MEMORANDUM:

SUBJECT: Request for Approval of Second Five-Year Review Report
Former Weldon Springs Ordnance Works, Weldon Springs, Missouri

FROM: Hoai Tran, Remedial Project Manager
Missouri/Kansas Remedial Branch

THRU: DeAndre Singletary, Chief
Missouri/Kansas Remedial Branch

TO: Cecilia Tapia, Director
Superfund Division

Attached for your approval is the Second Five-Year Review Report for the
Former Weldon Springs Ordnance Works (WSOW) site in Weldon Springs, St. Charles
County, Missouri. The WSOW site is separated into two operable units OUs: OU1 – soil
and pipeline, and OU2 – groundwater.

The remedy for OU1 included excavation and thermal destruction of
nitroaromatic-contaminated soils and wooden pipeline and also provided for the
excavation and stabilization of the lead-contaminated soils that did not meet lead Toxicity
Characteristics Leaching Procedure requirements. The site met remediation goals (RGs)
except for an area designated as T-13 on the Weldon Springs Training Area (WSTA).
The contamination at T-13 remains at depth and is under restricted access as it lies within
the fence line of WSTA. The remedy for OU1 is complete and is protective of human
health and the environment.

The remedy for OU2 included monitored natural attenuation (MNA) and
institutional controls (ICs). The remedy is expected to be protective of human health and
the environment upon attainment of RGs through MNA, which is functioning as
designed. In the interim, exposure pathways that could result in unacceptable risks are
being controlled; and ICs are in the process of being finalized to prevent the groundwater
in the restricted area from being used in the future.

In addition to assessing the MNA remedy, the OU2 review included the
evaluation of the Draft Performance Monitoring Report 003 (PMR003) for WSOW. The
Environmental Protection Agency, the Missouri Department of Natural Resources, and
the Army (the Agencies) met on September 28, 2010, and reached agreement on the
MNA optimization plan, which is discussed in Section 7.1.2 of this five-year review. After an exhaustive review process, the Agencies were able to concur on a monitoring program for all but three sampling locations. The remaining three sampling locations are to maintain the current sampling frequency with potential frequency change or removal from the monitoring program based on future data. The Army is expected to finalize the PMR003 accordingly.

Attachment

Approve  Disapprove
Date  5/18/10  Date  

Date  

Date  

Date  

Date  

ARMY ACCEPTANCE
OF THE FIVE YEAR REVIEW
FORMER WELDON SPRING ORDNANCE WORKS
WELDON SPRING, MISSOURI

Signature Sheet for the following Five-Year Review for Weldon Spring Ordnance Works.

The United States Army has prepared the following Five-Year Review in accordance with CERCLA, as amended. It is hereby approved by the 88th Regional Support Command (Property Owner) and submitted for your review and approval.

Reviewed by:

Jonathan Harrington
US Army Environmental Command
Cleanup & Munitions Response Division – West Branch

Barry McFarland
Environmental Protection Specialist (contractor), Environmental Division

Approved by:

David L. Moore
Chief, Public Works- Environmental Division
FINAL FIVE-YEAR REVIEW REPORT
OPERABLE UNIT 1 – SOIL
OPERABLE UNIT 2 – GROUNDWATER

FORMER WELDON SPRING ORDNANCE WORKS
WELDON SPRING, MISSOURI

SEPTEMBER 29, 2010

Prepared for:

Department of the Army
88th Regional Support Command
United States Army Reserve

and

United States Army Environmental Command

Prepared by:

ECC

and

Burns & McDonnell
Engineering Company, Inc.
EXECUTIVE SUMMARY

The Former Weldon Spring Ordnance Works (WSOW) is separated into two operable units; Operable Unit 1 (OU1)—soil and pipeline; and, Operable Unit 2 (OU2)—groundwater.

The remedy for OU1 included excavation and thermal destruction of nitroaromatic-contaminated soils and wooden pipeline and also provided for the excavation and stabilization of the lead-contaminated soils that did not meet lead Toxicity Characteristic Leaching Procedure requirements. The remedy for OU2 included monitored natural attenuation (MNA) and institutional controls (ICs). The site achieved construction completion with the signing of the Preliminary Close-Out Report on August 24, 2005. The trigger date for this Five-Year Review is the signature date of the first five-year review, March 21, 2005.

The assessment of this five-year review found that the remedy was constructed in accordance with the requirements of the Records of Decision (RODs). One Explanation of Significant Differences (ESD) was issued to address quantities of soil for rotary kiln treatment, additional materials for land disposal in the Weldon Spring Chemical Plant Disposal Cell, and quantities of materials for offsite disposal.

The remedy for OU1 is complete and is protective of human health and the environment. The T-13 area on the Weldon Spring Training Area (WSTA) has contamination remaining at depth. This area is under restricted access, as it lies within the fence line of the WSTA. The contamination is present at a depth of 10 feet or greater and is of limited lateral extent. There is limited chance of exposure to the contamination due to the fact that the remaining contamination is present at depths greater than construction activities would require disturbing.

The remedy for OU2 is expected to be protective of human health and the environment upon attainment of remedial goals (RGs) through MNA, which is functioning as designed. In the interim, exposure pathways that could result in unacceptable risks are being controlled and ICs are in the process of being finalized to prevent the groundwater in the restricted area from being used in the future.
Five-Year Review Summary Form

<table>
<thead>
<tr>
<th>SITE IDENTIFICATION</th>
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<tbody>
<tr>
<td>Site name (from WastLAM): Former Weldon Spring Ordnance Works</td>
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<tr>
<td>EPA ID (from WastLAM): MO5210021288</td>
</tr>
<tr>
<td>Region: 7 State: MO City/County: Weldon Spring / St. Charles</td>
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<table>
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<tr>
<th>SITE STATUS</th>
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<tbody>
<tr>
<td>NPL status: X Final ___ Deleted ___ Other (specify)</td>
</tr>
<tr>
<td>Remediation status (choose all that apply): ___ Under Construction X Operating (OU2) X Complete (OU1)</td>
</tr>
<tr>
<td>Multiple OUs? X YES ___ NO Construction completion date: 08/24/2005</td>
</tr>
<tr>
<td>Has site been put into reuse? X YES ___ NO</td>
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<table>
<thead>
<tr>
<th>REVIEW STATUS</th>
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<tbody>
<tr>
<td>Lead agency: EPA ___ State ___ Tribe X Other Federal Agency ___ US Army Environmental Command (USAEC) and 88th Regional Support Command (88th RSC)</td>
</tr>
<tr>
<td>Author name: ECC/Burns &amp; McDonnell</td>
</tr>
<tr>
<td>Author title: Subcontractor Author affiliation: Subcontractor</td>
</tr>
<tr>
<td>Review period: ** 03/21/2005 to 09/30/2009</td>
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<tr>
<td>Date(s) of site inspection: 03/31/2009</td>
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<tr>
<td>Type of review: X Post-SARA ___ Pre-SARA ___ NPL-Removal only ___ Non-NPL Remedial Action Site ___ NPL State/Tribe-lead Regional Discretion</td>
</tr>
<tr>
<td>Review number: ___ 1 (first) X 2 (second) ___ 3 (third) ___ Other (specify)</td>
</tr>
<tr>
<td>Triggering action: X Actual RA Onsite Construction at OU # ___ Actual RA Start</td>
</tr>
<tr>
<td>____ Construction Completion ___ NPL State/Tribe-lead Regional Discretion</td>
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<tr>
<td>____ Other (specify) Triggering action date (from WastLAM): 03/21/2005</td>
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<td>Due date (five years after triggering action date): 03/21/2005</td>
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</table>
Five-Year Review Summary Form, cont’d.

Issues:

**OU1—SOIL**
An area of contamination remains at T-13.

**OU2—GROUNDWATER**
Institutional controls need to be finalized as outlined in the RD/RA Work Plan – Phase II. Specific ICs to be addressed include establishing an Installation Regulation and negotiating a Deed Restrictive Covenant with the Missouri Department of Conservation (MDC).

Monitoring program optimization should be implemented for overall project efficiency.

Recommendations and Follow-up Actions:

**OU1—SOIL**
Provide current WSTA property owner/user with updates on remedial activities and provide assistance as needed for usability of the WSTA with respect to OU1 chemicals of concern.

**OU2—GROUNDWATER**
Generate IC document to include a summary of the ICs, applicable regulations and guidance, contact information, an environmental overlay, and other ICs that may be developed.

Complete review by USAEC counsel of applicability of a deed restrictive covenant based on the Missouri Environmental Covenants Act. Complete negotiations with MDC to implement deed restrictive covenant (in conjunction with the Department of Energy).

Monitoring program optimization should be implemented for overall project efficiency.

Protectiveness Statement(s):

**OU1—SOIL**
The remedy is complete and is protective of human health and the environment. The T-13 area on the WSTA has contamination remaining at depth. This area is under restricted access, as it lies within the fence line of the WSTA. The contamination is present at a depth of 10 feet or greater and is of limited lateral extent. There is limited chance of exposure to the contamination due to the fact that the remaining contamination is present at depths greater than construction activities would require disturbing.

**OU2—GROUNDWATER**
The remedy is expected to be protective of human health and the environment upon attainment of RGs, through MNA, which is functioning as designed. In the interim, exposure pathways that could result in unacceptable risks are being controlled and additional ICs are in the process of being finalized to prevent the groundwater in the restricted area from being used in the future.

Other Comments:
There are no other comments at this time.
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<td>88th RSC</td>
<td>Army 88th Regional Support Command United States Army Reserve</td>
</tr>
<tr>
<td>1,3-DNB</td>
<td>1,3-dinitrobenzene</td>
</tr>
<tr>
<td>Atlas</td>
<td>Atlas Powder Company</td>
</tr>
<tr>
<td>ARAR</td>
<td>applicable or relevant and appropriate requirement</td>
</tr>
<tr>
<td>BLRA</td>
<td>baseline risk assessment</td>
</tr>
<tr>
<td>BMcD</td>
<td>Burns &amp; McDonnell Engineering Company, Inc.</td>
</tr>
<tr>
<td>CERCLA</td>
<td>Comprehensive Environmental Response, Compensation, and Liability Act</td>
</tr>
<tr>
<td>COC</td>
<td>chemical of concern</td>
</tr>
<tr>
<td>CPA</td>
<td>Chemical Plant Area</td>
</tr>
<tr>
<td>CSR</td>
<td>Code of State Regulations</td>
</tr>
<tr>
<td>DOD</td>
<td>Department of Defense</td>
</tr>
<tr>
<td>DOE</td>
<td>United States Department of Energy</td>
</tr>
<tr>
<td>DNT</td>
<td>dinitrotoluene</td>
</tr>
<tr>
<td>ESD</td>
<td>Explanation of Significant Differences</td>
</tr>
<tr>
<td>FS</td>
<td>Feasibility Study</td>
</tr>
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<td>GMAR</td>
<td>Groundwater Monitoring Assessment Report</td>
</tr>
<tr>
<td>HEAST</td>
<td>Health Effects Assessment Summary Tables</td>
</tr>
<tr>
<td>IC</td>
<td>institutional control</td>
</tr>
<tr>
<td>IRIS</td>
<td>Integrated Risk Information System</td>
</tr>
<tr>
<td>IT</td>
<td>International Technology Corporation</td>
</tr>
<tr>
<td>KCD</td>
<td>Kansas City District</td>
</tr>
<tr>
<td>m-NT</td>
<td>m-nitrotoluene</td>
</tr>
<tr>
<td>MDC</td>
<td>Missouri Department of Conservation</td>
</tr>
<tr>
<td>MDNR</td>
<td>Missouri Department of Natural Resources</td>
</tr>
<tr>
<td>MECA</td>
<td>Missouri Environmental Covenants Act</td>
</tr>
<tr>
<td>mg/kg-day</td>
<td>milligram per kilogram per day</td>
</tr>
<tr>
<td>MNA</td>
<td>monitored natural attenuation</td>
</tr>
<tr>
<td>MWQS</td>
<td>Missouri Water Quality Standard</td>
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<tr>
<td>μg/L</td>
<td>micrograms per liter</td>
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<tr>
<td>NB</td>
<td>nitrobenzene</td>
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<td>NPL</td>
<td>National Priorities List</td>
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<td>o-NT</td>
<td>o-nitrotoluene</td>
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<td>OSWER</td>
<td>Office of Solid Waste and Emergency Response</td>
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<td>OU1</td>
<td>Operable Unit 1</td>
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# List of Acronyms and Abbreviations

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<td>OU2</td>
<td>Operable Unit 2</td>
</tr>
<tr>
<td>p-NT</td>
<td>p-nitrotoluene</td>
</tr>
<tr>
<td>PAH</td>
<td>polycyclic aromatic hydrocarbon</td>
</tr>
<tr>
<td>Pangea</td>
<td>Pangea Group, Inc.</td>
</tr>
<tr>
<td>PCB</td>
<td>polychlorinated biphenyl</td>
</tr>
<tr>
<td>PMR</td>
<td>performance monitoring report</td>
</tr>
<tr>
<td>ppm</td>
<td>parts per million</td>
</tr>
<tr>
<td>RA</td>
<td>remedial action</td>
</tr>
<tr>
<td>RAGS</td>
<td>Risk Assessment Guidance for Superfund</td>
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<tr>
<td>RAO</td>
<td>remedial action objective</td>
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<td>RD/RA</td>
<td>remedial design/remedial action</td>
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<td>RG</td>
<td>remediation goal</td>
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<td>RI</td>
<td>Remedial Investigation</td>
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<tr>
<td>ROD</td>
<td>Record of Decision</td>
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<td>Site</td>
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<tr>
<td>TBC</td>
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<tr>
<td>TCLP</td>
<td>Toxicity Characteristic Leaching Procedure</td>
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<tr>
<td>TNT</td>
<td>trinitrotoluene</td>
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<tr>
<td>UECA</td>
<td>Uniform Environmental Covenants Act</td>
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<tr>
<td>USACE</td>
<td>United States Army Corps of Engineers</td>
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<tr>
<td>USAEC</td>
<td>United States Army Environmental Command</td>
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<td>USEPA</td>
<td>United States Environmental Protection Agency</td>
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<td>Weston</td>
<td>Roy F. Weston, Inc.</td>
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<td>WSOw</td>
<td>Weldon Spring Ordnance Works</td>
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<td>WSSRAP</td>
<td>Weldon Spring Site Remedial Action Project</td>
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<td>WSTA</td>
<td>Weldon Spring Training Area</td>
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* * * * *
1.0 INTRODUCTION

This Five-Year Review Report for the Former Weldon Spring Ordnance Works (WSOW), Weldon Spring, Missouri (Site) was conducted in accordance with the United States Environmental Protection Agency (USEPA), Office of Emergency and Remedial Response, EPA 540-R-01-007, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-03B-P (June 2001), Comprehensive Five-Year Review Guidance (USEPA, 2001). This five-year review was conducted for the United States Army Environmental Command (USAEC) and the Army 88th Regional Support Command United States Army Reserve (88th RSC) by ECC and Burns & McDonnell Engineering Company, Inc. (BMcD) under Contract W91ZLK-05-D-0009, Delivery Order 0008. This document will become part of the Site Information Repository. The Information Repository is located at the St. Charles City-County Library District, Middendorf/Kredell Branch. This review does not include detail on site history and background, as it is available in other documents available at this same location. The purpose of a five-year review is to ensure that a remedial action remains protective of human health and the environment and is functioning as designed. This five-year review has been prepared pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

*If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

This requirement was interpreted further in the National Contingency Plan (NCP); 40 CFR §300.430(f)(4)(ii) states:

*If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*
This Five-Year Review addresses Operable Unit 1 (OU1) (soil and pipeline) and Operable Unit 2 (OU2) (groundwater) at the WSOW. The Army is only responsible for OU1 and OU2 at the WSOW. The United States Department of Energy (DOE) is responsible for four separate operable units (OUs) of the Weldon Spring Site (also known as the Weldon Spring Site Remedial Action Project [WSSRAP]): the Chemical Plant OU, the Groundwater OU, the Quarry Bulk Waste OU, and the Quarry Residuals OU. Reporting is conducted separately by the Army and DOE for their respective OUs. The triggering action for this Five-Year Review is the signature date of the first five-year review (March 21, 2005) (United States Army Corps of Engineers [USACE], 2005a). The five-year review for OU1 is a statutory review required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited and unrestricted exposure. The five-year review for OU2 is a policy review required due to the fact that remedial action, upon completion, will not leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure, but requires five years or more to complete.

1.1 OU1—SOIL
The remedial action (RA) for OU1 is complete. Soil contamination remains at depth at an area known as T-13, as such this area is not in a condition suitable for unlimited use and unrestricted exposure. Five-year reviews will be a statutory requirement due to remaining soil contamination.

1.2 OU2—GROUNDWATER
The RA for OU2, MNA, is currently operating. At completion of the RA for OU2, the site is expected to be left in a condition suitable for unlimited use and unrestricted exposure. Five-year reviews will be a policy requirement until the RA is complete and contaminants are below levels that allow for unlimited use and unrestricted exposure.

* * * * *
2.0 SITE CHRONOLOGY

2.1 CHRONOLOGY OF WSOW EVENTS—SITE-WIDE

A chronology of site-wide WSOW events is presented in Table 2-1.

Table 2-1: Chronology of WSOW Events—Site-Wide

<table>
<thead>
<tr>
<th>Event</th>
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<tbody>
<tr>
<td>Land for WSOW obtained</td>
<td>1940-1941</td>
</tr>
<tr>
<td>Facility operated by Atlas Powder Company (Atlas)</td>
<td>1941-1945</td>
</tr>
<tr>
<td>First clean up by Atlas: washed equipment with soda ash solution, steamed, flashed with water, excavated and removed contaminated soils, burned, and controlled flashing</td>
<td>1944</td>
</tr>
<tr>
<td>Second clean up by Atlas and USACE: used the same decontamination procedures as in 1944</td>
<td>1945-1946</td>
</tr>
<tr>
<td>Facility declared surplus property and ownership was transferred to the War Assets Administration</td>
<td>1946</td>
</tr>
<tr>
<td>War Assets Administration distributed a bulk of the acres to state and local jurisdictions (leaving only the current WSTA and the United States Atomic Energy Commission’s former Uranium Feed Material Plant site under Federal Ownership: the Uranium Feed Material Plant is commonly referred to as the Chemical Plant Area [CPA])</td>
<td>1949</td>
</tr>
<tr>
<td>Third clean up: A group of three efforts that took place during the 1950s; General Services Administration (successor to the War Assets Administration) regraded and hauled soils from the trinitrotoluene (TNT) lines and removed scrap materials; the 226 acres transferred to the Atomic Energy Commission were decontaminated in 1955 (removal of 28,250 cubic yards of contaminated soil and 21,500 linear feet of buried TNT wastewater pipeline from the area that had been TNT plants 1, 2, 3, and 4; 59 buildings were burned and eight more structures were razed); late in 1956, 136 buildings were burned and 20 were dismantled and/or sold in a clean up effort called Cox’s Program</td>
<td>1950-1956</td>
</tr>
<tr>
<td>Fourth clean up by the United States Army Support Center in St. Louis: coordinated with the USACE and ordnance experts for removal of equipment from and demolishing of 23 buildings</td>
<td>1962-1963</td>
</tr>
<tr>
<td>Fifth clean up: dismantled and shipped the wastewater incineration plants to another TNT facility; removed transformers, utility poles, and electrical and communication cables and demolished 70 buildings</td>
<td>1965-1967</td>
</tr>
<tr>
<td>Seven miles of railroad track were removed and shipped to other installations</td>
<td>1967</td>
</tr>
<tr>
<td>The Army initiated a comprehensive Remedial Investigation (RI) of the WSTA portion of the Site</td>
<td>1988</td>
</tr>
<tr>
<td>Site placed on the National Priorities List (NPL)</td>
<td>1990</td>
</tr>
<tr>
<td>Companion RI completed for the remainder of the WSOW (outside the WSTA) after the entire site was placed on the NPL</td>
<td>1990-1991</td>
</tr>
<tr>
<td>Baseline Risk Assessment (BLRA)</td>
<td>1992-1993</td>
</tr>
<tr>
<td>Preliminary Close-Out Report (PCOR)</td>
<td>2005</td>
</tr>
<tr>
<td>Second Five-Year Review (OU1 and OU2)</td>
<td>2010</td>
</tr>
</tbody>
</table>
2.3 **CHRONOLOGY OF WSOW EVENTS—OU2**

A chronology of events at WSOW OU2 is presented in Table 2-3.

