arlington, Virginia 22202.

SUPPLEMENTARY INFORMATION: The mission of the Advisory Group is to provide advice to the Under Secretary of Defense for Acquisition and Technology, to the Director Defense Research and Engineering (DDR&E), and through the DDR&E, to the Director Defense Advanced Research Projects Agency and the Military Departments in planning and managing an effective research and development program in the field of electron devices.

The Working Group B meeting will be limited to review of research and development programs which the military proposes to initiate with industry, universities or in their laboratories. The microelectronics area includes such programs on semiconductor materials, integrated circuits, charge couple devices and memories. The review will include classified program details throughout.

In accordance with section 10(d) of Pub. L. No. 92–463, as amended, (5 U.S.C. App. 10(d) (1994)), it has been determined that this Advisory Group meeting concerns matters listed in 5 U.S.C. 552b(c)(1) (1994), and that accordingly, this meeting will be closed to the public.

Dated: January 10, 2001.

L.M. Bynum,

Alternate OSD Federal Register Liaison Officer, Department of Defense.

[FR Doc. 01–1273 Filed 1–16–01; 8:45 am]

BILLING CODE 5001–10–M

DEPARTMENT OF DEFENSE

Office of the Secretary of Defense

Department of Defense Wage Committee; Notice of Closed Meetings

Pursuant to the provisions of section 10 of Public Law 92–463, the Federal Advisory Committee Act, notice is hereby given that closed meetings of the Department of Defense Wage Committee will be held on February 6, 2001; February 13, 2001; February 20, 2001; and February 27, 2001, at 10:00 a.m. in Room A105, The Nash Building, 1400 Key Boulevard, Rosslyn Virginia.

Under the provisions of section 10(d) of Public Law 92–463, the Department of Defense has determined that the meetings meet the criteria to close meetings to the public because the matters to be considered are related to internal rules and practices of the Department of Defense and the detailed wage data to be considered were obtained from officials of private establishments with a guarantee that the data will be held in confidence.

However, members of the public who may wish to do so are invited to submit material in writing to the chairman concerning matters believed to be deserving of the Committee's attention.

Additional information concerning the meetings may be obtained by writing to the Chairman, Department of Defense Wage Committee, 4000 Defense Pentagon, Washington, DC 20301–4000.

Dated: January 10, 2001.

L.M. Bynum,

Alternate OSD Federal Register Liaison Officer, Department of Defense.

[FR Doc. 01–1269 Filed 1–16–01; 8:45 am]

BILLING CODE 5001–10–M

DEPARTMENT OF ENERGY

Energy Employees Occupational Illness Compensation Act of 2000; List of Covered Facilities

AGENCY: Department of Energy.

ACTION: Notice of listing of covered facilities.

SUMMARY: The Energy Employees Occupational Illness Compensation Act of 2000 ("Act"), Public Law 106–398, establishes a program to provide compensation to individuals who developed illnesses as a result of their employment in nuclear weapons production-related activities and at certain federally-owned facilities in which radioactive materials were used. On December 7, 2000, the President issued Executive Order 13179 ("Order") directing the Department of Energy ("Department" or "DOE") to list covered facilities in the **Federal Register**. This notice responds to both the Act and the Order.

FOR FURTHER INFORMATION CONTACT: Office of Worker Advocacy, 1–877–447–9756.

ADDRESSES: The Department welcomes comments on this list. Individuals who wish to suggest additional facilities for inclusion on the list, indicate why one or more facilities should be removed from the list, or provide other information may contact: Office of Worker Advocacy (EH–8), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585, email: worker_advocacy@eh.doe.gov, toll-free: 1–877–447–9756.