Table 2-3: Chronology of WSOW Events—OU2

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiation of groundwater sampling investigations</td>
<td>1987</td>
</tr>
<tr>
<td>BLRA - Groundwater (Argonne National Laboratory)</td>
<td>1997</td>
</tr>
<tr>
<td>RI Report for OU2 (MK-Ferguson Company and Jacobs Engineering Group, Inc. and Argonne National Laboratory)</td>
<td>1997</td>
</tr>
<tr>
<td>FS for OU2 (Argonne National Laboratory)</td>
<td>1998</td>
</tr>
<tr>
<td>Groundwater Monitoring Report (during OU1 RA activities) (International)</td>
<td>1999</td>
</tr>
<tr>
<td>Round 22 groundwater sampling (first post OU1 RA sampling event)</td>
<td>1999</td>
</tr>
<tr>
<td>Groundwater Monitoring Report (post OU1 RA activities) (USACE)</td>
<td>2000</td>
</tr>
<tr>
<td>Round 35 groundwater sampling</td>
<td>2003</td>
</tr>
<tr>
<td>Groundwater Monitoring Assessment Report (USACE)</td>
<td>2004</td>
</tr>
<tr>
<td>Supplemental FS (USACE)</td>
<td>2004</td>
</tr>
<tr>
<td>ROD for OU2 (USACE)</td>
<td>2004</td>
</tr>
<tr>
<td>Round RA-01 groundwater sampling (first post OU2 RA implementation sampling event)</td>
<td>2005</td>
</tr>
<tr>
<td>Remedial Design / Remedial Action (RD/RA) Workplan, Phase II – ICs (USACE)</td>
<td>2006</td>
</tr>
<tr>
<td>Round RA-02 groundwater sampling (second post OU2 RA implementation sampling event)</td>
<td>2006</td>
</tr>
<tr>
<td>Round RA-03 groundwater sampling (third post OU2 RA implementation sampling event)</td>
<td>2006</td>
</tr>
<tr>
<td>Round RA-04 groundwater sampling (fourth post OU2 RA implementation sampling event)</td>
<td>2007</td>
</tr>
<tr>
<td>Round RA-05 groundwater sampling (fifth post OU2 RA implementation sampling event)</td>
<td>2008</td>
</tr>
<tr>
<td>Round RA-06 groundwater sampling (most recent post OU2 RA implementation sampling event)</td>
<td>2009</td>
</tr>
<tr>
<td>Five-Year Review by USAEC</td>
<td>2010</td>
</tr>
</tbody>
</table>
2.2 CHRONOLOGY OF WSOW EVENTS—OU1
A chronology of events at WSOW OU1 is presented in Table 2-2.

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feasibility Study (FS) for OU1</td>
<td>1993</td>
</tr>
<tr>
<td>Army released the Proposed Plan for the Former WSOW OU1: Soils and Pipeline</td>
<td>1993</td>
</tr>
<tr>
<td>Record of Decision (ROD) for OU1</td>
<td>1996</td>
</tr>
<tr>
<td>Site mobilization on December 15</td>
<td>1997</td>
</tr>
<tr>
<td>RA for OU1 initiated on January 5 (Roy F. Weston, Inc. [Weston]) (as listed in the Comprehensive Environmental Response, Compensation, and Liability Information System)</td>
<td>1998</td>
</tr>
<tr>
<td>RA for OU1 suspended (Weston)</td>
<td>1999</td>
</tr>
<tr>
<td>Draft RA Report for OU1 submitted (Weston)</td>
<td>2000</td>
</tr>
<tr>
<td>RA for OU1 resumed (Pangea Group, Inc. [Pangea])</td>
<td>2000</td>
</tr>
<tr>
<td>RA for OU1 completed (Pangea)</td>
<td>2001</td>
</tr>
<tr>
<td>Draft Close-Out Report for OU1 submitted (Pangea)</td>
<td>2001</td>
</tr>
<tr>
<td>Draft-Final RA Report for OU1 submitted to regulators (Weston)</td>
<td>2002</td>
</tr>
<tr>
<td>Draft-Final Close-Out Report for OU1 submitted to regulators (Pangea)</td>
<td>2002</td>
</tr>
<tr>
<td>Additional contamination discovered (USACE/DOE)</td>
<td>2002</td>
</tr>
<tr>
<td>Follow-up RA for OU1 initiated at T-13 (Pangea)</td>
<td>2003</td>
</tr>
<tr>
<td>RA for OU1 at T-13 completed (Pangea)</td>
<td>2004</td>
</tr>
<tr>
<td>Draft; Final RA Report for OU1 submitted (Pangea)</td>
<td>2004</td>
</tr>
<tr>
<td>Draft-Final: Final RA Report for OU1 submitted to regulators (Pangea)</td>
<td>2004</td>
</tr>
<tr>
<td>Explanation of Significant Differences (ESD) to the 1996 ROD submitted for signature</td>
<td>2004</td>
</tr>
<tr>
<td>Explanation of Significant Differences signed by USACE, Fort Leonard Wood, and USEPA</td>
<td>2004</td>
</tr>
<tr>
<td>Final RA Report for OU1 finalized; OU1 closure given by USEPA</td>
<td>2004</td>
</tr>
<tr>
<td>Five-Year Review by USACE</td>
<td>2005</td>
</tr>
<tr>
<td>Five-Year Review by USAEC</td>
<td>2010</td>
</tr>
</tbody>
</table>
3.0 BACKGROUND

3.1 PHYSICAL CHARACTERISTICS
The Site is located in St. Charles County, Missouri about 30 miles west of St. Louis. It is bisected by State Highway 94, bounded on much of the north by U.S. Highway 40-61, and bounded on much of the south by the Missouri River. The area of the Ordnance Works site during production was 17,232 acres.

Topography of the site is hilly, varying from gently rolling in the north to rugged in the south. The location of the site is shown on Figure 3-1.

3.2 GEOLOGY/HYDROGEOLOGY
The northern half of the Site drains northeastward through a series of creeks and man-made lakes to Dardenne Creek, which is a tributary of the Mississippi River. The southern portion of the Site is more steeply sloped and heavily wooded, and drains southeastward into Little Femme Osage Creek and the Missouri River.

Three aquifers have been identified in the Site area. They are the sand and gravel alluvium of the Mississippi and Missouri Rivers and their tributaries, the shallow bedrock aquifer (Burlington-Keokuk and adjacent lower formations), and the deeper bedrock aquifer (St. Peter Formation), which is separated from the shallow bedrock aquifer by an aquitard. The shallow bedrock aquifer consists of the Burlington-Keokuk Formation (weathered and unweathered), the Fern Glen Formation, and the Chouteau Group. The principal recharge to this aquifer is through precipitation infiltration from the overburden, from losing stream drainages, or from surface water impoundments. The aquitard consists of the Hannibal Formation, Sulphur Springs Group, Kimmswick Formation, Decorah Group, Plattin Formation, and Joachim Formation. The deeper bedrock aquifer is the St. Peter Formation. Recharge into the deep bedrock aquifer occurs where the bedrock units are near the surface or by leakage from the overlying shallow bedrock aquifer. However, the thickness of the confining unit and the low vertical flow velocities associated with the overlying shallow aquifer would likely mitigate any significant contaminant migration to the deeper aquifer on site.

3.3 LAND AND RESOURCE USE
The Former WSOW NPL site encompasses the WSTA, August A. Busch Memorial Conservation Area, the Weldon Spring Conservation Area, a Missouri Department of Transportation Depot, Francis Howell High School, Weldon Spring Heights, Former CPA, and the Missouri Research Park. The Former CPA is a separate NPL site known as the WSSRAP and is being addressed by the DOE (this Five-Year Review
Report applies only the OUs that are the responsibility of the Army and does not encompass the OUs that are the responsibility of the DOE). Figures 3-2 and 3-3 show the location of these properties.

The land in the immediate vicinity of the Site is currently undeveloped. Yet, the area to the northeast is rapidly being developed into single-family and multi-family residential areas. There have been dramatic increases in population in recent years in nearby incorporated areas such as O'Fallon, St. Peters, and Cottleville. Although there are no residential properties on the land parcels where plant operations occurred on the Former WSOW NPL site, based on current land use, cleanup goals were set to protect potential future residents. Office buildings have been built in Missouri Research Park. The August A. Busch and Weldon Spring Conservation Areas attract over one million visitors per year for fishing, hunting, and nature studies. Natural resources include several heavily wooded areas, the most diversified flora of any part of the state, migratory bird refuge areas, 37 lakes, and numerous fishing ponds.

The WSTA is currently under ownership of the 88th RSC and is used as a training area. The firing range at the WSTA is also used by local and federal law enforcement officials.

3.4 HISTORY OF CONTAMINATION
The Former WSOW site was an explosives production facility that manufactured TNT and dinitrotoluene (DNT) for use in World War II. The facility was placed on standby in 1944. While in standby, onsite contamination was discovered. There were several cleanup actions taken and investigations completed prior to the site being listed on the NPL.

3.5 INITIAL RESPONSE
There were several actions taken to reduce the extent of contamination prior to the placement of the Site on the NPL in 1990. These events are identified in Section 2.0, Site Chronology. These events are not related to the process established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) but significantly reduced the potential for exposure to nitroaromatic contamination prior to the initiation of the RAs at OU1 and OU2. Additional detail of these activities is provided as part of the Site Background in the Final Remedial Investigation, Weldon Spring Training Area, Volume I (International Technology Corporation [IT], 1993) and portions are included below. A RI was initiated in 1988 for OU1. Before the investigation was completed, the Site was placed on the NPL. RA for the soil and pipeline began in 1998. The RI for OU2 was initiated and completed following CERCLA procedures.

The following is the discussion of pre-ROD cleanup activities as presented in the Final Remedial Investigation, Weldon Spring Training Area (IT, 1993).
At least four large-scale cleanup actions have been undertaken to remove contaminants from the former TNT manufacturing activities at WSTA. The first cleanup occurred in early 1944 during the period the facility was on standby status. It was performed by Atlas Powder Company, the facility contractor, and was well documented (Hannan, 1944). Remediation methods included washing equipment with soda ash solution, steaming, flushing with water, excavation and removal of contaminated soils, burning, and controlled flashing.

The second cleanup was conducted from August 1945 through August 1946 by Atlas Powder Company and the Corps of Engineers. Although there was very little documentation of this cleanup action, it was assumed that Atlas' procedures were similar to their 1944 decontamination effort (USATHAMA, 1977b). Many of the same personnel were involved and a detailed written methodology had been prepared during the 1944 cleanup. Following this decontamination and return of the facility to the Ordnance Department supervision and subsequently to War Assets Administration supervision, most of the decontaminated equipment was salvaged or redistributed to other government agencies and explosives' manufacturers. Buildings were either salvaged, destroyed by fire, or flashed with flame and scrapped. Approximately 200 of the 1038 buildings from the Ordnance Works were either burned or demolished by December 1946 (Campbell, 1987a).

The third cleanup occurred after the General Services Administration (GSA), successor to the War Assets Administration, assumed custody of the WSTA portion of the Ordnance Works in 1950. For several months, GSA staff regraded and hauled soil from the TNT lines and removed scrap materials.

Prior to transfer of some former WSO W property to the Atomic Energy Commission (AEC) in 1956 (see below), the Army and the AEC completely decontaminated that site in 1955 as the fourth cleanup action. This included removal of 28,250 cubic yards of contaminated soil and 21,500 linear feet of buried TNT wastewater pipeline from the area that had been TNT plants 1, 2, 3, and 4 (USATHAMA, 1977c). Also, 59 buildings were burned and 8 more structures were razed. Although much of the 1955 decontamination effort was outside the current WSTA boundaries, the eastern edge of WSTA received extensive remediation activity at this time.

During approximately this same time period (late 1956) but not necessarily associated with the property transfer, an additional 136 buildings were destroyed by burning and 20 were dismantled and/or sold in a cleanup effort called Cox's Program.
3.6  BASIS FOR TAKING ACTION

Two RIs were conducted by USACE, one for the WSTA was initiated in 1988 and the other in 1993 for the rest of the WSOW. These two RIs were used to identify the types, quantities, and locations of contaminants in different media throughout the area. An RI Report prepared in 1997 (MK-Ferguson Company and Jacobs Engineering Group Inc., and DOE, 1997) further defined nature and extent of groundwater contamination in the shallow aquifer system at the site. Chemicals that posed potentially unacceptable risks were designated as chemicals of concern (COCs) and RGs were identified for these COCs.

3.6.1 OU1—Soil

Soil with concentrations of TNT and DNT that exceeded the following risk-based RGs required remediation:

- 2,4,6-TNT  57 parts per million (ppm) ($10^{-6}$ risk, residential exposure)
- 2,4- and 2,6-DNT  2.5 ppm ($10^{-6}$ risk, residential exposure)

Soils contaminated by polychlorinated biphenyls (PCB) and polycyclic aromatic hydrocarbons (PAH) that exceeded the following RGs required remediation:

- Total PCBs  10 ppm (USEPA PCB Spill Cleanup Policy)
- Total carcinogenic PAHs  10 ppm ($10^{-6}$ risk on the WSTA)

It was determined that the pipeline only presented a safety-related risk and not a health-related risk. The pipeline was removed and incinerated based on the non-quantified safety risk.

Lead was not found to pose a hazard to human health and the environment (see section 2.6 of the ROD [USACE, 1996]). Lead modeling conducted for the BLRA indicated lead was found at such scattered and infrequently visited locations that the risk levels were relatively low. The BLRA modeling indicated that soil lead concentrations did not cause an excessive human health risk. However, lead was found at many locations in the soils at the WSTA and in the Conservation Areas in concentrations above those established to be protective for Superfund sites. The cleanup of lead at WSOW was based upon the USEPA Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites. This was included as To Be Considered (TBC) material during determination of Applicable or Relevant and Appropriate Requirements (ARARs) for the Site. The USEPA Superfund Site Lead Policy cleanup level at the time of the ROD was 500 ppm. Additional analysis performed during the first five-year review to consider the updated value of 400 ppm indicated the remedy was still adequately protective. For lead risk...
assessment practice, both the 500 ppm and 400 ppm concentrations were intended to represent average concentrations over the site rather than maximum concentrations permitted at a single point. After removal of lead impacted soil, the average concentration of lead in soils remaining was reduced to less than 400 ppm, which provides adequate protection for unrestricted use.

An ecological risk assessment was also included in the BLRA (IT, 1993b). The environmental assessment concluded that some biota at WSOW may potentially be at risk due to concentrations of nitroaromatics and metals in soils. However biologists at the conservation areas were not able to confirm that the potentially affected populations were under stress. It was determined that the contaminated soils have not affected critical habitat on the conservation areas because of the relatively few acres impacted by contamination (USACE, 1996).

Since results of the exposure models used in the BLRA were qualified because of the many assumptions required, the BLRA suggested the presence of elevated chemicals in biota be verified through field testing. A report titled Sublethal Effects in Indigenous Animals Exposed to Chemical Contaminants at the Former Weldon Springs [sic] Ordinance [sic] Works EPA National Priorities List Site collected samples from four mammalian species (white-tailed deer, white-footed mouse, voles, and deer mouse) (Bickham, 1995). The report concluded:

> Although animals were collected from areas clearly contaminated with TNT and DNT, no strong evidence was found in any of the four species for significant genotoxic effects. ...Populations of mammals inhabiting the WSTA are not being strongly impacted by the presence of chemical contamination. ...It is possible that exposure is low enough that only part of the population is affected. Possibly this is limited to only the most sensitive individuals in the population. It is unclear as to whether or not such a subtle effect could have long-term impacts on the populations. However, this does not seem likely because of the ability of these species, especially the rodents, to adapt through natural selection to this situation.

The RI also included a groundwater investigation. This investigation indicated that groundwater was contaminated with TNT and DNT. The Army, USEPA, and Missouri Department of Natural Resources (MDNR) agreed that the soil and groundwater contamination would be addressed on separate schedules to permit accelerated cleanup of the soil.

### 3.6.2 OU2—Groundwater

The groundwater investigation conducted during the RI showed that the groundwater was contaminated with TNT and DNT. The BLRA evaluated the groundwater contamination. The human health risk
assessment indicated that the Site contaminant levels were acceptable for a recreational user, but not for a resident. The ecological risk assessment indicated that contaminant concentrations in spring water and sediment posed little or no risk to ecological resources in the area and that remediation was not needed from an ecological perspective.

The 1997 RI concluded:

Groundwater contamination with nitroaromatic compounds occurs sporadically at low levels across the groundwater system. Presence of nitroaromatic compounds in the groundwater is suspected to be a result of leakage from former TNT process lines, discharge from wastewater lines, and leaching of TNT-contaminated soils. The nitroaromatic compounds and their degradation products infiltrate into the shallow groundwater system and are discharged to springs by diffuse and discrete flow mechanisms. Nitroaromatics have low persistence and relatively low solubilities, but their mobilities are high as a result of low distribution coefficients. Biotransformation in the overburden material and shallow aquifer is the primary process affecting their distribution in the groundwater system. Microorganisms have been shown to transform and degrade TNT and DNT (Schumacher et al. 1993). The groundwater characterization results suggest that biotransformation is affecting nitroaromatic contamination in groundwater at the chemical plant area and the ordnance works area. In general, TNT and DNT concentrations decrease with distance from the historic source areas, while concentrations of degradation products increase. The decrease in TNT and DNT has been shown to be correlated at the ordnance works area with the increase in 2-amino-4,6-dinitrotoluene and 4-amino-2,6-dinitrotoluene (Schumacher et al. 1993).

The 1997 RI additionally concluded:

Carcinogenic . . . risk and systemic toxicity are not indicated for current or future recreational visitors from incidental ingestion and dermal exposure to springwater. Potential chemical carcinogenic risks above the acceptable risk range of $1 \times 10^{-6}$ to $1 \times 10^{-4}$ for a hypothetical future resident are indicated for only a few wells. Risks are due primarily to nitroaromatic compounds and TCE . . . Systemic toxicity is indicated for about 25% of the wells evaluated, due primarily to the presence of nitroaromatic compounds in well water from various locations at the chemical plant area and the ordnance works area . . .

Little evidence exists to indicate that aquatic biota are being adversely affected by contaminants in groundwater that is discharging to area springs. Some surface water and sediment toxicity
were identified for Burgermeister Spring, and calculations based on maximum contaminant concentrations reported from all area springs indicate a potential for low or moderate risks to aquatic biota. However, the ecological significance of the observed toxicity and estimated risks is very minor. Biotic surveys at Burgermeister Spring identified the presence of an aquatic community typical of similar habitats in the Midwest. That community exhibited no indications of being affected by contaminants. Furthermore, most springs in the area do not provide permanent habitat capable of supporting more than a very limited aquatic biota. No risks were identified for terrestrial biota drinking from area springs; risk levels were two or more orders of magnitude below the target risk level. On the basis of these results, there is no evidence that ecological resources are being adversely affected by groundwater contamination discharging to springs in the area, and current levels of groundwater contamination pose little or no risk to aquatic or terrestrial biota.
4.0 REMEDIAL ACTIONS

4.1 REMEDY SELECTION

4.1.1 OU1—Soil

On September 26, 1996, a ROD (USEPA, 1996) was signed to address OU1 (soils and pipeline). The selected remedy for OU1 included rotary kiln incineration of nitroaromatics contaminated soils and wooden pipelines. The remedy also included stabilization of lead contaminated soil followed by disposal at the DOE WSSRAP storage cell. PCB and PAH contaminated soil (<50 ppm PCB) and asbestos contaminated materials (>1% asbestos) were also placed in this disposal cell.

Major components of the selected remedy include:

- Excavation of contaminated soils and debris with levels above the RGs:
  - TNT 57 milligrams per kilogram (mg/kg)
  - DNT 2.5 mg/kg
  - Lead 500 mg/kg
  - PCBs (total) 10 mg/kg
  - PAHs 10 mg/kg
- Excavation of an estimated 83,300 feet of explosives contaminated wooden pipeline buried at average depth of less than 5 feet.
- Incineration of contaminated soils and shredded pipeline material onsite in a rotary kiln incinerator unit.
- Stabilization of soils above lead TCLP limits and some incinerator ash with binder materials to prevent leaching of contaminants.
- Land disposal of treated and untreated lead-contaminated soils and other contaminated materials not suitable for incineration in the DOE WSSRAP storage cell.
- Contingency for offsite disposal of small quantities of hazardous wastes, such as waste listed by the regulations of RCRA as hazardous wastes.

Section 2.11 of the ROD states that the Army will use the DOE WSSRAP storage cell, rather than a separately constructed and maintained facility at WSOW, for all specified landfill disposal. Because WSOW completely surrounds the DOE NPL site, use of this disposal cell is considered onsite disposal for purposes of CERCLA requirements. This cell is part of the WSSRAP and is therefore subject to its own five-year reviews and is not covered in this report. The remedy also included the disposal of PAH and
PCB (<50 ppm) contaminated soil in the DOE WSSRAP storage cell. An ESD was signed in 2004. This ESD addressed events that occurred during the remedial action which were deemed significantly different, but did not fundamentally alter the remedy. These differences included cost, project duration, quantity of material, use of the DOE WSSRAP storage cell for material that met the requirements for incineration but was remediated after operation of the incinerator had been discontinued, and offsite disposal of small quantities of waste at permitted facilities.

The technologies incorporated in the RA were selected to substantially reduce risks associated with the contaminated materials that represented the principal threat at the site, and provided for permanent destruction of the nitroaromatics contamination. Also, since the cleanup goals were set to protect for residential exposures, no ICs were required. The actions of this remedy addressed the direct threat to human health and the environment by remediating the contaminated soil and pipeline across the site. Additionally, the selected remedy for OU1 also eliminated a source of nitroaromatics to the groundwater (OU2).

4.1.2 OU2—Groundwater

On September 30, 2004, a ROD (USACE, 2004a) was signed to address OU2 (groundwater). The selected remedy was MNA. The selected remedy involves the collection of monitoring data to verify the effectiveness of naturally occurring processes to reduce contaminant concentration over time. The primary natural processes occurring in groundwater at the Site are dilution, sorption, and dispersion with secondary benefits from biodegradation and photolytic breakdown. The ROD established remedial goals for MNA and expectations for groundwater and use restrictions to protect human health and the environment until RGs are achieved.

As stated in the ROD, the remedial action objective (RAO) is to minimize the potential for exposure either by ingestion, dermal contact, or inhalation of contaminated groundwater until concentrations are reduced to RGs.

Major components of the selected OU2 remedy include:

- Collection of monitoring data to verify the effectiveness of naturally occurring processes to reduce contaminant concentrations.
- Use of select wells from the existing groundwater monitoring network to collect groundwater data. Use of select springs at the Site for additional monitoring data.
ICs in areas which exceed RGs designed to limit ingestion or dermal exposure to groundwater. The ICs also restrict activities that may negatively impact the remediation of contamination or result in creation of a potential for downward migration of contamination.

Groundwater COCs and their RGs are as listed below:

- 2,4,6-TNT: 2.8 micrograms per liter (µg/L) (10^-6 risk, residential scenario)
- 2,4-DNT: 0.11 µg/L (Missouri Water Quality Standards [MWQS])
- 2,6-DNT: 1.3 µg/L (10^-5 risk, residential scenario)
- o-nitrotoluene (o-NT): 37 µg/L (hazard index of 1, residential scenario)
- m-nitrotoluene (m-NT): 37 µg/L (hazard index of 1, residential scenario)
- p-nitrotoluene (p-NT): 37 µg/L (hazard index of 1, residential scenario)
- 1,3-dinitrobenzene (1,3-DNB): 1.0 µg/L (MWQS)
- Nitrobenzene (NB): 17 µg/L (MWQS)

The final RD/RA Work Plan for OU2 defines the design and implementation of the selected final remedial action for OU2 in two phases (Phase I – MNA [USACE, 2005b] and Phase II – ICs [USACE, 2006]).

4.1.2.1 Phase I—Monitored Natural Attenuation

The initial objectives of the monitoring program are:

- Verify that contaminant concentrations are declining with time at a rate and in a manner so that cleanup standards will be met in a reasonable time
- Ensure that lateral migration of contamination does not significantly extend beyond the current area of impact
- Monitor the contaminant levels at impacted springs, which are the only current potential points of exposure under current land use conditions
- Monitor hydrologic conditions at the site over time to identify any changes in groundwater flow direction that might affect the protectiveness of the selected remedy

The monitoring strategy was developed considering the nature and extent of contamination and the RGs. The data evaluation provided in the Groundwater Monitoring Assessment Report (GMAR) (USACE, 2004b) was used as the basis of the monitoring strategy developed in the RD/RA Work Plan. The existing monitoring network at the Site was used, with monitoring locations identified as Objective 1, 2, 3, or 4. Currently, 32 unique monitoring locations are identified as Objective 1, 2, 3, or 4 locations (28 of
the locations are for sampling and hydrologic monitoring and the remaining four locations are for hydrologic monitoring only). The goal of each objective is as follows:

- **Objective 1** locations verify that contaminant concentrations are declining with time at a rate and in a manner such that cleanup standards will be met in a reasonable timeframe. Monitoring of wells at locations with the highest concentrations of contaminants within individual spring recharge basin areas will be used to achieve this objective.

- **Objective 2** locations ensure that the lateral migration of contamination does not significantly extend beyond the current area of impact. This objective is met by monitoring various downgradient locations that are either not impacted or are minimally impacted.

- **Objective 3** locations monitor contaminant levels at the impacted springs. Continued improvement of water quality in these affected springs is expected.

- **Objective 4** locations monitor hydrologic conditions at the Site over time to identify any changes in groundwater flow that might affect the protectiveness of the selected remedy. Analytic monitoring at depth will be provided as part of this objective in addition to continued monitoring of water levels in select wells to verify the continued nature of conditions that limit the potential for downgradient migration of contamination.

The statistical rate calculations (as performed in the GMAR in 2004) for the COCs for the **Objective 1** and **Objective 3** monitoring points are included in Performance Monitoring Report (PMR) 003 (ECC, 2009). Statistical analyses were performed to recalculate MNA timeframes and determine if contaminants are continuing to attenuate at a rate sufficient to meet RGs in a reasonable time. Additionally, PMR 003 proposed an approach for monitoring program optimization.

### 4.1.2.2 Phase II—Institutional Controls

The ICs implemented at the Site are intended to:

- Restrict activities that may negatively impact the remediation of contamination
- Restrict activities that may result in creation of a potential for downward migration of contamination
- Reduce the potential for ingestion or dermal exposure to groundwater contaminated at concentrations above RGs
- Prevent use of groundwater contaminated above ARARs or health based RGs as a potable water source
The following ICs are intended for the federally owned property (WSTA) at the Site:

As discussed below and in the RD/RA Work Plan, proposed ICs referenced an Installation Master Plan (or similar document) and installation regulation(s). Based on the similar nature and intended function of these documents as described in the RD/RA Work Plan (and per AR210-20, which does not require formal Master Plans for each Army Reserve facility), a single IC document will be developed for the site to fulfill the RD/RA Work Plan requirement. The IC document will include a summary of the ICs, applicable regulations and guidance, contact information, the environmental overlay, and other ICs that may be developed.

- Compliance with Federal, Department of Defense (DOD), and Army Regulations – An environmental overlay was generated that included information regarding activities for both OU1 and OU2. Maps generated from this overlay provided a construct for managing activities that would be restricted under the ICs associated with OU2. Currently planned construction activities will require consideration of this IC.

- Informational Devices – Stakeholders provided comments on a draft Informational Brochure developed by the Missouri Department of Conservation (MDC). This brochure was finalized and has been distributed at the August A. Busch Memorial Conservation Headquarters and at the WSS Interpretive Center. This brochure is available for distribution to users of the WSTA as needed. Additionally, in conjunction with the Five-Year Review, a public meeting was held in June 2009 to provide a project update and address concerns. Notifications of the Five-Year Review and public meeting were published on May 10 and 31, 2009 in the St. Charles Journal, the St. Peters Journal, the O'Fallon Journal, the Wentzville Journal, and the St. Charles zoned edition of the St. Louis Post-Dispatch (on May 11, 2009 and June 1, 2009).

- Installation regulation – The 88th RSC has summarized regulations, policies, and guidance associated with environmental management of the WSTA and WSOW and real property transfers. The WSTA is transitioning from the 89th Regional Readiness Command to the 88th RSC. As part of the transition, environmental management procedures are being re-examined. Upon transition of the WSTA, the new leadership will revisit this IC component now that the Missouri Well Construction Code Rulemaking for a Special Area at Weldon Spring has been finalized.

- Compliance with CERCLA 120(h) and DOD guidance – The 88th RSC continues to be diligent with regard to these requirements. There are no actions currently planned that would be covered under this IC component.
The following ICs are intended for the state owned property (and property transferred out of Federal ownership in the future to state or private ownership) at the Site:

- Missouri Well Construction Code (10 Code of State Regulations [CSR] 23-3) – During an open session of the Missouri Well Installation Board on March 21, 2007, the motion to accept the Rulemaking for 10 CSR 23.3.100-Special Areas, as published in the Missouri Register, carried. Final publication occurred in August 2007.
- Informational Devices – Stakeholders provided comments on a draft Informational Brochure developed by the MDC. This brochure was finalized and is distributed at the August A. Busch Memorial Conservation Headquarters and at the Weldon Spring Site Interpretive Center. MDC intends to update and reproduce this brochure as necessary.
- Deed Restrictive Covenant – The Army has previously engaged in several meetings with the MDC regarding a deed restrictive covenant. The DOE is engaged in a process for a lease. Both DOE and DOD have approached the MDC at the same time so that both processes may be pursued concurrently. DOE is currently working with MDC to form an agreement with regard to the lease language and conditions. The Army maintains an awareness of DOE’s progress and will continue to engage MDC as appropriate. Until these agreements are finalized, the Army will coordinate with the MDC to determine whether any activities MDC is engaged in are inconsistent with the RAO and the intended protection afforded by the proposed ICs. In May 2009, Mr. John Vogel of the MDC indicated that the MDC has not installed any new wells on the property and does not plan to install any wells in the near term. The Army also forwarded Mr. Vogel a status update on the Missouri Well Construction Code Special Area Rulemaking for Weldon Spring. The Missouri Environmental Covenants Act (MECA), which is based on the Uniform Environmental Covenants Act, was passed by the Missouri Legislature and signed by the Governor (taking effect August 2007). The application of a covenant based on the MECA is under review by USAEC counsel. DOE is scheduled to meet with MDC in 2010 to revisit this IC layer.

4.2 REMEDY IMPLEMENTATION

4.2.1 OU1—Soil

A transportable incineration system was selected for the remediation of OU1. The remediation involved excavation and incineration of TNT/DNT contaminated pipelines and soils. Remediation also involved the stabilization of lead contaminated soils that failed the TCLP and disposal of construction debris,
separated from the contaminated soils, in the onsite landfill. Restoration of the affected areas was also included. Stockpiled waste was disposed of in the adjacent DOE WSSRAP storage cell.

The OUI ROD was signed on September 26, 1996. From 1997 to 2004, several phases of remediation took place that removed contaminated soils, pipeline, and waste.

The following activities were conducted from 1997 to 1999 during the first phase of remediation:

- Excavated 41,790 cubic yards of TNT/DNT contaminated soils
- Thermally treated 71,836 tons of pipeline material and associated TNT/DNT and lead contaminated soils and debris
- Backfilled the excavations with 39,121 tons of treated ash, 2,500 cubic yards of borrow soils, and 15,588 tons of top soil
- Removed approximately 3,000 linear feet of abandoned toluene pipelines
- Excavated 10,325 cubic yards of lead contaminated soils from WSTA areas and Burning Ground 1 (Burning Ground 1 is southeast of the WSTA, but within the boundaries of the original WSOW property)

The following activities were conducted from 2000 to 2001 during the second phase of remediation:

- Transported approximately 23,756 cubic yards of the previously treated waste, contaminated soil, and miscellaneous debris from the WSOW to the DOE WSSRAP storage cell
- Excavated approximately 2,000 cubic yards at Burning Ground 1
- Chemical stabilization of approximately 10,086 cubic yards of DNT and/or lead contaminated soil (disposed of at the DOE WSSRAP storage cell after stabilization)

The following activities were conducted from 2003 to 2004 during the third phase of remediation:

- Investigation of areas T-13 and T-14 confirmed that contamination did not remain at T-14; however, contamination was found to remain at T-13
- Removed approximately 1,350 cubic yards of TNT/DNT contaminated soil from the T-13 main excavation and disposed of off-site
- Removed 189 pounds of off-specification TNT from a 64-foot long clay tile pipe at T-13 and incinerated off-site
- Removed 184 cubic yards of TNT/DNT contaminated soil from the T-13 pipeline excavation and disposed of off-site
Details of the remediation process at T-13 are included in the *Remedial Action Report* (Pangea, 2004). It is estimated that up to 428 cubic yards of TNT/DNT impacted soils above RGs remain in place at T-13 (Pangea, 2004). Appendix A shows the general location of TNT/DNT exceedances of RGs at T-13. With concurrence from USEPA and MDNR, excavation at T-13 was halted at depths ranging from 16 to 22 feet bgs as the risk of dermal exposure at depth was minimal (USACE, 2004c).

The site achieved construction complete status with the *Preliminary Close Out Report*, signed on August 24, 2005 (USEPA, 2005).

4.2.2 OU2—Groundwater

On September 30, 2004 the OU2 ROD was signed (USACE, 2004a). The final RD/RA Work Plan for OU2, defining the design and implementation of the selected final remedial action for OU2, was published in two phases. The final RD/RA Work Plan Phase I – MNA (USACE, 2005b) was dated June 10, 2005. The final RD/RA Work Plan Phase II – ICs (USACE, 2006) was dated January 31, 2006.

Six rounds of groundwater monitoring have been conducted to collect groundwater and spring water samples since the remedy selection. The first four rounds (RA-01, August 2005; RA-02, May 2006; RA-03, September 2006; and RA-04, May 2007) were conducted by USACE. The last two rounds (RA-05, August 2008; and RA-06, April 2009) were conducted for USAEC by ECC/BCMCD. Performance Monitoring Reports have been submitted to provide information regarding the analysis and evaluation of data collected as part of the MNA remedy and also provide information on ICs at the site (USACE 2008, ECC/BCMCD, 2009a, and ECC/BCMCD, 2009b).

A majority of the ICs have been executed and are in place at the site and functioning as intended; however follow-up is needed on other ICs.

Compliance with Federal, DOD, and Army Regulations associated with environmental planning and implementation of ICs has been maintained since remedy implementation initiated. Compliance with CERCLA 120(h) and DOD guidance for future transfers of property to state or private ownership has also been maintained since remedy implementation initiated. Informational devices (pamphlet/notice with regard to the groundwater contamination at the WSTA and the associated use restrictions) have been made available to installation personnel and the public and are readily available at the DOE WSS Interpretive Center and the August A. Busch Memorial Conservation Area Headquarters. Final publication of the Missouri Well Construction Code including 10 CSR 23.3.100-Special Areas (designating the site as a Special Area) occurred in August 2007.
The completion of the development of the IC document (identified an Installation Master Plan in the RD/RA Work Plan Phase II) and Deed Restrictive Covenant with MDC require follow-up to be implemented as intended in the RD/RA Work Plan Phase II.

4.3 SYSTEM OPERATION / OPERATION AND MAINTENANCE

4.3.1 OU1—Soil

O&M activities at OU1 include inspection of cover and signage at T-13. Nature and extent of allowable future activities at T-13 will be in accordance with the IC document. Documentation of activities at T-13 (as warranted) will be included in the Performance Monitoring Reports prepared for OU2. Separate documentation will be prepared as required. Five-year reviews will be conducted for OU1.

4.3.2 OU2—Groundwater

System Operation / O&M at OU2 is being conducted in accordance with the RD/RA Work Plan Phase I and Phase II. The primary activities associated with the O&M include the following:

- Routine groundwater sampling of the performance monitoring network — Groundwater sampling has been conducted in accordance with the schedule presented in the RD/RA Work Plan Phase I. This schedule calls for sampling of 23 to 27 locations every year, based on monitoring point objective, for the first five years.
- Inspection of wells included in the performance monitoring network (conducted in conjunction with groundwater sampling activities) — Minor maintenance items identified during the sampling events are addressed by the field sampling team; no major maintenance items requiring further action have been identified.
- IC monitoring and inspection — The ICs that have been executed and are in place at the site are functioning as intended; however, as discussed in the previous section, follow-up is needed on other ICs.
- Reporting — Performance Monitoring Reports are produced for each sampling round to summarize the results of sampling activities, summarize well inspection results, provide status reports for ICs, discuss analytical data (and perform statistical analysis, if necessary), and provide recommendations for future site activities.
- Five-year reviews — Because the remedy (MNA) will take more than five years to achieve conditions of hazardous substances, pollutants, or contaminants remaining on site at levels that allow for unlimited use and unrestricted exposure, five year reviews will be conducted until RGs are achieved.
The six rounds of groundwater monitoring have followed procedures as specified in the RD/RA Work Plan Phase I. The RD/RA Work Plan Phase I references the *Operable Unit 2: Ground Water Final Workplan, Former Weldon Spring Ordnance Works, Weldon Spring, Missouri* (USACE, 2002) procedures to be used for RD/RA implementation. The following changes (documented in March 12, 2008 Memorandum) have been incorporated into the MNA implementation since the publishing of the RD/RA Work Plan Phase I:

- **Purge Method** – previous protocol required water level in the well casing be drawn down such that water level in the casing was stable or rising prior to establishing stability with field water quality parameters. Since most of the wells at the site are classified as low-recovery, a low-recovery purge technique is utilized. The low-recovery protocol indicates that if the water level draw down in the casing is one foot or more at 100 mL/min, purge flow rates be set at 100 mL/min, the appropriate number of system volumes be purged, and upon parameter stabilization, samples collected (historical data may be used to predetermine whether or not a well meets the low-recovery criteria).

- **Investigation Derived Waste** – previous protocol called for discharge of purge water to the ground surface. During development of the ROD and RD/RA Work Plan, MDNR indicated that purge water should be collected. In lieu of revising the work plan to adopt the procedure formally, an agreement was made that contaminated purge water of interest would be containerized and disposed of properly. Until a revision to the agreement is made, contaminated IDW will be containerized and properly disposed.

- **Vehicular Access** – Most monitoring well and spring locations are accessible by vehicle through coordination with property owners (MDC and 89th RRC). The primary access to monitoring well cluster 106 and SP6301 (located on MDC property) is impassable due to heavy rutting and erosion. An alternate access route has been identified by MDC. Coordination with MDC is required for use of the alternate access to minimize degradation of this access route.

* * * * *
5.0 PROGRESS SINCE THE LAST REVIEW

5.1 OU1—SOIL

This is the second five-year review. The only issue identified in the previous five-year review was an area of remaining contamination at T-13. The only recommendation/follow-up action from the previous five-year review report was as follows:

"Provide current WSTA property owner/user with updates on remedial activities and provide assistance as needed for usability of the WSTA with respect to OU1 COCs."

This issue did not affect the current protectiveness of the remedy. Contact has been maintained with WSTA officials since the previous five-year review to provide updates and assistance as needed, consistent with the previous five-year review.

5.2 OU2—GROUNDWATER

The first five-year review did not include OU2 since a groundwater remedy had not been selected at the time of the first five-year review.

* * * * *
6.0 FIVE-YEAR REVIEW PROCESS

6.1 ADMINISTRATIVE COMPONENTS

The Five-Year Review team members included the USAEC, the USACE, the Army Reserves, the USEPA, and the MDNR. This team was generated to provide a comprehensive evaluation of the WSOW OU1 and OU2 RAs. Preliminary research and investigation was completed by ECC/BMcd.

6.2 COMMUNITY INVOLVEMENT

A Community Relations Plan (CRP) (IT, 1992a) for the Site was prepared in 1992. In 2010, a Supplemental Community Relations Plan (USACE, 2010) was prepared, which incorporated comments from USEPA and MDNR. The CRP and Supplemental CRP are available at the Information Repository.

The Information Repository is available for public review at the following location:

St. Charles City/County Library District
Middendorf-Kredell Branch
2750 Highway K
O'Fallon, Missouri 63366-7859
(636) 978-7926 (phone)
(636) 978-7998 (fax)
P.O.C: Anna Sylvan, MLS, LLM
Hours: Monday – Thursday, 9 a.m. – 9 p.m.
Friday & Saturday, 9 a.m. – 6 p.m.
Sunday, 1 p.m. – 5 p.m.

Project information is also available at the project website:


A Restoration Advisory Board (RAB) was established for the Site in 1997. In 2005, RAB members voted to execute RAB adjournment. The RAB was officially adjourned at a public meeting on August 18, 2010. Further details regarding the RAB are included in the Supplemental CRP.

A public meeting was held on June 9, 2009 at the DOE Interpretive Center (in conjunction with the preparation of this Five-Year Review) to provide an update on site activities and receive input from the public.

An advertisement (included in Appendix B) was printed in the St. Charles Journal, the St. Peters Journal, the O'Fallon Journal, and the Wentzville Journal on May 10, 2009 and in the St. Charles zoned edition of the St. Louis Post-Dispatch on May 11, 2009. The advertisement was placed in the paper to notify the
community that a Five-Year Review was in progress and publicized the public meeting to be held on June 9, 2009. The notice identified the COCs at the Site and updated the community on the status of the RAs. The community was encouraged to contribute to the review process. A second advertisement (included in Appendix B) was printed in the St. Charles Journal, the St. Peters Journal, the O’Fallon Journal, and the Wentzville Journal on May 31, 2009 and in the St. Charles zoned edition of the St. Louis Post-Dispatch on June 1, 2009 to serve as a reminder of the ongoing Five-Year Review and upcoming public meeting. Two contacts were provided in each advertisement:

Barry McFarland 88th RSC
Glenn Tisdale USACE

Upon final approval of this Five-Year Review, an advertisement will be printed in the above-mentioned newspapers that will announce that the Five-Year Review for the Site is complete. The advertisement will also provide information on the location of the Information Repository where a copy of the review will be filed.