SUPPLEMENTARY INFORMATION:

Purpose: The Energy Employees Occupational Illness Compensation Act of 2000 ("Act"), Public Law 106–398, establishes a program to provide compensation to individuals who developed illnesses as a result of their employment in nuclear weapons production-related activities and at certain federally-owned facilities in which radioactive materials were used. On December 7, 2000, the President issued Executive Order 13179 ("Order") directing the Department of Energy ("Department" or "DOE") to list covered facilities in the **Federal Register**. Section 2. c. vii of the Order instructs the Department to list three types of facilities:

(1) Atomic weapons employer facilities, as defined in section 3621 (4) of the Act;

(2) Department of Energy facilities, as defined by section 3621 (12) of the Act; and

(3) Beryllium vendors, as defined by section 3621 (6) of the Act.

Compensation options and mechanisms are defined differently for each of these facility categories. The atomic weapons employer category includes facilities in which the primary work was not related to atomic weapons, and consequently these facilities are not commonly known as atomic weapons facilities. Their inclusion in this list is consistent with the Act, and is not intended as a classification for any other purpose.

The list at the end of this notice represents the Department's best efforts to date to compile a list of facilities in these three categories. Reconstructing the operational history of the nuclear weapons system over a sixty-year period is a complex and sometimes imprecise undertaking. Some list entries are based on records that contain the names and addresses of companies and facilities at the time work was performed for the Department and its predecessor federal agencies. The list may identify a corporate headquarters facility as a production location, or may contain some inadvertent duplication because of changes in names, ownership, and addresses. Similarly, attempts to minimize duplication may have resulted in the inadvertent omission of subsidiaries and satellite locations that should be included. Accordingly, the

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Department is continuing its research efforts in order to better understand past production activities, and DOE intends to update this list at least once annually so long as new information becomes available. The public is invited to comment on the list and to provide additional information.

In addition to continuing its research efforts, the Department is developing information dissemination mechanisms to make facility-specific data available to the public, including a publicly accessible database of site-related information. This database will help ensure that the Department keeps track of facilities involved in atomic weapons and other work potentially resulting in contamination or exposure. The site database will include, among other information, the type of nuclear weapons-related production work done, the dates such work occurred, and available health and safety data concerning the facility. The listing of facility name and location in this notice represents only a first step in providing information to the public.

The Act does not cover workers involved in uranium mining and milling, or those who worked in support of naval nuclear propulsion programs. Consequently, facilities associated with this type of work are not listed in this notice. Some workers who became ill as a result of their employment at these facilities may be covered by other programs such as the Radiation Exposure Compensation Act (RECA), the Federal Exposure Compensation Act (FECA), or other jurisdictions' worker compensation programs.

Introduction to the Covered Facility List

The list that follows covers the three categories of employers defined by the Act: atomic weapons employers ("AWE"), Department of Energy facilities ("DOE"), and beryllium vendors ("BE"). Some facilities fall into more than one category. For example, if a private contractor facility handled both radioactive materials and beryllium, it will have "AWE" and "BE" in the "facility type" column. For another example, a facility will have both "DOE" and "AWE" codes if ownership changed between the DOE and another entity. The Department intends to provide facility-specific explanations of the applicability of these categories through the database mentioned above.

Each of the categories is defined below:

1. Atomic Weapons Employers

Section 3621 (4) of the Act defines an atomic weapons employer as "an entity that—

(A) processed or produced, for the use by the United States, material that emitted radiation and was used in the production of an atomic weapon, excluding uranium mining and milling; and

(B) is designated as an atomic weapons employer for purposes of this title by the Secretary of Energy."

Most facilities listed as an AWE conducted nuclear weapons-related work for a limited period of time or in certain select areas of the plant. For example, some sites worked with radioactive materials to evaluate processing machinery that was being considered for use in atomic weapons production. Radioactive materials may not have been used as a routine part of the facility's operations. The Act covers those workers who became sick as a consequence of their work in support of nuclear weapons production activities, and was not intended to cover all workers at each site named.

The lines between research, atomic weapons production, and non-weapons production are often difficult to draw. For the purposes of this notice, and as directed by the Act, only those facilities whose work involved radioactive material that was connected to the weapons production chain are included. Available information about many of these facilities is incomplete or unclear, and the Department welcomes comments or additional information regarding facilities that may have supported atomic weapons production that are not on this list, as well as information that clarifies the work done at facilities named below.