6.3 DOCUMENT REVIEW
A review of relevant documents was conducted for history, background, basis for action, community concerns, technical assessment, ARARs, RGs, remedy selection, remedial action, site status, monitoring results, and future action.

6.3.1 OU1—Soil
The document review conducted as part of the Five-Year Review included the following:

• Record of Decision, Former Weldon Spring Ordnance Works, Weldon Spring, Missouri, Operable Unit 1: Soils and Pipeline, prepared by USACE - KCD with technical assistance from IT Corporation, September 1996 (USACE, 1996)


6.3.2 OU2—Groundwater

The document review conducted as part of the Five-Year Review included the following:

• Baseline Risk Assessment for the Groundwater Operable Units at the Chemical Plant Area and the Ordnance Works Area, Weldon Spring, Missouri, prepared for DOE, WSSRAP, prepared by Environmental Assessment Division, Argonne National Laboratory, July 1997 (DOE, 1997)

• Remedial Investigation for the Groundwater Operable Units at the Chemical Plant Area and the Ordnance Works Area, Weldon Spring Site, prepared for DOE, WSSRAP, prepared by MK-Ferguson Company and Jacobs Engineering Group, Inc., and Environmental Assessment Division, Argonne National Laboratory, July 1997 (MK-Ferguson Company and Jacobs Engineering Group Inc., and DOE, 1997)

• Feasibility Study for Remedial Action for the Groundwater Operable Units at the Chemical Plant Area and the Ordnance Works Area, Weldon Spring, Missouri, prepared for DOE, WSSRAP, prepared by Environmental Assessment Division, Argonne National Laboratory, December 1998 (DOE, 1998)


• Explanation of Significant Differences, Former Weldon Spring Ordnance Works, Weldon Spring, Missouri, Operable Unit 1: Soils and Pipeline, USACE – KCD, July 2004 (USACE, 2004c)

• Supplemental Feasibility Study for Remedial Action for the Groundwater Operable Unit, Operable Unit 2, Former Weldon Spring Ordnance Works, Weldon Spring, Missouri, USACE – KCD, June 1, 2004 (USACE, 2004d)
• Record of Decision for the Final Remedial Action for Operable Unit 2 Groundwater at the Former Weldon Spring Ordnance Works Site, Weldon Spring, Missouri, USACE – KCD, September 2004 (USACE, 2004a)


• Performance Monitoring Report 001, Rounds RA-01, RA-02, and RA-03 (AUG-05, MAY-06, SEP-06), Operable Unit 2 – Groundwater, Former Weldon Spring Ordnance Works, Weldon Spring, Missouri, prepared for 88th RSC prepared by USACE – KCD, September 2008 (USACE, 2008)

• Final Performance Monitoring Report 002, Round RA-05 (August 2008), Operable Unit 2 – Groundwater, Former Weldon Spring Ordnance Works, Weldon Spring, Missouri, prepared for 88th RSC and USAEC, prepared by ECC and BMcD, September 30, 2009 (ECC/BMcD, 2009a)

• Draft Performance Monitoring Report 003, Round RA-06 (April 2009), Operable Unit 2 – Groundwater, Former Weldon Spring Ordnance Works, Weldon Spring, Missouri, prepared for 88th RSC and USAEC, prepared by ECC and BMcD, July 27, 2009 (ECC/BMcD, 2009b)

6.4 DATA REVIEW

6.4.1 OU1—Soil

No new data has been collected for OU1 since the previous five-year review. There is no data collection requirement for OU1. Contaminated materials from OU1 have been remediated, with the exception of area T-13. Contamination has been left in place at depth at T-13, as previously documented. The T-13 area is within the fence line of the WSTA and signs identify the area; access to T-13 is limited to installation workers and users.

6.4.2 OU2—Groundwater

Six sampling rounds have been conducted since the implementation of the OU2 RA (RA-01 [August 2005] to RA-06 [April 2009]). Analytical Data from these rounds is presented in Appendix C. Analytical data from Rounds 22 (October 1999) to 35 (August 2003) is presented in the GMAR.
Statistical analysis (as performed in the GMAR) was conducted on data collected from Round 22 to RA-06 (October 1999 to April 2009) to determine if contaminants were continuing to attenuate at a rate sufficient to meet RGs in a reasonable time. This data set includes post-OU1 RA implementation concentrations. This analysis is presented in PMR 003 (ECC/BMcD, 2009b).

Nine monitoring location/constituent pairs exhibited confidence intervals above respective RGs (compared to 21 monitoring location/constituent pairs with confidence intervals above respective RGs identified in 2004). Of the nine locations identified in 2009, six exhibited a decreasing trend (five in Spring Basin B and one in Spring Basin D) and three exhibited an increasing trend (two in Spring Basin B and one in Spring Basin F).

The estimated MNA site-wide timeframe (from remedy implementation) significantly decreased from approximately 163 years (2004 evaluation) to approximately 22 years (2009 evaluation). The calculated 22 years MNA timeframe only provides an estimate for site-wide monitoring point/constituent pairs with decreasing trends and is not indicative of overall site-wide achievement of RGs, as it does not take in to account monitoring point/constituent pairs with increasing trends. As discussed in PMR 003, the reduced MNA timeframe can be attributed to contaminant reductions in recent sampling rounds. Also, the preliminary remediation goal (PRG) for 2,6-DNT used to evaluate the MNA timeframe in the 2004 evaluation was more conservative than the one used in the 2009 evaluation, resulting in longer MNA timeframes for 2,6-DNT.

Based on recent data and the results of the statistical analysis, monitoring program optimization recommendations were presented in PMR 003 and are summarized in Section 7.1.2 of this Five-Year Review.

6.5 SITE INSPECTION

A site inspection was conducted on March 31, 2009 (the site inspection checklist is included in Appendix D). The site inspection was attended by members of the review team representing USAEC, 88th RSC, USACE-KCD, USEPA, MDNR, ECC, and BMcD. The purpose of the site inspection was to assess protectiveness of the remedy and identify any current or potential issues related to the protectiveness and operation of the remedy.

6.5.1 OU1—Soil

During inspection of OU1 it was determined that the remedy was functioning as designed. It was observed during the site inspection that a small animal habitat (piles of trees, brush, soil and other natural materials) was created on a portion of area T-13. In the process of creating this habitat, some of the
vegetative cover under or immediately surrounding the habitat was negatively impacted and the underlying soil cover was minimally disturbed. Recommendations were made during the site inspection to remove the debris and re-grade and seed. These tasks were performed on April 15 and April 17, 2009.

6.5.2 OU2—Groundwater
All monitoring locations (wells and springs) are inspected annually during the sampling event. Minor maintenance items identified during the sampling events are addressed by the field sampling team. Inspection of selected monitoring locations during the site inspection indicated no further maintenance was necessary.

A majority of the proposed ICs have been implemented. Two ICs require further attention. The new 88th RSC leadership will review and revise installation regulations as needed for the federally-owned land (WSTA property). Also, discussions with the MDC must be completed and the deed restrictive covenant implemented for the state-owned land (former WSOW property).

6.6 INTERVIEWS
Interviews were conducted with various parties connected to the site (facility operators, regulators, construction/operation and maintenance, and community) regarding current site conditions, potential problems, and related concerns. Table 6-1 (presented below) includes names, title, organization, date, and method of all individuals interviewed. All interviews were recorded on an Interview Questionnaire form. The interviews forms are included as Attachment 4 in Appendix D.

A total of eleven individuals were contacted by phone and interviewed. The interview consisted of several questions dealing with site conditions and activities within the last five years. Overall, the individuals interviewed have a positive impression of the site and think the site is well maintained. Also, several individuals are impressed with the Weldon Spring Interpretive Center and think it is a great asset for the surrounding communities and visitors.

No significant problems regarding the site were identified during the interviews; however, Jesse Scott, Environmental Engineer, DOD Unit, Federal Facilities Section of MDNR, during the interview and in a follow-up letter (see Appendix D, Attachment 4), did note that that he did not think all the ICs have been implemented at the site consistent with the RD/RA Work Plan and that they need to be put in place as indicated. The development of an IC document is currently ongoing and will address this concern.
Table 6-1: Interview Information

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<td>Missouri Department of Transportation</td>
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<td>Remedial Project Manager</td>
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<td>Environmental Engineer</td>
<td>MDNR</td>
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7.0 TECHNICAL ASSESSMENT

7.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?

7.1.1 OU1—Soil

Yes. As discussed in the previous five-year review, the remedy is functioning as intended by the decision documents. No developments since the previous five-year review have affected the remedy.

The T-13 area is entirely within the fence line of the WSTA, limiting access to installation workers and users. Two caution signs identify area T-13 and are in excellent shape.

During the site inspection, it was observed that a small animal habitat (piles of trees, brush, soil, and other natural materials) was created on a portion of area T-13. In the process of creating this habitat, some of the vegetative cover under or immediately surrounding the habitat was negatively impacted and the underlying soil cover was minimally disturbed. As a follow-up to the site inspection, the small animal habitat was removed and re-grading and re-seeding were performed in April 2009. Completion of this maintenance item is anticipated to improve the function of the soil and vegetative cover.

It is recommended that all potential intrusive activities be limited at T-13 to minimize future maintenance and repairs.

7.1.2 OU2—Groundwater

Yes, the remedy is functioning as intended by the decision documents. As stated in the ROD, the RAO is to minimize the potential for exposure either by ingestion, dermal contact, or inhalation of contaminated groundwater until concentrations are reduced to RGs. This remedy meets the RAO by utilizing MNA and ICs.

Remedial Action Performance

Since remedy implementation, six rounds of MNA sampling have been conducted under the current monitoring program. Analytical results and statistical analysis indicate that contaminants are attenuating at a rate sufficient to meet cleanup goals in a reasonable time, contaminant migration remains confined to the currently impacted groundwater system, and contaminant levels at potential exposure points (springs) do not pose unacceptable risks to receptors and are declining over time. Concentrations are not expected to exceed historical maximums, however localized and temporary upward trends resulting from ongoing dispersion, analytical variability, or other factors may be observed.
Opportunities for Optimization

The current monitoring network includes 28 sample locations (20 monitoring well locations and 8 spring locations). The majority of the locations (23) are sampled annually with the remaining five sampled every two years. PMR 003 discussed proposed monitoring program optimization in detail based on recent analytical data results (from samples collected during Rounds RA-01 through RA-06), monitoring location objectives (1, 2, 3, or 4) by spring basin group (both function and location of monitoring point), and statistical analysis. A meeting was held on September 28, 2010 between the Army, USEPA, and MDNR and agreement was reached on a revised, optimized monitoring program. The revised optimization summary table, initially proposed in PMR 003 and revised in accordance with agreements reached in the September 28, 2010 meeting, includes the list of wells that will be sampled and the monitoring frequency for future sampling events and will be documented in the RD/RD Work Plan Addendum No. 1 that is being developed. A brief summary of the monitoring program optimization is presented here.

The optimization makes no change to 20 locations, reduces sampling frequencies at three locations, and removes two locations from the monitoring program. The remaining three locations are to maintain the current sampling frequency with potential frequency change or removal from the monitoring program based on future data. Seven of the eight spring locations will be retained for annual sampling as spring locations represent the only existing complete pathway for exposure.

Twenty monitoring points are to maintain the current sampling frequency. The monitoring points include four Objective 1 monitoring points for annual sampling (MWV01, MWV09, MWS12, and USGS4); eight Objective 2 monitoring points for annual sampling (SP6301, MWS116, MWS110, MWS108, SP6502, MWS103, SP5603, and SP5304); three Objective 3 monitoring points for annual sampling (SP5605, SP5602, and SP5303); and five Objective 4 monitoring points for sampling every two years (MWS01, MW4007, MWD09, MWD34, and MWD15).

Three monitoring points (including Objective 1 locations MWS21 and MWS15 and Objective 2 location MWS31) that have frequently been below RGs or nondetect will be sampled at a reduced frequency, changing from annual to every two years.

Two monitoring points that were below RGs or nondetect over the six most recent rounds are removed from the monitoring program. Statistical analysis indicated neither of the monitoring points had confidence intervals that exceeded the respective RGs during the evaluation period (October 1999 to April 2009). Additionally, the function of these locations is redundant with the function of monitoring
points retained in the monitoring program. Monitoring points retained in the monitoring program will serve to ensure the removal of these two locations will not adversely affect the function of the monitoring program. These two locations are Objective 2F monitoring points (MWS106 and SP6303).

One Objective 1 monitoring point (MWS04) is to maintain the current sampling frequency (annual sampling) for two years, with sampling frequency then reduced to every two years if the two years of annual sampling indicate results are below RGs. Two Objective 1 monitoring points (MWS16 and MWS17) are to maintain the current sampling frequency (annual sampling) for two years, with removal from the monitoring program if the two years of annual sampling indicate results are below RGs. These locations have frequently been below RGs or nondetect. Basins that would be affected by these potential changes would retain Objective 2 monitoring points for annual sampling to ensure the reduced frequency will not adversely affect the function of the monitoring program.

The monitoring program may be modified over the life of the remedy by increasing or decreasing monitoring locations and monitoring frequencies to assure the performance goals of the ROD and the design of the RD/RA established in the RD/RA Work Plan are being achieved and detect potential changes in site conditions in a timely manner.

**Implementation of Institutional Controls**

A majority of the ICs are in place to limit ingestion or dermal exposure to groundwater and to effectively restrict activities that may negatively impact the attenuation or migration of contamination; however follow-up is needed on other ICs.

The following ICs have been executed and are in place at the site and functioning as intended:

- Compliance with Federal, DOD, and Army Regulations
- Informational Devices
- Compliance with CERCLA 120(h) and DOD guidance
- Missouri Well Construction Code (10 CSR 23-3)

The following ICs require follow-up action to function as intended (Recommendations and Follow-Up Actions are presented in Section 9.2):

- IC document – An IC document will be developed to include a summary of the ICs, applicable regulations and guidance, contact information, an environmental overlay, and other ICs that may be developed to fulfill the RD/RA Work Plan requirement. This document will incorporate IC
components referenced in the RD/RA Work Plan as being included in the Installation Master Plan (or similar document) and installation regulation(s). For example, the Missouri Well Construction Code, evaluated as an installation regulation would be included in this document as well as Federal, DOD, and Army Regulations [discussed previously] and the Deed Restrictive Covenant [discussed below].

- Deed Restrictive Covenant – Negotiations with MDC must be completed and covenant implemented. The application of a covenant based on the MECA is under review by USAEC counsel. DOE is also negotiating with MDC to implement a lease. DOE and DOD have approached MDC concurrently. DOE has upcoming discussions with MDC in 2010.

7.2 QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS, AND REMEDIAL ACTION OBJECTIVES (RAOs) USED AT THE TIME OF THE REMEDY SELECTION STILL VALID?

7.2.1 OU1—Soil

Yes. The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection are still valid. The first five-year review discussed changes that occurred in the first five years after remedy selection, specifically changes in TBCs, toxicity, contaminant characteristics, and risk assessment methods. There have been no changes in the current reporting period (from the first five-year review to the present). There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy.

7.2.1.1 Changes in Standards and TBCs

No changes in standards or new standards have been established since the previous five-year review that affect the protectiveness of the remedy.

7.2.1.2 Changes in Exposure Pathways

The BLRA considered only recreational and occupational exposures to soils, however the RGs selected in the ROD were based on a residential scenario to allow future unrestricted use of the Site. No change to land use has occurred since the previous five-year review and land use in the foreseeable future is expected to be similar to current land use.

7.2.1.3 Changes in Toxicity and Other Contaminant Characteristics

RGs established for 2,4,6-TNT, 2,4-DNT, and 2,6-DNT are risk-based concentrations. 2,4-DNT, 2,6-DNT, and 2,4,6-TNT are listed in the Integrated Risk Information System (IRIS) provided by USEPA. IRIS toxicity and other contaminant characteristics for 2,4-DNT, 2,6-DNT, and 2,4,6-TNT have not been
updated in IRIS since the previous five-year review was completed. There have been no changes in the toxicity factors for 2,4,6-TNT, 2,4-DNT, and 2,6-DNT that were used in the BLRA.

7.2.1.4 Changes in Risk Assessment Methods
Risk assessment methods for inhalation calculations have changed compared to the methods used in the BLRA. However, there exists no significant risk from the inhalation pathway since the OU1 remedy has been constructed.

7.2.1.5 Expected Progress Towards Meeting RAOs
The RA for OU1 is complete. Soil contamination remains at depth at an area known as T-13, as such this area is not in a condition suitable for unlimited use and unrestricted exposure. ICs in place are functioning as planned to ensure the continued protectiveness of the remedy.

7.2.2 OU2—Groundwater
Yes. The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection are still valid. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy.

7.2.2.1 Changes in Standards and TBCs
No changes in standards or new standards have been established since remedy implementation that negatively affect the protectiveness of the remedy. The Missouri Well Construction Code (10 CSR 23-3), which designates the site as a special area (see PMR-003, Appendix F [ECC/BMCD, 2009b]), should be considered an ARAR and should provide an additional layer of protection from exposure to groundwater.

7.2.2.2 Changes in Exposure Pathways
During the OU2 RI, it was determined that the groundwater contamination at the site did not pose a threat to human health from recreational exposure nor did it pose a significant ecological risk. However, some areas on the WSOW were identified as having contaminant concentrations that exceeded state levels for groundwater and surface water. The BLRA considered exposure to spring water by ingestion and dermal contact for recreational users and exposure to groundwater by ingestion and dermal contact for future residents. No change to land use has occurred since the remedy selection and land use in the foreseeable future is expected to be similar to current land use. Nevertheless, cleanup standards are based on ARARs and levels deemed to be protective for residential drinking water.
7.2.2.3 Changes in Toxicity and Other Contaminant Characteristics

There are no federal standards for the nitroaromatic COCs at WSOW. RGs for 2,4-DNT, 1,3-DNB, and NB are based on MWQS (10 CSR 20-7.031). RGs for 2,6-DNT, 2,4,6-TNT, o-NT, m-NT, and p-NT are risk-based concentrations. MWQS values (MDNR, 2008) for 2,4-DNT, 1,3-DNB, and NB have not changed since the ROD signature date. 2,6-DNT and 2,4,6-TNT are listed in the IRIS provided by USEPA. IRIS toxicity and other contaminant characteristics for 2,6-DNT and 2,4,6-TNT have not been changed in IRIS since the BLRA was completed. O-NT, m-NT, and p-NT are not listed in IRIS. For the BLRA, toxicity and other contaminant characteristics for o-NT, m-NT, and p-NT were obtained from the Health Effects Assessment Summary Tables (HEAST) provided by USEPA. For this review, values in the USEPA Risk-Based Concentration Table (USEPA, 2008) were used. Reference Doses (RfDs) for o-NT, m-NT, and p-NT have been updated since the BLRA and are presented in Table 7-1.

Table 7-1: Effects of Changes in Toxicity Factors

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Previous RfD Value mg/kg-day</th>
<th>Current RfD Value mg/kg-day</th>
<th>Reference</th>
<th>Increased Chemical Toxicity (Y/N)</th>
<th>Increased Potential Risk (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>o-NT</td>
<td>0.001</td>
<td>0.009</td>
<td>USEPA, 2008</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>m-NT</td>
<td>0.001</td>
<td>0.02</td>
<td>USEPA, 2008</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>p-NT</td>
<td>0.001</td>
<td>0.004</td>
<td>USEPA, 2008</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>

mg/kg-day = milligram per kilogram per day
USEPA, 2008 = USEPA Risk-Based Concentration Table (September, 2008)

7.2.2.4 Changes in Risk Assessment Methods

Risk assessment methods for calculating risk for future residents and recreational users have changed since the calculations were performed for the BLRA. Current risk assessment practice would typically call for the future resident to be considered as a child for 6 years of the 30-year exposure and as an adult for the remaining 24 years. Change in the risk to recreational users (the only existing potentially completed pathway for exposure) and future residents based on this methodology change is likely insignificant and the overall risk to recreational users would remain acceptable.

7.2.2.5 Expected Progress Towards Meeting RAOs

The remedy is performing as planned. Recent analytical results have generally exhibited a reduced number of RG exceedances and a decreased number of contaminant concentrations. The statistical analysis performed in PMR 003 recalculated the MNA timeframes and confirmed that contaminants are continuing to attenuate at a rate sufficient to meet remediation goals in a reasonable time (22 years). The calculated 22 years MNA timeframe only provides an estimate for site-wide monitoring point/constituent
pairs with decreasing trends and is not indicative of overall site-wide achievement of RGs, as it does not take into account monitoring point/constituent pairs with increasing trends. Therefore the site-wide achievement of RGs is expected to take longer than 22 years; however, the decrease in MNA timeframes for calculatable monitoring point/constituent pairs indicates successful attenuation of contaminants. The ICs in place are functioning as planned to ensure the protectiveness of the operating remedy. Implementation of addition ICs in ongoing.

7.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?

7.3.1 OU1—Soil
No other information has come to light that could call into question the protectiveness of the remedy.

7.3.2 OU2—Groundwater
No other information has come to light that could call into question the protectiveness of the remedy.

7.4 TECHNICAL ASSESSMENT SUMMARY

7.4.1 OU1—Soil
According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD. There have been no changes in physical conditions of the Site that would affect the protectiveness of the remedy. ARARs for soil contamination cited in the ROD have been met. There have been no changes in the toxicity factors for the COCs that were used in the BLRA that affect the protectiveness of the remedy. A change to the risk assessment methodology for determining inhalation risk has been implemented, however; there exists no risk from the inhalation pathway since the OU1 remedy has been constructed. There is no other information that calls into question the protectiveness of the remedy.

7.4.2 OU2—Groundwater
According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD. There have been no changes in physical conditions of the Site that would affect the protectiveness of the remedy. Standards identified in the ROD have not been revised and do not call into question the protectiveness of the remedy. Changes to toxicity and other contaminant characteristics are minimal and do not call into question the protectiveness of the remedy. ARARs cited in the ROD are still valid and it is anticipated ARARs will have been met at remedy completion. Toxicity values for o-NT, m-NT, and p-NT have been updated since the BLRA, but the potential risk posed by these chemicals has not increased. A change to the risk assessment methodology for determining risk to residents and
recreational users has been implemented, however; the overall risks are still considered to be acceptable. There is no other information that calls into question the protectiveness of the remedy.

* * * * *
### 8.0 ISSUES

#### 8.1 OU1—SOIL

<table>
<thead>
<tr>
<th>Issues</th>
<th>Affects Current Protectiveness (Y/N)</th>
<th>Affects Future Protectiveness (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>An area of contamination remains at T-13</td>
<td>N</td>
<td>Y</td>
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</tbody>
</table>

#### 8.2 OU2—GROUNDWATER

<table>
<thead>
<tr>
<th>Issues</th>
<th>Affects Current Protectiveness (Y/N)</th>
<th>Affects Future Protectiveness (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC—Generation of IC document to include a summary of the ICs, applicable regulations and guidance, contact information, an environmental overlay, and other ICs that may be developed</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>IC—Complete negotiations with MDC to implement deed restrictive covenant (in conjunction with DOE)</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Monitoring Program Optimization—Implement changes to modify monitoring locations and monitoring frequencies based on recent data, monitoring location objectives, and statistical analysis</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>
### 9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

#### 9.1 OU1—SOIL

<table>
<thead>
<tr>
<th>Issue</th>
<th>Recommendations and Follow-Up Actions</th>
<th>Responsible Party</th>
<th>Oversight Agency</th>
<th>Milestone Date</th>
<th>Affects Protectiveness (Y/N)</th>
<th>Current</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remaining contamination at T-13</td>
<td>Generate IC document to include procedures for providing current WSTA property owner/user with updates on remedial activities and provide assistance as needed for usability of the WSTA with respect to OU1 COCs</td>
<td>USAEC / 88th RSC</td>
<td>None Required</td>
<td>Ongoing</td>
<td>N Y</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 9.2 OU2—GROUNDWATER

<table>
<thead>
<tr>
<th>Issue</th>
<th>Recommendations and Follow-Up Actions</th>
<th>Responsible Party</th>
<th>Oversight Agency</th>
<th>Milestone Date</th>
<th>Affects Protectiveness (Y/N)</th>
<th>Current</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC—IC document</td>
<td>Generate IC document to include a summary of the ICs, applicable regulations and guidance, contact information, an environmental overlay, and other ICs that may be developed</td>
<td>USAEC / 88th RSC</td>
<td>USEPA / MDNR</td>
<td>September 2011</td>
<td>N Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC—Deed restrictive covenant</td>
<td>Complete review by USAEC counsel of applicability of a covenant based on the MECA. Complete negotiations with MDC to implement deed restrictive covenant (in conjunction with DOE)</td>
<td>DOD</td>
<td>USEPA / MDNR</td>
<td>September 2011</td>
<td>N Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitoring Program Optimization</td>
<td>Implement changes to modify monitoring locations and monitoring frequencies based on recent data, monitoring location objectives, and statistical analysis</td>
<td>DOD</td>
<td>USEPA / MDNR</td>
<td>January 2011</td>
<td>N N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10.0 PROTECTIVENESS STATEMENT

10.1 OU1—SOIL
The remedy is complete and is protective of human health and the environment. The T-13 area on the WSTA has contamination remaining at depth. This area is under restricted access, as it lies within the fence line of the WSTA. The contamination is present at a depth of 10 feet or greater and is of limited lateral extent. There is limited chance of exposure to the contamination due to the fact that the remaining contamination is present at depths greater than construction activities would require disturbing.

10.2 OU2—GROUNDWATER
The remedy is expected to be protective of human health and the environment upon attainment of RGs, through MNA, which is functioning as designed. In the interim, exposure pathways that could result in unacceptable risks are being controlled and ICs are in the process of being finalized to prevent the groundwater in the restricted area from being used in the future.

* * * * *
11.0 NEXT REVIEW

11.1 OU1—SOIL
The next five-year review for OU1 will occur no later than five years following the date of the signed EPA concurrence letter to this Five-Year Review.

11.2 OU2—GROUNDWATER
The next five-year review for OU2 will occur no later than five years following the date of the signed EPA concurrence letter to this Five-Year Review.

* * * * *
12.0 REFERENCES


PUBLIC NOTICE
FIVE-YEAR REVIEW BEGINS AT THE
FORMER WELDON SPRING ORDNANCE WORKS
ST. CHARLES COUNTY, MISSOURI

The U.S. Army Environmental Command is conducting a second five-year review of the soil and pipeline (Operational Unit 1) and groundwater and springs (Operational Unit 2) of the former Weldon Spring Ordnance Works. This 17,000 acre site is located in St. Charles County Missouri, off of Highway 94, about 30 miles west of St. Louis. To address the contaminated soil and pipeline, the approved remedy included removal and incineration of trinitrotoluene (TNT) and dinitrotoluene (DNT) contaminated soil and pipeline. The remedy also included the stabilization and disposal of lead contaminated soil. The cleanup goals were met for the contaminants of concern (polychlorinated biphenyls, polycyclic aromatic hydrocarbons, lead, TNT and DNT), or determined to be protective of human health and the environment. The selected remedy for groundwater and springs includes monitored natural attenuation and institutional controls to limit groundwater and springwater use. The contaminants of concern for the groundwater and springs include TNT, DNT, dinitrobenzene, nitrobenzene, and nitrotoluene.

What is the purpose of a Five-Year Review?
The purpose of a five-year review is to determine whether the remedies continue to be effective. The Five-Year Review Report documents the methods, findings, conclusions and any recommendations of the review. This process is repeated every five years.

Why is a Five-Year review being done for this site?
This second five-year review will evaluate the effectiveness of the cleanup remedies. During this five-year review, a site inspection will be conducted, a determination will be made whether the remedies continue to protect human health and the environment, and upon completion of the review, a Five-Year Review Report will be compiled and made available to the public.

When and where will the Five-Year Report be available?
The five-year review is scheduled for completion by September 30, 2009 and will then be available in the information repository at the St. Charles City-County Library District, Middendorf/Kredell Branch, located at 2750 Hwy. K, O' Fallon, MO, 63366-7859. An electronic version of the document will be posted on the MDNR website at: http://www.dnr.mo.gov/env/hwp/fedfac/fis-dod.htm#weldon-spring-ord.

Public Information Meeting
A public information meeting will be held to explain current activities at the site and to answer your questions. This is your opportunity to talk to Army representatives about environmental issues and the ongoing five-year review.

Date: Tuesday, 9 June 2009 at 7:00 pm
Location: Weldon Spring Site Interpretive Center
7295 Highway 94 South
St. Charles, MO 63304

The community is encouraged to provide input to the five-year review process during the public information meeting or by contacting the following:
Barry McFarland
316-681-1759, x. 1419
88th Regional Support Command
Environmental Protection Specialist
3130 George Washington Blvd.
Wichita, KS 67210-1598
barry.mcfarland@us.army.mil

Glenn Tisdale
816-389-3367
US Army Corps of Engineers
Kansas City District
601 E. 12th St, Suite 0463
Kansas City, MO 64106
Glenn.T.Tisdale@usace.army.mil
REMINDER: PUBLIC INFORMATION MEETING FOR FORMER WELDON SPRING
ORDNANCE WORKS FIVE YEAR REVIEW AND FUTURE ACTIONS

A public information meeting will be held to explain current and future activities at the site and to answer
your questions. This is your opportunity to talk to Army representatives about environmental issues and
the on-going five-year review.

Date: Tuesday, 9 June 2009 at 7:00 pm
Location: Weldon Spring Site Interpretive Center
7295 Highway 94 South
St. Charles, MO 63304

The community is encouraged to provide input to the five-year review process during the public
information meeting or by contacting the following:

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barry McFarland</td>
<td>316-681-1759, x. 1419</td>
<td><a href="mailto:bmcfarland@us.army.mil">bmcfarland@us.army.mil</a></td>
</tr>
<tr>
<td>88th Regional Support Command</td>
<td>816-389-3367</td>
<td><a href="mailto:tisdale@usace.army.mil">tisdale@usace.army.mil</a></td>
</tr>
<tr>
<td>Environmental Protection Specialist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3130 George Washington Blvd.</td>
<td>601 E. 12th St, Suite 0463</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B

Public Notice Advertisements
Scales provided are approximate and are to be used for general reference only. The U.S. Army Corps of Engineers is not responsible for the misuse of the information provided in these figures. All other sampling points from excavation sidewall and excavation floor met Remediation Goals.
APPENDIX A

General Location of TNT/DNT Exceedances of RGs at T-13
Figure 3.3: General Site Information

Operable Unit 2: Groundwater
Remedial Design / Remedial Action Work Plan
Weldon Spring Ordnance Works
Weldon Spring, Missouri

This figure contains information on the extent of contamination within the Weldon Spring Ordnance Works site.

Legend for Spring Recharge Basins

General Legend
- Groundwater Contaminant
- Water Spring Ordnance Works
- Weldon Spring Training Area Boundary
- Chemical Plant and Raffinate Area Boundary
- Approximate Direction of Groundwater Flow
- Approximate Concentration of Groundwater

NOTE:
1. FIGURE ADAPTED FROM FINAL RECORD OF DECISION FOR THE REMEDIAL ACTION FOR OPERABLE UNIT 2 GROUNDWATER AT THE FORMER WELDON SPRING ORDNANCE WORKS SITE, WELDON SPRING, MISSOURI (USACE, 2004)
NOTES:

1. FIGURE ADAPTED FROM FINAL RECORD OF DECISION FOR THE REMEDIAL ACTION FOR OPERABLE UNIT 2 GROUNDWATER AT THE FORMER WELDON SPRING ORDNANCE WORKS SITE, WELDON SPRING, MISSOURI (USACE, 2004).

2. THE SOUTHERN BOUNDARY OF THE WSOW IS DEFINED, APPROXIMATELY, BY THE MISSOURI RIVER (SEE ALSO FIGURE 3-3).
NOTE:
1. FIGURE ADAPTED FROM FINAL RECORD OF DECISION FOR THE REMEDIAL ACTION FOR OPERABLE UNIT 2 GROUNDWATER AT THE FORMER WELDON SPRING ORDNANCE WORKS SITE, WELDON SPRING, MISSOURI (USACE, 2004)

Figure 3-1
SITE LOCATION WELDON SPRING ORDNANCE WORKS
RA-01 (August 2005) Analytical Data Summary Table
## Table 1
Sample Results
Former Weldon Spring Ordnance Works
August 2005

<table>
<thead>
<tr>
<th>NAME</th>
<th>Remedial Action Goals (ug/l)</th>
<th>WSOW-MW4007-0805</th>
<th>WSOW-MWD09-0805</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Result Units</td>
<td>IDL</td>
<td>PQL</td>
</tr>
<tr>
<td>1,3,5-Trinitrobenzene</td>
<td>-</td>
<td>µg/l</td>
<td>0.08</td>
</tr>
<tr>
<td>1,3-Dinitrobenzene</td>
<td>1</td>
<td>µg/l</td>
<td>0.08</td>
</tr>
<tr>
<td>2,4,6-Trinitrotoluene</td>
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<td>µg/l</td>
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</tr>
<tr>
<td>2,4-Dinitrotoluene</td>
<td>0.11</td>
<td>µg/l</td>
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<tr>
<td>2,6-Dinitrotoluene</td>
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<td>µg/l</td>
<td>0.08</td>
</tr>
<tr>
<td>2-Amino-4,6-dinitrotoluene</td>
<td>-</td>
<td>µg/l</td>
<td>0.08</td>
</tr>
<tr>
<td>2-Nitrotoluene</td>
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<td>µg/l</td>
<td>0.08</td>
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<td>3-Nitrotoluene</td>
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</tr>
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<td>µg/l</td>
<td>0.08</td>
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<td>Nitrobenzene</td>
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<td>µg/l</td>
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<td>NAME</td>
<td>Remedial Action Goals (µg/l)</td>
<td>WSOW-MWD15-0805</td>
<td>WSOW-MWD34-0805</td>
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<tr>
<td>-----------------------------</td>
<td>------------------------------</td>
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<td>Result Units</td>
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<tr>
<td>1,3,5-Trinitrobenzene</td>
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<td>µg/l</td>
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<td>1,3-Dinitrobenzene</td>
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<td>µg/l</td>
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<td>0.08</td>
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Former Weldon Spring Ordnance Works
August 2005

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Former Weldon Spring Ordnance Works
August 2005

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Former Weldon Spring Ordnance Works
August 2005

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Former Weldon Spring Ordnance Works
August 2005

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Former Weldon Spring Ordnance Works
August 2005

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Table 1
Sample Results
Former Weldon Spring Ordnance Works
August 2005

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RA-02 (May 2006) Analytical Data Summary Table
### Table 1
Sample Results
Former Weldon Spring Ordnance Works OU2
May 2006

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<th>Units</th>
<th>IDL</th>
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<th>Qualifier</th>
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RAO=Remedial Action Objective

U=not detected or detected below the method detection limit
J=detected above MDL but below the method quantitation limit (MQL).
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<tr>
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Table 1
Sample Results
Former Weldon Spring Ordnance Works OU2
May 2006

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<th>Analyte</th>
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<th>Units</th>
<th>IDL</th>
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May 2006

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U=not detected or detected below the method detection limit
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Table 1
Sample Results
Former Weldon Spring Ordnance Works OU2
May 2006

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Table 1
Sample Results
Former Weldon Spring Ordnance Works OU2
May 2006

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May 2006

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## Table 1
Sample Results
Former Weldon Spring Ordnance Works OU2
May 2006

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### Table 1
Sample Results
Former Weldon Spring Ordnance Works OU2
May 2006

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<th>Analyte</th>
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Former Weldon Spring Ordnance Works OU2
May 2006

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<thead>
<tr>
<th>Analyte</th>
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</table>

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Table 2
QA Sampling Results
Former Weldon Spring Ordnance Works OU2
May 2006

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RAO=Remedial Action Objective
RA-03 (September 2006) Analytical Data Summary Table
### Table 1
Sample Results
Former Weldon Spring Ordnance Works OU2
May 2006

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RAO=Remedial Action Objective
U=not detected or detected below the method detection limit
J=detected above MDL but below the method quantitation limit (MQL)
### Table 1
Sample Results
Former Weldon Spring Ordnance Works OU2
May 2006

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Table 1
Sample Results
Former Weldon Spring Ordnance Works OU2
May 2006

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# Table 1
Sample Results
Former Weldon Spring Ordnance Works OU2
May 2006

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Table 1  
Sample Results  
Former Weldon Spring Ordnance Works OU2  
May 2006

<table>
<thead>
<tr>
<th>Analyte</th>
<th>RAOs</th>
<th>Result</th>
<th>Units</th>
<th>IDL</th>
<th>PQL</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
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<td>0.158</td>
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<tr>
<th>Analyte</th>
<th>RAOs</th>
<th>Result</th>
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<th>IDL</th>
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<th>Qualifier</th>
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<th>Units</th>
<th>IDL</th>
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<th>Qualifier</th>
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<th>Analyte</th>
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<th>Units</th>
<th>IDL</th>
<th>PQL</th>
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<tbody>
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<th>IDL</th>
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<th>Units</th>
<th>IDL</th>
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</tbody>
</table>

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# Table 1
## Sample Results
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May 2006

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<td>Nitrobenzene</td>
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**RAO**=Remedial Action Objective

**U**=not detected or detected below the method detection limit

**J**=detected above MDL but below the method quantitation limit (MQL)
<table>
<thead>
<tr>
<th>Analyte</th>
<th>RAOs</th>
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<tr>
<td>1,3,5-Trinitrobenzene</td>
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<tr>
<td>1,3-Dinitrobenzene</td>
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<tr>
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</tr>
<tr>
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<td>0.11</td>
</tr>
<tr>
<td>2,6-Dinitrotoluene</td>
<td>1.3</td>
</tr>
<tr>
<td>2-Amino-4,6-dinitrotoluene</td>
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</tr>
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</table>

RAO=Remedial Action Objective
U=not detected or detected below the method detection limit
J=detected above MDL but below the method quantitation limit (MQL)
RA-04 (June 2007) Analytical Data Summary Table
Weldon Spring Ordnance Works
June 2007
Data Table

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U=non-detect
J=estimated result
## Weldon Spring Ordnance Works
### June 2007
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<tr>
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<td>0.12 0.5 U</td>
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<tr>
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<td>ug/L</td>
<td>0.068 0.25 U</td>
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J=estimated result
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<td>ug/L 0.068 0.25</td>
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U=non-detect
J=estimated result
## Weldon Spring Ordnance Works
### June 2007
#### Data Table

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<td>2-Nitrotoluene</td>
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<td>0.5 UJ</td>
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<tr>
<td>4-AMINO-2,6-DINITROTOLUENE</td>
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<td>0.3 UJ</td>
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<tr>
<td>4-Nitrotoluene</td>
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<td>0.5 UJ</td>
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</tr>
<tr>
<td>Nitrobenzene</td>
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<td>0.25 UJ</td>
<td>0.068</td>
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U=non-detect
J=estimated result
## Weldon Spring Ordnance Works
### June 2007
#### Data Table

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<td>ug/L</td>
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<td>ug/L</td>
<td>0.16</td>
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<td>3-Nitrotoluene</td>
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<td>ug/L</td>
<td>0.12</td>
</tr>
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<td>4-AMINO-2,6-DINITROTOLUENE</td>
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<td>ug/L</td>
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<td>4-Nitrotoluene</td>
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<td>0.18</td>
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<td>Nitrobenzene</td>
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U=non-detect
J=estimated result
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<td>ug/L 0.068 0.25 U</td>
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U=non-detect
J=estimated result
# Weldon Spring Ordnance Works
## June 2007
### Data Table

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U = non-detect
J = estimated result
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<td>ug/L 0.5 U J</td>
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U=non-detect  
J=estimated result
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<td>ug/L 0.12 0.5 U</td>
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U=non-detect
J=estimated result
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J=estimated result
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J=estimated result
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U=non-detect
J=estimated result
## Weldon Spring Ordnance Works
### June 2007
#### Data Table

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U = non-detect
J = estimated result
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U=non-detect
J=estimated result
RA-05 (August 2008) Analytical Data Summary Table
Table 3-1
Analytical Data - August 2008 (Round RA-05)
Weldon Spring Ordnance Works
Weldon Spring, Missouri

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<td>0.21 U</td>
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<td>0.2 U</td>
<td>0.2 U</td>
<td>5.1 U</td>
<td>0.2 U</td>
</tr>
</tbody>
</table>

Notes:
- Detections presented in bold.
- Detections exceeding Remediation Goals highlighted.
- J = estimated value
- NA = not applicable
- U = non-detect (reporting limit shown)
- U* = non-detect (method detection limit shown; reporting limit above Remediation Goal due to dilution)

µg/L = micrograms per liter

MW01 was scheduled for sampling during Round RA-05; however, MWS01 was sampled due to dry conditions at MW01.

SP6303 was scheduled for sampling during Round RA-05, but was not sampled due to dry conditions.

USGS4 was sampled during Round RA-05; however, both sample bottles were broken during shipment to the laboratory.