2. Department of Energy Facilities

Section 3621 (12) of the Act defines a DOE facility as "any building, structure, or premise, including the grounds upon which such building, structure, or premise is located—

(A) in which operations are, or have been, conducted by, or on behalf of, the Department of Energy (except for buildings, structures, premises, grounds, or operations covered by Executive Order 12344, pertaining to the Naval Nuclear Propulsion Program); and

(B) with regard to which the Department of Energy has or had—

(i) A proprietary interest; or

(ii) Entered into a contract with an entity to provide management and operation, management and integration, environmental remediation services, construction, or maintenance services."

Consistent with this definition, the Department has taken a broad view of where operations have been conducted by DOE or its predecessor agencies. The list includes any facility handling radioactive materials or beryllium in which the Department had management and operations, management and integration, environmental remediation, or construction and maintenance contracts. This broad definition includes many facilities which are not generally thought of as Departmental facilities, as well as facilities which are not necessarily involved with weapons-related work. For example, some universities and private companies are included because the Department contracted for environmental remediation services at these sites, even though the Department did not own the facility. Also, some DOE-owned laboratories are included because they do work involving radioactive materials, even though that work is not related to nuclear weapons production.

The Act covers production workers at the gaseous diffusion plants at Paducah, KY and Piketon, OH. Production workers at these facilities are covered for work conducted until July 28, 1998, when the facilities were privatized under the control of the United States Enrichment Corporation (USEC, Inc.)

The listing of Department of Energy facilities is only intended for the context of implementing this Act and does not create or imply any new Departmental obligations or ownership at any of the facilities named on this list.

3. Beryllium Vendors

Section 3621(6) of the Act defines beryllium vendor as the following:

"(A) Atomics International.

(B) Brush Wellman, Incorporated, and its predecessor, Brush Beryllium Company.

(C) General Atomics.

(D) General Electric Company.

(E) NGK Metals Corporation and its predecessors, Kawecki-Berylco, Cabot Corporation, BerylCo, and Beryllium Corporation of America.

(F) Nuclear Materials and Equipment Corporation.

(G) StarMet Corporation, and its predecessor, Nuclear Metals, Incorporated.

(H) Wyman Gordan, Incorporated.

(I) Any other vendor, processor, or producer of beryllium or related products designated as a beryllium vendor for purposes of this title under Section 3622."

Beryllium metal has been an important material for atomic weapons production, and it was used at many places throughout the production

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system. The list indicates private firms that processed, produced, or provided beryllium metal for the Department, as defined by the Act. This information is drawn from a variety of historical documents, and much data remains incomplete. The Department welcomes comments or additional information about its beryllium vendors.