K:\ENV\ECC\W06\49912\Deliver\W06\July 2009 Project Update Meeting\Analytical Data Table_RA-05
Table 3-1
Analytical Data - August 2008 (Round RA-05)
Weldon Spring Ordnance Works
Weldon Spring, Missouri

<table>
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<th>Comments</th>
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<td>F59539-12</td>
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<th>MWS17</th>
<th>MWS21</th>
<th>MWS31</th>
<th>MWD34</th>
<th>MW4007</th>
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<td>0.1 U</td>
<td>0.1 U</td>
<td>0.1 U</td>
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<td>0.2 U</td>
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<td>0.2 U</td>
<td>0.2 U</td>
<td>0.2 U</td>
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<td>0.2 U</td>
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<td>0.2 U</td>
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Notes:
Detections presented in **bold**.
Detections exceeding Remediation Goals highlighted.
J = estimated value
NA = not applicable
U = non-detect (reporting limit shown)
U* = non-detect (method detection limit shown; reporting limit above Remediation Goal due to dilution)
µg/L = micrograms per liter
MW01 was scheduled for sampling during Round RA-05; however, MW01 was sampled due to dry conditions at MW01.
SP6303 was scheduled for sampling during Round RA-05, but was not sampled due to dry conditions.
USGS4 was sampled during Round RA-05; however, both sample bottles were broken during shipment to the laboratory.
### Table 3-1
Analytical Data - August 2008 (Round RA-05)

**Weldon Spring Ordnance Works**

**Weldon Spring, Missouri**

<table>
<thead>
<tr>
<th>Sample Location</th>
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<table>
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<tbody>
<tr>
<td>1,3,5-Trinitrobenzene</td>
<td>NA</td>
<td>µg/L</td>
</tr>
<tr>
<td>1,3-Dinitrobenzene</td>
<td>0.2 U</td>
<td>µg/L</td>
</tr>
<tr>
<td>2,4,6-Trinitrotoluene</td>
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<td>µg/L</td>
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<td>2,4-Dinitrotoluene</td>
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<td>µg/L</td>
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<tr>
<td>2,6-Dinitrotoluene</td>
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<td>µg/L</td>
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<tr>
<td>4-amino-2,6-Dinitrotoluene</td>
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<tr>
<td>m-Nitrotoluene</td>
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<td>µg/L</td>
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<tr>
<td>p-Nitrotoluene</td>
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<tr>
<td>Nitrobenzene</td>
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<td>µg/L</td>
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<td>0.2</td>
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<td>0.2</td>
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<td>µg/L</td>
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<td>0.2</td>
<td>0.2</td>
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<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
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</tbody>
</table>

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- U* = non-detect (method detection limit shown; reporting limit above Remediation Goal due to dilution)
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- USGS4 was sampled during Round RA-05; however, both sample bottles were broken during shipment to the laboratory.
## Table 3-1
### Analytical Data - August 2008 (Round RA-05)
**Weldon Spring Ordnance Works**  
**Weldon Spring, Missouri**

<table>
<thead>
<tr>
<th>Sample Location</th>
<th>Lab ID</th>
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<th>Comments</th>
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<td>Lab 10</td>
<td>F59539-3</td>
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### Analyte Remediation Goal Units

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<tbody>
<tr>
<td>1,3,5-Trinitrobenzene</td>
<td>NA</td>
<td>µg/L</td>
</tr>
<tr>
<td>1,3-Dinitrobenzene</td>
<td>1</td>
<td>µg/L</td>
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<tr>
<td>2,4,6-Trinitrotoluene</td>
<td>2.8</td>
<td>µg/L</td>
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<tr>
<td>2,4-Dinitrotoluene</td>
<td>0.11</td>
<td>µg/L</td>
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<tr>
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<tr>
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<td>m-Nitrotoluene</td>
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<td>µg/L</td>
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<tr>
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### Analyte Remediation Goal Units

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<th>Units</th>
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<tbody>
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<td>µg/L</td>
</tr>
<tr>
<td>1,3-Dinitrobenzene</td>
<td>0.2 U</td>
<td>µg/L</td>
</tr>
<tr>
<td>2,4,6-Trinitrotoluene</td>
<td>0.2 U</td>
<td>µg/L</td>
</tr>
<tr>
<td>2,4-Dinitrotoluene</td>
<td>0.1 U</td>
<td>µg/L</td>
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<td>2,6-Dinitrotoluene</td>
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<tr>
<td>o-Nitrotoluene</td>
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<td>µg/L</td>
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<td>m-Nitrotoluene</td>
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<td>µg/L</td>
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<tr>
<td>p-Nitrotoluene</td>
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</tr>
<tr>
<td>Nitrobenzene</td>
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<td>µg/L</td>
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</tbody>
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### Notes:
- Detections presented in bold.
- Detections exceeding Remediation Goals highlighted.
- **J** = estimated value
- **NA** = not applicable
- **U** = non-detect (reporting limit shown)
- **U*** = non-detect (method detection limit shown; reporting limit above Remediation Goal due to dilution)
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- MWV01 was scheduled for sampling during Round RA-05; however, MWS01 was sampled due to dry conditions at MWV01.
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- USGS4 was sampled during Round RA-05; however, both sample bottles were broken during shipment to the laboratory.
RA-06 (April 2009) Analytical Data Summary Table
Table 3-1
Analytical Data - April 2009 (Round RA-06)
Weldon Spring Ordnance Works
Weldon Spring, Missouri

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<tr>
<td>1,3,5-Trinitrobenzene</td>
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<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>2.6 J</td>
<td>4.8 J</td>
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<tr>
<td>2,4,6-Trinitrotoluene</td>
<td>2.8</td>
<td>µg/L</td>
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<td>0.36 J</td>
<td>0.34 J</td>
<td>6.7</td>
<td>6.7 J</td>
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<td>1.8 J</td>
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<td>3.6 J</td>
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<tr>
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<td>1.0 UJ</td>
<td>1.0 UJ</td>
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<td>1.0 UJ</td>
<td>1.0 UJ</td>
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<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>11.2 J</td>
</tr>
<tr>
<td>p-Nitrotoluene</td>
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<td>µg/L</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>2.0 J</td>
<td>17.1 J</td>
</tr>
<tr>
<td>Nitrobenzene</td>
<td>17</td>
<td>µg/L</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 U</td>
<td>15.8 J</td>
<td>0.45 J</td>
<td>10.3 J</td>
<td>15.9 J</td>
</tr>
</tbody>
</table>

Notes:
Detections presented in bold.
Detections exceeding Remediation Goals highlighted.
J = estimated value
NA = not applicable
U = non-detect (reporting limit shown)
µg/L = micrograms per liter
## Table 3-1
### Analytical Data - April 2009 (Round RA-06)

**Weldon Spring Ordnance Works**  
Weldon Spring, Missouri

<table>
<thead>
<tr>
<th>Sample Location</th>
<th>Lab ID</th>
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<th>MWS16</th>
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<th>MWS21</th>
<th>MWS31</th>
<th>MWS103</th>
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<td></td>
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<td>Date</td>
<td>M81704-1</td>
<td>M81704-2</td>
<td>M81704-3</td>
<td>M81646-11</td>
<td>M81646-12</td>
</tr>
<tr>
<td>Sample Location</td>
<td>MWS15</td>
<td>MWS16</td>
<td>MWS17</td>
<td>MWS21</td>
<td>MWS31</td>
<td>MWS103</td>
<td></td>
</tr>
<tr>
<td>MWS15</td>
<td>M81704-1</td>
<td>M81704-2</td>
<td>M81704-3</td>
<td>M81646-11</td>
<td>M81646-12</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyte</td>
<td>Remediation Goal</td>
<td>Units</td>
<td>0.13 U</td>
<td>10</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>6.5 J</td>
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<td></td>
</tr>
<tr>
<td>1,3,5-Trinitrobenzene</td>
<td>NA</td>
<td>µg/L</td>
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<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
</tr>
<tr>
<td>1,3-Dinitrobenzene</td>
<td>1</td>
<td>µg/L</td>
<td>2.8</td>
<td>1.7</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
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<tr>
<td>2,4,6-Trinitrotoluene</td>
<td>2.8</td>
<td>µg/L</td>
<td>0.11</td>
<td>0.083 J</td>
<td>0.070 J</td>
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<td>0.10 Uj</td>
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<td>µg/L</td>
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<td>5.0</td>
<td>2.5</td>
<td>1.0 U</td>
<td>1.0 U</td>
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<tr>
<td>2,6-Dinitrotoluene</td>
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<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
</tr>
<tr>
<td>2-amino-4,6-Dinitrotoluene</td>
<td>NA</td>
<td>µg/L</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
</tr>
<tr>
<td>4-amino-2,6-Dinitrotoluene</td>
<td>37</td>
<td>µg/L</td>
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<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
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<tr>
<td>o-Nitrotoluene</td>
<td>37</td>
<td>µg/L</td>
<td>0.94 J</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
</tr>
<tr>
<td>m-Nitrotoluene</td>
<td>37</td>
<td>µg/L</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
</tr>
<tr>
<td>p-Nitrotoluene</td>
<td>37</td>
<td>µg/L</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
</tr>
<tr>
<td>Nitrobenzene</td>
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<td>µg/L</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
</tr>
</tbody>
</table>

**Notes:**  
Detections presented in **bold**.  
Detections exceeding Remediation Goals highlighted.  

- J = estimated value  
- NA = not applicable  
- U = non-detect (reporting limit shown)  
- µg/L = micrograms per liter
### Table 3-1
**Analytical Data - April 2009 (Round RA-06)**

**Weldon Spring Ordnance Works**

**Weldon Spring, Missouri**

<table>
<thead>
<tr>
<th>Sample Location</th>
<th>Lab ID</th>
<th>Date Collected</th>
<th>Comments</th>
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<tbody>
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<td>Weldon Spring</td>
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<td>4/2/2009</td>
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<tr>
<td></td>
<td>M81704-11</td>
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<tr>
<td>Weldon Spring</td>
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<td>4/2/2009</td>
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<tr>
<td></td>
<td>M81704-12</td>
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<td></td>
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<tr>
<td>USGS4</td>
<td>MWS116</td>
<td>4/2/2009</td>
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<td></td>
<td>M81704-13</td>
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<td></td>
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<tr>
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<td></td>
<td>M81646-5</td>
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<td>SP5304</td>
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<td>3/31/2009</td>
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</table>

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Remediation Goal</th>
<th>Units</th>
<th>MWS106</th>
<th>MWS108</th>
<th>MWS110</th>
<th>MWS116</th>
<th>USGS4</th>
<th>SP5303</th>
<th>SP5304</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,3,5-Trinitrobenzene</td>
<td>NA</td>
<td>µg/L</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>4.7</td>
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<tr>
<td>1,3-Dinitrobenzene</td>
<td>1 µg/L</td>
<td></td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
</tr>
<tr>
<td>2,4,6-Trinitrotoluene</td>
<td>2.8 µg/L</td>
<td></td>
<td>1.0 U</td>
<td>1.0 U</td>
<td>1.0 U</td>
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<td>3.3</td>
<td>1.0 U</td>
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<tr>
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<td>0.10 UJ</td>
<td>0.10 UJ</td>
<td>0.10 UJ</td>
<td>0.11 J</td>
<td>0.10 UJ</td>
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<td>1.0 UJ</td>
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<td>1.0 U</td>
<td></td>
<td></td>
<td>1.3</td>
<td>0.24 J</td>
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<tr>
<td>4-amino-2,6-Dinitrotoluene</td>
<td>NA µg/L</td>
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<td>1.0 U</td>
<td>1.0 U</td>
<td>0.13 J</td>
<td>1.0 U</td>
<td>0.86 J</td>
<td>0.2 U</td>
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<tr>
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<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
</tr>
<tr>
<td>m-Nitrotoluene</td>
<td>37 µg/L</td>
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<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
</tr>
<tr>
<td>p-Nitrotoluene</td>
<td>37 µg/L</td>
<td></td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
<td>1.0 UJ</td>
</tr>
<tr>
<td>Nitrobenzene</td>
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<td>1.0 UJ</td>
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<td>1.0 UJ</td>
<td>1.8 J</td>
<td>1.0 U</td>
</tr>
</tbody>
</table>

**Notes:**
- Detections presented in **bold**.
- Detections exceeding Remediation Goals highlighted.
- J = estimated value
- NA = not applicable
- U = non-detect (reporting limit shown)
- µg/L = micrograms per liter
Table 3-1
Analytical Data - April 2009 (Round RA-06)
Weldon Spring Ordnance Works
Weldon Spring, Missouri

<table>
<thead>
<tr>
<th>Sample Location</th>
<th>Lab ID</th>
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<th>Comments</th>
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<td>SP5605</td>
<td>M81646-2</td>
<td>3/30/2009</td>
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<td>SP6301</td>
<td>M81704-6</td>
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<td>SP6303</td>
<td>M81646-3</td>
<td>3/30/2009</td>
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<td>SP6502</td>
<td>M81646-4</td>
<td>3/30/2009</td>
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<table>
<thead>
<tr>
<th>Analyte</th>
<th>Remediation Goal</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,3,5-Trinitrobenzene</td>
<td>NA</td>
<td>µg/L</td>
</tr>
<tr>
<td>1,3-Dinitrobenzene</td>
<td>1</td>
<td>1.0 U</td>
</tr>
<tr>
<td>2,4,6-Trinitrotoluene</td>
<td>2.8 µg/L</td>
<td>0.31 J</td>
</tr>
<tr>
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<td>0.45</td>
</tr>
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<td>0.47 J</td>
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<td>NA</td>
<td>0.97 J</td>
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<td>0.55 J</td>
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<td>m-Nitrotoluene</td>
<td>37 µg/L</td>
<td>1.0 U</td>
</tr>
<tr>
<td>p-Nitrotoluene</td>
<td>37 µg/L</td>
<td>1.0 U</td>
</tr>
<tr>
<td>Nitrobenzene</td>
<td>17 µg/L</td>
<td>1.0 U</td>
</tr>
</tbody>
</table>

Notes:
- Detections presented in bold.
- Detections exceeding Remediation Goals highlighted.
- J = estimated value
- NA = not applicable
- U = non-detect (reporting limit shown)
- µg/L = micrograms per liter
APPENDIX D

Site Inspection Checklist
# Site Inspection Checklist

## I. SITE INFORMATION

<table>
<thead>
<tr>
<th>Site name: Weldon Spring Ordnance Works</th>
<th>Date of inspection: 31 March 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location and Region: St. Charles County, MO USEPA Region 7</td>
<td>EPA ID: MOS210021288</td>
</tr>
<tr>
<td>Agency, office, or company leading the five-year review: ECC (for USAEC)</td>
<td>Weather/temperature: Overcast/ 50s to 60s</td>
</tr>
</tbody>
</table>

Remedy Includes: (Check all that apply)
- Landfill cover/containment
- Access controls
- Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- Other: Excavation, thermal destruction and/or offsite disposal of soil and wooden pipeline

### Attachments:
- Inspection team roster attached
- Site map attached

## II. INTERVIEWS (Check all that apply)

1. O&M technical lead: David Nelson
   - Process Engineer
   - Name
   - Title
   - Interviewed _ at site _ at office _ by phone _ Phone no. _816-389-3572_
   - Problems, suggestions: _Interview Questionnaires (11 total) are included in Attachment 4_

2. O&M staff: None
   - Name
   - Title
   - Interviewed _ at site _ at office _ by phone _ Phone no. _
   - Problems, suggestions: _Report attached_
3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

**Agency: USEPA, Region 7**

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Date</th>
<th>Phone no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daniel Wall</td>
<td>Remedial Project Manager</td>
<td>1 June 2009</td>
<td>913-551-7710</td>
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</tbody>
</table>

Problems; suggestions; _X_ Report attached

**Agency: MDNR**

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Date</th>
<th>Phone no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jesse Scott</td>
<td>Environmental Engineer</td>
<td>14 May 2009</td>
<td>573-522-5045</td>
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</tbody>
</table>

Problems; suggestions; _X_ Report attached

**Agency: St Charles Department of Community & Environment**

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Date</th>
<th>Phone no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gil Copley</td>
<td>Director</td>
<td>5 May 2009</td>
<td>636-949-7477</td>
</tr>
</tbody>
</table>

Problems; suggestions; _X_ Report attached

**Agency**

<table>
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<tr>
<th>Name</th>
<th>Title</th>
<th>Date</th>
<th>Phone no.</th>
</tr>
</thead>
</table>

Problems; suggestions; _X_ Report attached

4. **Other interviews** (optional) _X_ Report(s) attached.

<table>
<thead>
<tr>
<th>Name</th>
<th>Category</th>
<th>Organization</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marsha Miller</td>
<td>Facility Owner/Operator</td>
<td>WSTA</td>
<td>5 May 2009</td>
</tr>
<tr>
<td>John Vogel</td>
<td>Facility Owner/Operator</td>
<td>MDC</td>
<td>15 May 2009</td>
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<tr>
<td>Jane Powell</td>
<td>Facility Owner/Operator</td>
<td>DOE</td>
<td>6 May 2009</td>
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<tr>
<td>Kevin Wideman</td>
<td>Facility Owner/Operator</td>
<td>MDOT</td>
<td>19 May 2009</td>
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<td>Chris Greiner</td>
<td>Community</td>
<td>Howell High School</td>
<td>14 May 2009</td>
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<td>Jim Meiners</td>
<td>Community</td>
<td>Weldon Spring Heights</td>
<td>20 April 2009</td>
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<td>Karl Daubel</td>
<td>Community</td>
<td>Self</td>
<td>20 April 2009</td>
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### III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

<table>
<thead>
<tr>
<th>1. O&amp;M Documents</th>
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<td>X</td>
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<td>Up to date</td>
</tr>
<tr>
<td>As-built drawings</td>
<td>X</td>
<td>Readily available</td>
<td>Up to date</td>
</tr>
<tr>
<td>Maintenance logs</td>
<td>X</td>
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<td>Up to date</td>
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Remarks: The five year review site inspection was conducted during the MNA annual performance monitoring sampling task (groundwater and springs). The field team had the Work Plan was on site.

<table>
<thead>
<tr>
<th>2. Site-Specific Health and Safety Plan</th>
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</tr>
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<td>Contingency plan/emergency response plan</td>
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<td>Up to date</td>
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</table>

Remarks: The field team had the Site-Specific Health and Safety Plan on site.

<table>
<thead>
<tr>
<th>3. O&amp;M and OSHA Training Records</th>
<th></th>
<th></th>
<th></th>
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</table>

Remarks: The field team had up to date records with them.

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<tr>
<th>4. Permits and Service Agreements</th>
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<td>Air discharge permit</td>
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<tr>
<td>Effluent discharge</td>
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<td>Up to date</td>
</tr>
<tr>
<td>Waste disposal, POTW</td>
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<td>Up to date</td>
</tr>
<tr>
<td>Other permits</td>
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<table>
<thead>
<tr>
<th>5. Gas Generation Records</th>
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Remarks

<table>
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<tr>
<th>6. Settlement Monument Records</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

Remarks

<table>
<thead>
<tr>
<th>7. Groundwater Monitoring Records</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

Remarks

<table>
<thead>
<tr>
<th>8. Leachate Extraction Records</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

Remarks

<table>
<thead>
<tr>
<th>9. Discharge Compliance Records</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>X</td>
<td>Readily available</td>
<td>Up to date</td>
</tr>
<tr>
<td>Water (effluent)</td>
<td>X</td>
<td>Readily available</td>
<td>Up to date</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10. Daily Access/Security Logs</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>

Remarks
IV. O&M COSTS

1. O&M Organization
   - State in-house Contractor for State
   - PRP in-house Contractor for PRP
   - Federal Facility in-house Contractor for Federal Facility
   - Other

2. O&M Cost Records
   - Readily available
   - Up to date
   - Funding mechanism/agreement in place
   - Original O&M cost estimate $500,000 Breakdown attached for initial five year (Attachment 3)

   Total annual cost by year for review period if available

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Date</th>
<th>Date</th>
<th>Total cost</th>
<th>Breakdown attached</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 Oct 05</td>
<td>30 Sep 06</td>
<td>Date</td>
<td>Date</td>
<td>$108,800</td>
<td></td>
</tr>
<tr>
<td>01 Oct 06</td>
<td>30 Sep 07</td>
<td>Date</td>
<td>Date</td>
<td>$104,000</td>
<td></td>
</tr>
<tr>
<td>01 Oct 07</td>
<td>30 Sep 08</td>
<td>Date</td>
<td>Date</td>
<td>$58,000</td>
<td></td>
</tr>
</tbody>
</table>

Note: O&M cost are associated with the performance monitoring task for the MNA remedy

3. Unanticipated or Unusually High O&M Costs During Review Period
   - Describe costs and reasons: None

V. ACCESS AND INSTITUTIONAL CONTROLS  X Applicable    N/A

A. Fencing

1. Fencing damaged Location shown on site map Gates secured X N/A
   Remarks: Fencing is not an IC requirement.

B. Other Access Restrictions

1. Signs and other security measures Location shown on site map N/A
   Remarks: Two caution signs identify area T-13 (see Section X) and are in excellent shape (see photographs in Attachment 5).
### C. Institutional Controls (ICs)

1. **Implementation and enforcement**
   - Site conditions imply ICs not properly implemented: Yes
   - Site conditions imply ICs not being fully enforced: Yes

   Type of monitoring (e.g., self-reporting, drive by): Site Inspections
   - Frequency: Periodic (annual initially with change in frequency to be coordinated with regulators)
   - Responsible party/agency: US Department of Army/88th Regional Support Command

   **Contact:** Barry McFarland  
   **Environmental Protection Specialist**  
   **31 March 2009**  
   **316-681-1759, x. 1419**

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Date</th>
<th>Phone no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting is up-to-date</td>
<td>Yes</td>
<td>No</td>
<td>X Unknown</td>
</tr>
<tr>
<td>Reports are verified by the lead agency</td>
<td>Yes</td>
<td>No</td>
<td>X Unknown</td>
</tr>
<tr>
<td>Specific requirements in deed or decision documents have been met</td>
<td>Yes</td>
<td>X No</td>
<td>N/A</td>
</tr>
<tr>
<td>Violations have been reported</td>
<td>Yes</td>
<td>X No</td>
<td>N/A</td>
</tr>
</tbody>
</table>

2. **Adequacy**
   - ICs are adequate: X
   - ICs are inadequate: No

   Remarks: ICs are adequate as proposed, but do require finalization (see remarks above in V.C.1).

### D. General

1. **Vandalism/trespassing**
   - Location shown on site map: X
   - Remarks: No vandalism evident

2. **Land use changes on site**
   - Remarks: On site land use has not changed. Although site development has occurred with the recent construction (2008) of the Navy and Marine Corps Reserve Center.

3. **Land use changes off site**
   - Remarks: Off site land use has not changed immediately around the site.

### VI. GENERAL SITE CONDITIONS

#### A. Roads
   - Location shown on site map: X
   - Remarks: Roads are managed and maintained by WSTA and MDC. During the site inspection erosion of the access roadway for Monitoring Well cluster MW103 in the Weldon Spring Conservation Area was observed. The roadway was still usable at the time of the inspection and MDC was notified of this issue. (see photograph in Attachment 5).

Five-year Review Report - 5
### B. Other Site Conditions

Remarks: None

<table>
<thead>
<tr>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

### VII. LANDFILL COVERS

**Applicable**: X N/A

#### A. Landfill Surface

<table>
<thead>
<tr>
<th>Settlement (Low spots)</th>
<th>Location shown on site map</th>
<th>Settlement not evident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areal extent</td>
<td>Depth</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lengths</td>
<td>Widths</td>
<td>Depths</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion</td>
<td>Location shown on site map</td>
<td>Erosion not evident</td>
</tr>
<tr>
<td>Areal extent</td>
<td>Depth</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holes</td>
<td>Location shown on site map</td>
<td>Holes not evident</td>
</tr>
<tr>
<td>Areal extent</td>
<td>Depth</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetative Cover</td>
<td>Grass</td>
<td>Cover properly established</td>
</tr>
<tr>
<td>Trees/Shrubs (indicate size and locations on a diagram)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative Cover (armored rock, concrete, etc.)</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulges</td>
<td>Location shown on site map</td>
<td>Bulges not evident</td>
</tr>
<tr>
<td>Areal extent</td>
<td>Height</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wet areas/water damage not evident</td>
</tr>
<tr>
<td>-----</td>
<td>-----</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Wet areas</td>
<td>Location shown on site map</td>
<td>Areal extent</td>
</tr>
<tr>
<td>Ponding</td>
<td>Location shown on site map</td>
<td>Areal extent</td>
</tr>
<tr>
<td>Seeps</td>
<td>Location shown on site map</td>
<td>Areal extent</td>
</tr>
<tr>
<td>Soft subgrade</td>
<td>Location shown on site map</td>
<td>Areal extent</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ponding Location shown on site map Areal extent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seeps Location shown on site map Areal extent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Soft subgrade Location shown on site map Areal extent</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No evidence of slope instability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Location shown on site map N/A or okay</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Location shown on site map N/A or okay</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Location shown on site map N/A or okay</td>
</tr>
<tr>
<td>B. Benches</td>
<td>Applicable</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)</td>
</tr>
<tr>
<td>1. Flows Bypass Bench</td>
<td>Location shown on site map</td>
<td>N/A or okay</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Bench Breached</td>
<td>Location shown on site map</td>
<td>N/A or okay</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Bench Overtopped</td>
<td>Location shown on site map</td>
<td>N/A or okay</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Letdown Channels</td>
<td>Applicable</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)</td>
</tr>
<tr>
<td>1. Settlement</td>
<td>Location shown on site map</td>
<td>No evidence of settlement</td>
</tr>
<tr>
<td>Areal extent</td>
<td>Depth</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Material Degradation</td>
<td>Location shown on site map</td>
<td>No evidence of degradation</td>
</tr>
<tr>
<td>Material type</td>
<td>Areal extent</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Erosion</td>
<td>Location shown on site map</td>
<td>No evidence of erosion</td>
</tr>
<tr>
<td>Areal extent</td>
<td>Depth</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>4. <strong>Undercutting</strong></td>
<td>Location shown on site map</td>
<td>No evidence of undercutting</td>
</tr>
<tr>
<td></td>
<td>Areal extent</td>
<td>Depth</td>
</tr>
<tr>
<td>5. <strong>Obstructions</strong></td>
<td>Type</td>
<td>No obstructions</td>
</tr>
<tr>
<td></td>
<td>Location shown on site map</td>
<td>Areal extent</td>
</tr>
<tr>
<td>6. <strong>Excessive Vegetative Growth</strong></td>
<td>Type</td>
<td>No evidence of excessive growth</td>
</tr>
<tr>
<td></td>
<td>Location shown on site map</td>
<td>Areal extent</td>
</tr>
<tr>
<td><strong>D. Cover Penetrations</strong></td>
<td>Applicable</td>
<td>N/A</td>
</tr>
<tr>
<td>1. <strong>Gas Vents</strong></td>
<td>Active</td>
<td>Passive</td>
</tr>
<tr>
<td></td>
<td>Properly secured/locked</td>
<td>Functioning</td>
</tr>
<tr>
<td></td>
<td>Evidence of leakage at penetration</td>
<td>Needs Maintenance</td>
</tr>
<tr>
<td>2. <strong>Gas Monitoring Probes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Properly secured/locked</td>
<td>Functioning</td>
</tr>
<tr>
<td></td>
<td>Evidence of leakage at penetration</td>
<td>Needs Maintenance</td>
</tr>
<tr>
<td>3. <strong>Monitoring Wells</strong> (within surface area of landfill)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Properly secured/locked</td>
<td>Functioning</td>
</tr>
<tr>
<td></td>
<td>Evidence of leakage at penetration</td>
<td>Needs Maintenance</td>
</tr>
<tr>
<td>4. <strong>Leachate Extraction Wells</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Properly secured/locked</td>
<td>Functioning</td>
</tr>
<tr>
<td></td>
<td>Evidence of leakage at penetration</td>
<td>Needs Maintenance</td>
</tr>
<tr>
<td>5. <strong>Settlement Monuments</strong></td>
<td>Located</td>
<td>Routinely surveyed</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### E. Gas Collection and Treatment

<table>
<thead>
<tr>
<th>Applicable</th>
<th>N/A</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1.</th>
<th><strong>Gas Treatment Facilities</strong></th>
<th>Flaring</th>
<th>Thermal destruction</th>
<th>Collection for reuse</th>
<th>Good condition</th>
<th>Needs Maintenance</th>
<th>Remarks</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>2.</th>
<th><strong>Gas Collection Wells, Manifolds and Piping</strong></th>
<th>Good condition</th>
<th>Needs Maintenance</th>
<th>Remarks</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>3.</th>
<th><strong>Gas Monitoring Facilities</strong> <em>(e.g., gas monitoring of adjacent homes or buildings)</em></th>
<th>Good condition</th>
<th>Needs Maintenance</th>
<th>N/A</th>
</tr>
</thead>
</table>

### F. Cover Drainage Layer

<table>
<thead>
<tr>
<th>Applicable</th>
<th>N/A</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1.</th>
<th><strong>Outlet Pipes Inspected</strong></th>
<th>Functioning</th>
<th>N/A</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>2.</th>
<th><strong>Outlet Rock Inspected</strong></th>
<th>Functioning</th>
<th>N/A</th>
</tr>
</thead>
</table>

### G. Detention/Sedimentation Ponds

<table>
<thead>
<tr>
<th>Applicable</th>
<th>N/A</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>1.</th>
<th><strong>Siltation</strong></th>
<th>Areal extent</th>
<th>Depth</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Siltation not evident</td>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2.</th>
<th><strong>Erosion</strong></th>
<th>Areal extent</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Erosion not evident</td>
<td>Remarks</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3.</th>
<th><strong>Outlet Works</strong></th>
<th>Functioning</th>
<th>N/A</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>4.</th>
<th><strong>Dam</strong></th>
<th>Functioning</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>H. Retaining Walls</strong></td>
<td>Applicable</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>1. <strong>Deformations</strong></td>
<td>Location shown on site map</td>
<td>Deformation not evident</td>
<td></td>
</tr>
<tr>
<td>Horizontal displacement</td>
<td>Vertical displacement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotational displacement</td>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. <strong>Degradation</strong></td>
<td>Location shown on site map</td>
<td>Degradation not evident</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>I. Perimeter Ditches/Off-Site Discharge</strong></th>
<th>Applicable</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Siltation</strong></td>
<td>Location shown on site map</td>
<td>Siltation not evident</td>
</tr>
<tr>
<td>Areal extent</td>
<td>Depth</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. <strong>Vegetative Growth</strong></td>
<td>Location shown on site map</td>
<td>N/A</td>
</tr>
<tr>
<td>Vegetation does not impede flow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Areal extent</td>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. <strong>Erosion</strong></td>
<td>Location shown on site map</td>
<td>Erosion not evident</td>
</tr>
<tr>
<td>Areal extent</td>
<td>Depth</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. <strong>Discharge Structure</strong></td>
<td>Functioning</td>
<td>N/A</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>VIII. VERTICAL BARRIER WALLS</strong></th>
<th>Applicable</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Settlement</strong></td>
<td>Location shown on site map</td>
<td>Settlement not evident</td>
</tr>
<tr>
<td>Areal extent</td>
<td>Depth</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. <strong>Performance Monitoring</strong></td>
<td>Type of monitoring</td>
<td></td>
</tr>
<tr>
<td>Performance not monitored</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>Evidence of breaching</td>
<td></td>
</tr>
<tr>
<td>Head differential</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IX. GROUNDWATER/SURFACE WATER REMEDIES</td>
<td>X Applicable</td>
<td>N/A</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-------------</td>
<td>-----</td>
</tr>
</tbody>
</table>

### A. Groundwater Extraction Wells, Pumps, and Pipelines

<table>
<thead>
<tr>
<th>1. Pumps, Wellhead Plumbing, and Electrical</th>
<th>Applicable</th>
<th>X N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good condition</td>
<td>All required wells properly operating</td>
<td>Needs Maintenance</td>
</tr>
<tr>
<td>Remarks ________________________________</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances</th>
<th>Good condition</th>
<th>Needs Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks ________________________________</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Spare Parts and Equipment</th>
<th>Readily available</th>
<th>Good condition</th>
<th>Requires upgrade</th>
<th>Needs to be provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks _____________________</td>
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</table>

### B. Surface Water Collection Structures, Pumps, and Pipelines

<table>
<thead>
<tr>
<th>1. Collection Structures, Pumps, and Electrical</th>
<th>Good condition</th>
<th>Needs Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks ________________________________</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances</th>
<th>Good condition</th>
<th>Needs Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks ________________________________</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>3. Spare Parts and Equipment</th>
<th>Readily available</th>
<th>Good condition</th>
<th>Requires upgrade</th>
<th>Needs to be provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remarks _____________________</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Treatment System</td>
<td>Applicable</td>
<td>X N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------</td>
<td>-------</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. **Treatment Train** (Check components that apply)
   - Metals removal
   - Oil/water separation
   - Bioremediation
   - Air stripping
   - Carbon adsorbers
   - Filters
   - Additive (e.g., chelation agent, flocculent)
   - Others
   - Good condition
   - Needs Maintenance
   - Sampling ports properly marked and functional
   - Sampling/maintenance log displayed and up to date
   - Equipment properly identified
   - Quantity of groundwater treated annually
   - Quantity of surface water treated annually
   - Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   - N/A
   - Good condition
   - Needs Maintenance
   - Remarks

3. **Tanks, Vaults, Storage Vessels**
   - N/A
   - Good condition
   - Proper secondary containment
   - Needs Maintenance
   - Remarks

4. **Discharge Structure and Appurtenances**
   - N/A
   - Good condition
   - Needs Maintenance
   - Remarks

5. **Treatment Building(s)**
   - N/A
   - Good condition (esp. roof and doorways)
   - Chemicals and equipment properly stored
   - Needs repair
   - Remarks

6. **Monitoring Wells** (pump and treatment remedy)
   - Properly secured/locked
   - Functioning
   - Routinely sampled
   - Good condition
   - All required wells located
   - Needs Maintenance
   - N/A
   - Remarks

<table>
<thead>
<tr>
<th>D. Monitoring Data</th>
<th></th>
<th></th>
</tr>
</thead>
</table>

1. **Monitoring Data**
   - Is routinely submitted on time
   - Is of acceptable quality
   - Remarks: Groundwater has been collected annually under the RD/RA Work Plan for operable Unit 1, Phase 1-MNA Performance Monitoring and is of acceptable quality. Six rounds (RA-01 to RA-06) of groundwater have been collected to date and results and evaluation of this data are addressed in the Performance Monitoring Reports 001, 002, and 003.
2. Monitoring data suggests:
Groundwater plume is effectively contained  Contaminant concentrations are declining
Remarks: Based on past Performance Monitoring Reports, analytical data indicates the groundwater plume is contained and concentrations are demonstrated a downward trend. As required in the RD/RA Work Plan, results of the five-year statistical evaluation will be provided in the upcoming Performance Monitoring Report-003.

D. Monitored Natural Attenuation

1. Monitoring Wells (natural attenuation remedy)
   X Properly secured/locked  X Functioning  X Routinely sampled  X Good condition
   X All required wells located  Needs Maintenance  N/A
Remarks: Operable Unit 2 (Groundwater) - All monitoring wells and springs are inspected annually by field sampling team. All wells are in good condition, secured and locked. Minor well repairs (broken hinges, broken plugs, animal nest, etc) are addressed as identified. No major repairs have been required. During the site inspection selected Monitoring Well (individual or clusters) and Spring locations were inspected, including USGS4, MW04, MW12, MW16, MW31, MW103, SP5602, SP5603, SP5303 and SP5304. (see photographs in Attachment 5).

X. OTHER REMEDIES

Operable Unit 1 (Soils & Pipeline) – At area T-13 there is remaining contamination at depth. It was observed during the site inspection that a small animal habitat (piles of trees, brush, soil and other natural materials) was created on a portion of area T-13. In the process of creating this habitat some of the vegetative cover under or immediately surrounding the habitat was destroyed and the underlying soil cover was disturbed. Except for this one area, vegetation and soil cover in excellent shape (see photographs in Attachment 5).

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Operable Unit 1 (Soils & Pipeline) – This remedy reduced/eliminated the known sources of groundwater contamination. One area within the WSTA, T-13, has contamination remaining at depth (10 feet or greater and of limited lateral extent), but is well within the facility fence line. Although the general public is restricted from this area, military and federal personnel do have limited access. However, the remedy (depth to material, soil cover and signage) is functioning as designed and there is no contact with the material.

Operable Unit 2 (Groundwater)
Phase I MNA – This ongoing remedy includes the collection of monitoring data from selected groundwater wells and springs to verify the effectiveness of the naturally occurring process to reduce contaminant concentrations. To date data indicates that several monitoring points continue to exhibit concentrations above remedial goals and some monitoring points with previous exceedences of remedial goals may be beginning to trend towards achievement of the remedial goals. Statistical evaluation of the monitoring data will be performed as part of the five year review to further evaluate the remedy’s effectiveness and function.

Phase 2 Institutional Controls - This ongoing remedy includes limiting the ingestion or dermal exposure to groundwater and prevent the use of groundwater as a potable water source. A majority of the proposed ICs have been implemented. However with the transfer of the command from the 89th RRC to the 88th RSC installation regulations must be reviewed and revised as needed. Also negotiations with MDC must be completed and the deed restrictive covenant implemented.

<table>
<thead>
<tr>
<th>B. Adequacy of O&amp;M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe issues and observations related to the implementation and scope of O&amp;M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.</td>
</tr>
<tr>
<td>No issues noted at this time.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Early Indicators of Potential Remedy Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe issues and observations such as unexpected changes in the cost or scope of O&amp;M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.</td>
</tr>
</tbody>
</table>

Operable Unit 1 (Soils & Pipeline) - Recommendations were made during the site inspection to remove the debris and perform maintenance in area T-13 (re-grade and seed). These tasks were performed on 15 and 17 April 2009, respectively.

Operable Unit 2 (Groundwater) – None observed at this time.
### D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Operable Unit 1 (Soils & Pipeline) - It is recommended that all potential intrusive activities be limited at area T-13 in order to minimize future maintenance and repairs.

Operable Unit 2 (Groundwater) - Further evaluation and analysis of the monitoring data collected to date will be performed as part of the five-year review, and optimization recommendations will be made at that time.
ATTACHMENT 1

INSPECTION TEAM ROSTER
<table>
<thead>
<tr>
<th>NAME</th>
<th>ORGANIZATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrew Maly</td>
<td>US Army Environmental Command</td>
</tr>
<tr>
<td>Barry McFarland</td>
<td>88&lt;sup&gt;th&lt;/sup&gt; Regional Support Command</td>
</tr>
<tr>
<td>Jered Wisdom</td>
<td>88&lt;sup&gt;th&lt;/sup&gt; Regional Support Command</td>
</tr>
<tr>
<td>David Nelson</td>
<td>US Army Corps of Engineers, KCD</td>
</tr>
<tr>
<td>Daniel Wall</td>
<td>US Environmental Protection Agency, Region 7</td>
</tr>
<tr>
<td>Andrew Reed</td>
<td>Missouri Department of Natural Resources</td>
</tr>
<tr>
<td>Jesse Scott</td>
<td>Missouri Department of Natural Resources</td>
</tr>
<tr>
<td>Edward Leonard</td>
<td>ECC</td>
</tr>
<tr>
<td>Craig Stevens</td>
<td>Burns &amp; McDonnell</td>
</tr>
</tbody>
</table>

Five-year Review Report - 17
ATTACHMENT 2

SITE MAPS
Figure 2-1: General Site Information
Operable Unit 2: Groundwater
Weldon Spring Ordnance Works
Weldon Spring, Missouri

This figure contains information on the extent of nitrobenzene contamination above Condensation Goals for Operable Unit 2: Groundwater. Nitrobenzene contamination in groundwater is limited to the shallow bedrock aquifer and the overburden valley zone.

Also shown are the Spring Recharge Basins in which the monitoring points are located, the approximate location of the groundwater divide, and the identification of various properties that are within the extent of the boundaries of the former Weldon Spring Ordnance Works.

Monitoring Point clusters are annotated on this figure. For more detailed information on nature and extent of contamination, refer to Section 2.1.1, Table 2.1, Table 2.3, and Figure 2.1.

St. Charles County Well Field

Legend for Spring Recharge Basins

General Legend
- Topographic Contours
- Lakes
- Rivers
- Surface
- Draining Stream
- Leaking Stream
- Monitoring Basin
- Undeveloped Land - unassessed
- Areal coverage based on nitrobenzene (NB) levels and/or nitrobenzene (NB) to other contaminants
- Areal coverage based on nitrobenzene (NB) levels and/or nitrobenzene (NB) to other contaminants

Weldon Spring Ordnance Works Boundary (WODW)
- Weldon Spring Ordnance Works Boundary (WODW)
- Chemical Plant and Refineries Area Baseline (CPA)
- Chemical Plant and Refineries Area Baseline (CPA)
- Chemical Plant and Refineries Area Baseline (CPA)
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- Chemical Plant and Refineries Area Baseline (CPA)
- Chemical Plant and Refineries Area Baseline (CPA)
Figure 2-1: Weldon Spring Ordnance Works Project Location

Legend
- Weldon Spring Training Area Boundary
- Weldon Spring Ordnance Works Boundary
ATTACHMENT 3

ORIGINAL O&M COST ESTIMATE
Remedial Design/Remedial Action
Work Plan for the Final Remedial Action for the
Groundwater Operable Unit

FORMER WELDON SPRING ORDNANCE WORKS
WELDON SPRING, MISSOURI
OPERABLE UNIT 2: GROUNDWATER

Prepared by: US Army Corps of Engineers, Kansas City District
Prepared for: 89th Regional Readiness Command

Phase I - Monitored Natural Attenuation: Performance Monitoring

June 10, 2005
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5.0 SUMMARY OF PROJECT COSTS

Current projections for duration of the remedial action are approximately 160 years. Costs for performance monitoring of the selected remedy and associated actions are provided below. One well will be installed but the cost for this installation is not included in the estimate provided. Well maintenance is included. However, cost for abandonment of wells is not currently included in this design. The actual determination of wells to be abandoned and the abandonment process will be carried out at a currently undetermined future date. Costs are broken out by Year of Remedial Action (i.e. Costs for Year 1 cover actions associated with Phase I subsequent to the approval of Phase I for 1 year).