Covered Facility List

Jurisdiction	Facility name	Location	Facility type
AL	Southern Research Institute	Sylacauga	AWE
AL	Speed Ring Experimental & Tool Company	Culman	BE
AL	Tennessee Valley Authority	Muscle Shoals	AWE
AK	Amchitka Island Nuclear Explosion Site	Amchitka Island	DOE
AK	Project Chariot Site	Cape Thompson	DOE
CA	Arthur D. Little Co.	San Francisco	AWE
CA	Atomics International	Canoga Park	BE
CA	Burris Park Field Station	Kingsburg	AWE
CA	Ceradyne, Inc.	Santa Ana	BE
CA	Dow Chemical Co.	Walnut Creek	AWE
CA	Electro Circuits, Inc.	Pasadena	AWE
CA	Energy Technology Engineering Center	Santa Susana	DOE
CA	General Atomics	La Jolla	AWE/BE/DOE
CA	General Electric Vallecitos	Pleasanton	AWE
CA	Hunter Douglas Aluminum Corp.	Riverside	AWE
CA	Laboratory for Energy-Related Health Research	Davis	DOE
CA	Laboratory of Biomedical and Environmental Sciences	Los Angeles	DOE
CA	Laboratory of Radiobiology and Environmental Health	San Francisco	DOE
CA	Lawrence Berkeley National Laboratory	Berkeley	DOE
CA	Lawrence Livermore National Laboratory	Livermore	DOE
CA	Sandia Laboratory, Salton Sea Base	Imperial County	DOE
CA	Sandia National Laboratories—Livermore	Livermore	DOE
CA	Stanford Linear Accelerator Center	Palo Alto	DOE
CA	Stauffer Metals, Inc.	Richmond	AWE
CA	University of California	Berkeley	AWE/DOE
CO	Coors Porcelain	Golden	BE
CO	Project Rio Blanco Nuclear Explosion Site	Rifle	DOE
CO	Project Rulison Nuclear Explosion Site	Grand Valley	DOE
CO	Rocky Flats Plant	Golden	DOE
CO	Shattuck Chemical	Denver	AWE
CO	University of Denver Research Institute	Denver	AWE/BE
CT	American Chain and Cable Co.	Bridgeport	AWE
CT	Anaconda Co.	Waterbury	AWE
CT	Bridgeport Brass Co., Havens Lab.	Bridgeport	AWE
CT	Combustion Engineering	Windsor	AWE/DOE
CT	Connecticut Aircraft Nuclear Engine Lab. (CANEL)	Middletown	BE/DOE
CT	Dorr Corp.	Stamford	AWE
CT	Fenn Machinery Co.	Hartford	AWE
CT	New England Lime Co.	Canaan	AWE
CT	Seymour Specialty Wire	Seymour	AWE/DOE
CT	Sperry Products, Inc.	Danbury	AWE
CT	Torrington Co.	Torrington	AWE
DE	Allied Chemical and Dye Corp.	North Claymont	AWE
DC	National Bureau of Standards, Van Ness Street	Washington	AWE
DC	Naval Research Laboratory	Washington	AWE/DOE
FL	American Beryllium Co.	Sarasota	BE
FL	Armour Fertilizer Works	Bartow	AWE
FL	C.F. Industries, Inc.	Bartow	AWE
FL	Gardinier, Inc.	Tampa	AWE
FL	International Minerals and Chemical Corp	Mulberry	AWE
FL	Pinellas Plant	Clearwater	DOE
FL	University of Florida	Gainesville	AWE
FL	Virginia-Carolina Chemical Corp	Nichols	AWE
FL	W.R. Grace Co., Agricultural Chemical Div	Ridgewood	AWE
ID	Argonne National Laboratory—West	Scoville	DOE
ID	Idaho National Engineering Laboratory	Scoville	DOE
IL	Allied Chemical Corp.	Metropolis	AWE
IL	American Machine and Metals, Inc.	E. Moline	AWE
IL	Argonne National Laboratory-East	Argonne	DOE
IL	Armour Research Foundation	Chicago	AWE
IL	Blockson Chemical Co	Joliet	AWE
IL	C–B Tool Products Co.	Chicago	AWE
IL	Crane Co.	Chicago	AWE
IL	ERA Tool and Engineering Co.	Chicago	AWE
IL	Fansteel Metallurgical Corp.	North Chicago	BE
IL	Fermi National Accelerator Laboratory	Batavia	DOE
IL	Granite City Steel	Granite City	AWE/DOE
IL	Great Lakes Carbon Corp.	Chicago	AWE
IL	GSA 39th Street Warehouse	Chicago	AWE

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etc

Jurisdiction	Facility name	Location	Facility type
IL	International Register	Chicago	AWE
IL	Kaiser Aluminum Corp.	Dalton	AWE
IL	Lindsay Light and Chemical Co.	W. Chicago	AWE
IL	Madison Site (Speculite)	Madison	AWE/DOE
IL	Midwest Manufacturing Co.	Galesbury	AWE
IL	Museum of Science and Industry	Chicago	AWE
IL	National Guard Armory	Chicago	AWE/DOE
IL	Podbeliniac Corp.	Chicago	AWE
IL	Precision Extrusion Co.	Bensenville	AWE
IL	Quality Hardware and Machine Co.	Chicago	AWE
IL	R. Krasburg and Sons Manufacturing Co.	Chicago	AWE
IL	Sciaky Brothers, Inc.	Chicago	AWE
IL	Swenson Evaporator Co.	Harvey	AWE
IL	University of Chicago	Chicago	AWE/DOE
IL	W.E. Pratt Manufacturing Co.	Joliet	AWE
IL	Wycoff Drawn Steel Co.	Chicago	AWE
IN	American Bearing Corp.	Indianapolis	AWE
IN	Dana Heavy Water Plant	Dana	DOE
IN	General Electric Plant	Shelbyville	AWE
IN	Joslyn Manufacturing and Supply Co	Ft. Wayne	AWE
IN	Purdue University Van der Graaf Lab	Lafayette	AWE
IN	Washrite	Indianapolis	AWE
IA	Ames Laboratory	Ames	DOE
IA	Iowa Ordnance Plant	Burlington	DOE
IA	Titus Metals	Waterloo	AWE
KS	Spencer Chemical Co., Jayhawks Works	Pittsburg	AWE
KY	Paducah Gaseous Diffusion Plant	Paducah	DOE
MR*	Eniwetok Test Site	Marshall Islands	DOE
MD	Armco-Rustless Iron & Steel	Baltimore	AWE
MD	W.R. Grace and Company	Curtis Bay	AWE/DOE
MA	American Potash & Chemical	West Hanover	AWE
MA	C.G. Sargent & Sons	Graniteville	AWE
MA	Chapman Valve	Indian Orchard	AWE/DOE
MA	Edgerton Germeshausen & Grier, Inc.	Boston	AWE
MA	Fenwal, Inc.	Ashland	AWE
MA	Franklin Institute	Boston	BE
MA	Heald Machine Co.	Worcester	AWE
MA	La Pointe Machine and Tool Co.	Hudson	AWE
MA	Massachusetts Institute of Technology	Cambridge	AWE/BE
MA	Metals and Controls Corp.	Attleboro	AWE
MA	National Research Corp.	Cambridge	AWE
MA	Norton Co.	Worcester	AWE/BE
MA	Nuclear Metals, Inc.	Concord	AWE/BE
MA	Reed Rolled Thread Co.	Worcester	AWE
MA	Shpack Landfill	Norton	AWE/DOE
MA	Ventron Corporation	Beverly	AWE/DOE
MA	Winchester Engineering and Analytical Center	Winchester	DOE
MA	Woburn Landfill	Woburn	AWE
MA	Wyman Gordon Inc.	Grayton, North Grafton	BE
MI	AC Spark Plug	Flint	BE
MI	Baker-Perkins Co.	Saginaw	AWE
MI	Carboloy Co.	Detroit	AWE
MI	Extruded Metals Co.	Grand Rapids	AWE
MI	General Motors	Adrian	AWE/DOE
MI	Gerity-Michigan Corp.	Adrian	BE
MI	Mitts & Merrel Co.	Saginaw	AWE
MI	Oliver Corp.	Battle Creek	AWE
MI	Revere Copper and Brass	Detroit	AWE/BE
MI	Speed Ring Experimental & Tool Company	Detroit	BE
MI	Star Cutter Corp.	Farmington	AWE
MI	University of Michigan	Ann Arbor	AWE
MI	Wolverine Tube Division	Detroit	AWE
MN	Elk River Reactor	Elk River	DOE
MS	Salmon Nuclear Explosion Site	Hattiesburg	DOE
MO	Kansas City Plant	Kansas City	DOE
MO	Latty Avenue Properties	Hazelwood	AWE/DOE
MO	Mallinckrodt Chemical Co., Destrehan St. Plant	St. Louis	AWE/DOE
MO	Medart Co.	St. Louis	AWE
MO	Roger Iron Co.	Joplin	AWE
MO	Spencer Chemical Co.	Kansas City	AWE
MO	St. Louis Airport Site	St. Louis	AWE/DOE
MO	Tyson Valley Powder Farm	St. Louis	AWE
MO	United Nuclear Corp.	Hematite	AWE
MO	Weldon Spring Plant	Weldon Spring	DOE

etc.

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