Current cost estimates for Phase I:

- Year 1 – $110,000
  - Includes (2) sampling events, (1) Groundwater Monitoring Report, Well Maintenance, and (2) Public Meetings and Coordination
- Year 2 – $112,000
  - Includes (2) sampling events, (1) Groundwater Monitoring Report, Well Maintenance, and (2) Public Meetings and Coordination
- Year 3 – $84,000
  - Includes (1) sampling event, (1) Groundwater Monitoring Report, Well Maintenance, 2 Public Meetings and Coordination
- Year 4 – $76,000
  - Includes (1) sampling event, (1) Groundwater Monitoring Report, Well Maintenance, (1) Public Meeting and Coordination
- Year 5 – $118,000
  - Includes (1) sampling event, (1) Groundwater Monitoring Report, 5-year Review, Well Maintenance, (1) Public Meeting and Coordination

Costs will be updated and presented for both Phase I and Phase II as part of Phase II. O&M costs do not currently include implementation of additional actions (Section 2.6).
ATTACHMENT 4

INTERVIEW QUESTIONNAIRES
<table>
<thead>
<tr>
<th>Category</th>
<th>Name</th>
<th>Title</th>
<th>Affiliate</th>
<th>Contact Number</th>
<th>Date Of Interview</th>
<th>Method Of Interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility Operator</td>
<td>Marsha Miller</td>
<td>Facility Manager</td>
<td>WSTA</td>
<td>(636) 329-1200</td>
<td>5 May 2009</td>
<td>Telephone</td>
</tr>
<tr>
<td>Facility Operator</td>
<td>Jane Powell</td>
<td>Project Manager</td>
<td>DOE</td>
<td>(513) 648-3148</td>
<td>6 May 2009</td>
<td>Telephone</td>
</tr>
<tr>
<td>Facility Operator</td>
<td>John Vogel</td>
<td>Wildlife Management Biologist</td>
<td>MDC</td>
<td>(636) 300-1953</td>
<td>15 May 2009</td>
<td>Telephone</td>
</tr>
<tr>
<td>Facility Operator</td>
<td>Kevin Wideman</td>
<td>Senior Environmental Specialist</td>
<td>DOT</td>
<td>(573) 526-4171</td>
<td>19 May 2009</td>
<td>Telephone</td>
</tr>
<tr>
<td>Regulator</td>
<td>Daniel Wall</td>
<td>Project Manager</td>
<td>USEPA</td>
<td>(913) 551-7710</td>
<td>1 June 2009</td>
<td>Telephone</td>
</tr>
<tr>
<td>Regulator</td>
<td>Jesse Scott</td>
<td>Environmental Engineer</td>
<td>MDNR</td>
<td>(573) 522-5045</td>
<td>14 May 2009</td>
<td>Telephone</td>
</tr>
<tr>
<td>Regulator</td>
<td>Gil Copley</td>
<td>Director</td>
<td>St. Charles County Department of Community and Environment</td>
<td>(636) 949-7477</td>
<td>5 May 2009</td>
<td>Telephone</td>
</tr>
<tr>
<td>Construction/O&amp;M</td>
<td>David Nelson</td>
<td>Processor Engineer</td>
<td>USACE/KCD</td>
<td>(816) 389-3572</td>
<td>5 May 2009</td>
<td>Telephone</td>
</tr>
<tr>
<td>Community</td>
<td>Chris Greiner</td>
<td>Principal</td>
<td>Howell High School</td>
<td>(636) 851-4700</td>
<td>14 May 2009</td>
<td>Telephone</td>
</tr>
<tr>
<td>Community</td>
<td>Jim Meiners</td>
<td>Trustee</td>
<td>WSH</td>
<td>(314) 757-5147</td>
<td>20 April 2009</td>
<td>Telephone</td>
</tr>
<tr>
<td>Community</td>
<td>Karl Daubel</td>
<td>NA</td>
<td>NA</td>
<td>(636) 537-2784</td>
<td>20 April 2009</td>
<td>Telephone</td>
</tr>
</tbody>
</table>

**NOTE:**
- WSTA - Weldon Spring Training Area
- DOE - Missouri Department of Energy
- MDC - Missouri Department of Conservation
- DOT - Missouri Department of Transportation
- USEPA - United States Environmental Protection Agency
- MDNR - Missouri Department of Natural Resources
- USACE/KCD - U.S Army Corps of Engineers - Kansas City District
- WSH - Weldon Spring Heights
- NA - Not applicable
Facility Owner Questionnaire

6 May 2009

FIVE-YEAR REVIEW FOR FORMER
WELDON SPRING ORDNANCE WORKS
FACILITY OWNER INTERVIEW QUESTIONNAIRE

1) Name (Last, First, M.I.): Title: Mr. □ Mrs. □ Ms. X

Miller, Marsha, Facility Manager

2) Work Address:

Weldon Springs Training Area
7301, Hwy 94S
St. Charles, MO 63304

Number of years at the above address: ~1.5 years

3) How long have you worked at the site? ~1.5 years

How long have you worked at the site? ~1.5 years

3) What is your overall impression of the project?

Overall, positive impression with the project.

4) Do you feel well informed about the site's activities and progress?

Not really. She does not feel most of the information from the upper management reaches her.

5) Have you been approached by people wanting to know about this site? Yes X No □

6) Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response for local authorities? Yes X No □

If so, please give details.

Last year, Ms. Miller received a call and was informed that troops were breathing in carbon monoxide from one of their buildings. The Safety Office was notified and they performed carbon monoxide monitoring as well as installed carbon monoxide detectors in all the buildings. None of the buildings tested had carbon monoxide detections. It was determined later that the troops were sleeping in their trucks with the vehicles turned on and they caused breathing in of the carbon monoxide.

Do you have any comments, suggestions, or recommendations regarding the site's management or operations? Yes! No X

Additional Comments

Ms. Miller is both the Storage Supervisor and the Facility Manager. The site has a lot of potential and believes it is not used to its full capacity. If the training areas had better facilities, they could have additional troops come in for training.
Ms. Miller believes the facility needs to have a DOD UIC so the facility can receive funds for site use. These funds would be used for site improvements and upkeep. Be able to support larger number of troops for training.

The FBI has a firing range on-site and would like to upgrade it, but Ms. Miller does not know who to contact so the FBI can work with them.

Memorandum of Understanding (MOU) needs to be updated for the current usage of the training facility.
1) Name (Last, First, M.I.):
Powell, Jane, Project Manager

Title: Mr. □ Mrs. □ Ms. X

2) Work Address:
U.S. Department of Energy
Office of Legacy Management
10995 Hamilton-Cleves Hwy
Harrison, Ohio 45030

Number of years at the above address: 3.5
How long have you worked at the site? 3.5

3) What is your overall impression of the project?
Site is well maintained.
Employees associated with the site are professional.

4) Do you feel well informed about the site's activities and progress? Yes X No □
Ms. Powell knows whom to call if a question/issue/concern/etc. arises and the Army personnel have always been very responsive.

5) Have you been approached by people wanting to know about this site? Yes □ No X

6) Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response for local authorities? Yes □ No X
If so, please give details.

7) Do you have any comments, suggestions, or recommendations regarding the site's management or operations?
Excellent neighbors.
8) Additional comments

An initial meeting with MDC is scheduled in July/August to get things moving. Per GW restrictions in July 07, DOE implemented special well drilling protocol in an effort to protect aquifers.
FIVE-YEAR REVIEW FOR
FORMER WELDON SPRING ORDNANCE WORKS
FACILITY OWNER INTERVIEW QUESTIONNAIRE

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<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>1)</strong> Name (Last, First, M.I.):</td>
<td>Title: Mr. X Mrs. □ Ms.□</td>
</tr>
<tr>
<td>Vogel, John, Wildlife Management Biologist</td>
<td></td>
</tr>
<tr>
<td><strong>2)</strong> Work Address:</td>
<td></td>
</tr>
<tr>
<td>Missouri Department of Conservation</td>
<td></td>
</tr>
<tr>
<td>2360 Hwy D</td>
<td></td>
</tr>
<tr>
<td>St. Charles, Missouri 63304</td>
<td></td>
</tr>
<tr>
<td>Number of years at the above address: 9</td>
<td></td>
</tr>
<tr>
<td>How long have you worked at the site? 9</td>
<td></td>
</tr>
<tr>
<td><strong>3)</strong> What is your overall impression of the project?</td>
<td></td>
</tr>
<tr>
<td>Overall positive impression.</td>
<td></td>
</tr>
<tr>
<td><strong>4)</strong> Do you feel well informed about the site’s activities and progress?</td>
<td>Yes X No□</td>
</tr>
<tr>
<td><strong>5)</strong> Have you been approached by people wanting to know about this site?</td>
<td></td>
</tr>
<tr>
<td>Yes, usually new people to the area have general questions (i.e., is it safe to eat fish/dogs swim in the water).</td>
<td></td>
</tr>
<tr>
<td><strong>6)</strong> Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response for local authorities?</td>
<td>Yes□ No X</td>
</tr>
<tr>
<td>If so, please give details.</td>
<td></td>
</tr>
<tr>
<td><strong>7)</strong> Do you have any comments, suggestions, or recommendations regarding the site’s management or operations?</td>
<td></td>
</tr>
<tr>
<td>Boundary fence issue - trying to coordinate with the Army to clear trees/brush on the fence so MOC can make repairs on the fence.</td>
<td></td>
</tr>
<tr>
<td><strong>8)</strong> Additional Comments</td>
<td></td>
</tr>
<tr>
<td>Last MW installed was approximately 3 years ago by DOE.</td>
<td></td>
</tr>
</tbody>
</table>
FIVE-YEAR REVIEW FOR
FORMER WELDON SPRING ORDNANCE WORKS
FACILITY OWNER INTERVIEW QUESTIONNAIRE

<table>
<thead>
<tr>
<th>1) Name (Last, First, M.I.):</th>
<th>Title: Mr. X Mrs. □ Ms. ☑</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wideman, Kevin, Senior Environmental Specialist</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2) Work Address:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missouri Department of Transportation</td>
</tr>
<tr>
<td>105 W Capital Ave</td>
</tr>
<tr>
<td>Jefferson City, MO 65102</td>
</tr>
</tbody>
</table>

| Number of years at the above address: 16 |

<table>
<thead>
<tr>
<th>3) What is your overall impression of the project?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. Wideman has limited knowledge of the site.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4) Do you feel well informed about the site's activities and progress? Yes□ No:</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5) Have you been approached by people wanting to know about this site?</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6) Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response for local authorities? Yes□ No:</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>If so, please give details.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have any comments, suggestions, or recommendations regarding the site's management or operations?</td>
</tr>
<tr>
<td>NA</td>
</tr>
</tbody>
</table>
FIVE-YEAR REVIEW FOR
FORMER WELDON SPRING ORDNANCE WORKS
REGULATOR INTERVIEW QUESTIONNAIRE

1) Name (Last, First, M.I.): Wall, Daniel, Remedial Project Manager
   Title: Mr. X Mrs. 1 Ms. -

2) Work Address:
   USEPA, Region 7
   901 N. 5th St
   Kansas City, Kansas, 66101

   Number of years at the above address: Mr. Wall was assigned this project in January 2009.

3) What is your overall impression of the project?
   Restoration has gone well.
   End results seem to fit well with the intended land use.
   No large concerns.

4) Have there been routine communications or activities (i.e., site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? Yes X No

   If yes, please give purpose and results.

   Mr. Wall has was assigned this project in January 2009 so he has not participated in site visits, inspections, reporting activities, etc. in the last 5 years. He did participate in the Five Year Review site inspection held in March 2009.

5) Have there been any complaints, violations, or other incidents related to the site requiring a response by your office? Yes X No

   None that he is aware of.

   If so, please give details of the events and results of the response.

6) Do you feel well informed about the site’s activities and progress? Yes X No

   If no, why?

   Do you have any comments, suggestions, or recommendations regarding the site’s management or operation?

   None at this time.
FIVE-YEAR REVIEW FOR
FORMER WELDON SPRING ORDNANCE WORKS
REGULATOR INTERVIEW QUESTIONNAIRE

<table>
<thead>
<tr>
<th>1) Name (Last, First, M.I.):</th>
<th>Scott, Jesse, Environmental Engineer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title: Mr. X Mrs. ☐ Ms. ☑</td>
<td></td>
</tr>
<tr>
<td>2) Work Address:</td>
<td>Missouri Department of Natural Resources</td>
</tr>
<tr>
<td></td>
<td>1730 E Elm St</td>
</tr>
<tr>
<td></td>
<td>Jefferson City, MO 65101</td>
</tr>
<tr>
<td>Number of years at the above address:</td>
<td>3 Months</td>
</tr>
<tr>
<td>3) What is your overall impression of the project?</td>
<td>Clean to the best condition and economical feasibility. Seems stable</td>
</tr>
<tr>
<td>4) Have there been routine communications or activities (i.e., site visits, inspections, reporting activities, etc.) conducted by your office regarding the site?</td>
<td>Yes ☑ No ☐</td>
</tr>
<tr>
<td>If yes, please give purpose and results.</td>
<td>Conduct visual inspections.</td>
</tr>
<tr>
<td></td>
<td>Oversight of annual review and sampling events. Split samples have been collected during sampling events and the results are as expected.</td>
</tr>
<tr>
<td>5) Have there been any complaints, violations, or other incidents related to the site requiring a response by your office?</td>
<td>Yes ☑ No ☐</td>
</tr>
<tr>
<td>If so, please give details of the events and results of the response.</td>
<td>A concerned citizen came across debris (pieces of rusted drum) located on the Louis and Clark Trail (near former Burning Ground No.1) and asked if it was safe to be in that area. The area was inspected by DOE and was deemed safe. Samples will also be collected.</td>
</tr>
<tr>
<td>6) Do you feel well informed about the site's activities and progress?</td>
<td>Yes ☑ No ☐</td>
</tr>
<tr>
<td>If no, why?</td>
<td></td>
</tr>
</tbody>
</table>

Page 1 of 2
Do you have any comments, suggestions, or recommendations regarding the site’s management or operation?

Mr. Scott mentioned that he did not think all the institutional controls have been implemented at the site and they need to be put in place. See attached letter for further details.
June 16, 2009

Ms. Lauren Sparkman
Associate Environmental Engineer
ECC
1432 N. Great Neck Rd, Suite, 103
Virginia Beach, VA 23454

RE: Regulator Response to Five-Year Review for Weldon Spring Ordnance Works
Regulator Interview Questionnaire

Dear Ms. Sparkman:

As part of the Five-Year Review process for Weldon Spring Ordnance Works I was interviewed as a regulator for the site. In response to their last question, "Do you have any comments, suggestions, or recommendations regarding the site's management or operation?", I replied, "All of the site's institutional controls have not yet been implemented. These need to be put in place on site as promised." ECC then requested that I further elaborate upon my response. Below is my response to their request.

After reviewing the previously agreed upon RDIRA and ROD documents it was concluded that not all of the institutional controls (ICs) have been carried out.

IC objectives, as outlined by the ROD, include:

- Restrict activities that may negatively impact the remediation of contamination
- Restrict activities that may result in creation of a potential for downward migration of contamination
- Reduce the potential for ingestion or dermal exposure to groundwater contaminated at concentrations above remediation goals
- Prevent use of groundwater contaminated above ARARs or health-based remediation goals as a potable water source

Phase II of the RD/RA document deals exclusively with the ICs and their implementation. Sections 3 & 4 specifically provide a detailed summary of the ICs and step by step recommendations for their implementation. The RD/RA and ROD documents were both agreed upon with the understanding that the processes and procedures outlined within them would be followed and implemented accordingly. Few if any steps have been taken toward proper IC implementation. The Special Use Area discussed (now Special Area 4) and the T13 signage has been completed successfully, but no other ICs outlined in the RD/RA have been established.
A primary objective to conducting a five-year review, is determining whether or not the remedy is functioning and is protective of current and future human health. This includes making sure that the ICs are properly implemented.

Currently the Department of Energy (DOE) is coordinating with the Missouri Department of Conservation (MDC) on the implementation of the ICs on their property. It is recommended that the Department of Defense coordinate with the DOE to discuss the implementation of the ICs with the MDC. Since the MDC only meets with their advisory commission once a quarter this may be a good opportunity.

I would like to thank you for the opportunity to provide comments on this review. If you have any questions or need further clarification, please contact me in writing to the Missouri Department of Natural Resources, Hazardous Waste Program, Federal Facilities Section, 917 N. Hwy 67, Suite 104, Florissant, Missouri 63031, via e-mail at jesse.scott@dnr.mo.gov, or by phone to (573) 751-3907.

Sincerely,

HAZARDOUS WASTE PROGRAM

Original signed by Jesse Scott

Jesse Scott, Environmental Engineer
Federal Facilities Section

JS:dd
# FIVE-YEAR REVIEW FOR
# FORMER WELDON SPRING ORDNANCE WORKS
# REGULATOR INTERVIEW QUESTIONNAIRE

<table>
<thead>
<tr>
<th>1) Name (Last, First, M.I.):</th>
<th>Title: Mr. X Mrs. □ Ms.:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copley, Gil, Director</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2) Work Address:</th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Charles County Department of Community and Environment</td>
</tr>
<tr>
<td>1650 Boone's Lick Rd</td>
</tr>
<tr>
<td>St. Charles, MO 63301</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of years at the above address: 13 years</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>3) What is your overall impression of the project?</th>
</tr>
</thead>
<tbody>
<tr>
<td>The project was well thought out and was well executed. It was completed successfully.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4) Have there been routine communications or activities (i.e., site visits, inspections, reporting activities, etc.) conducted by your office regarding the site?</th>
</tr>
</thead>
<tbody>
<tr>
<td>If yes, please give purpose and results.</td>
</tr>
</tbody>
</table>

Not recently; however, in the early 2000s, the community questioned concerns of possible infant and fetal deaths.

Per www.scchealth.org:

"After receiving an inquiry on 16 January, 2001 concerning infant and fetal deaths in O'Fallon, Missouri during 2000, the Missouri Department of Health and Senior Services (DHSS) undertook an epidemiological evaluation of infant and fetal deaths. In the 2002 and final update of an epidemiological investigation has shown no evidence of an elevated fetal or infant mortality in the O'Fallon community. In addition, the examination of the causes of fetal and infant deaths did not support the hypothesis that a single environmental factor had caused the fetal and infant deaths in the O'Fallon community."

<table>
<thead>
<tr>
<th>5) Have there been any complaints, violations, or other incidents related to the site requiring a response by your office?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes □ No X</td>
</tr>
</tbody>
</table>

If so, please give details of the events and results of the response.

<table>
<thead>
<tr>
<th>6) Do you feel well informed about the site's activities and progress?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes X □ No</td>
</tr>
</tbody>
</table>

Receives routine updates; however, have not been following the site closely since the RA is completed.
<table>
<thead>
<tr>
<th>7) Do you have any comments, suggestions, or recommendations regarding the site's management or operation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. Copley worked on the RAB Rehabilitation Board and thinks the Weldon Spring Site Interpretative Center (DOE) is a wonderful thing. The Center provides a balance view of the history for anyone that is interested in the history of the site.</td>
</tr>
</tbody>
</table>
FIVE-YEAR REVIEW FOR FORMER WELDON SPRING ORDNANCE WORKS CONSTRUCTION /O&M INTERVIEW QUESTIONNAIRE

1) Name (Last, First, M.I.): Nelson, David C., Process Engineer

Title: Mr. X Mrs. r1 Ms.(L

2) Work Address:
   U.S. Army Corps of Engineers - Kansas City District
   601 East 12th St. Room 139
   Kansas City, MO 64106

Number of years at the above address: 10 years

What is your overall impression of the project?

Site has been managed very well. The identified risk at the site have been addressed – no issues.

3) Is the remedy functioning as expected? Yes X No L

How well is the remedy performing?

As expected.

4) What does the monitoring data show?
   In some areas (MW16 – downgradient of T-13) currently below remediation; therefore;
   may request to discontinue sampling this well in the future. There is some seasonal
   variation, but it is consistent with historical ranges.

Are there any trends that show contaminant levels are decreasing? Yes X No L

5) Is there a continuous on-site O&M presence?
   No, not required

If so, please describe staff and activities.

If not, please describe staff and frequency of site inspections and activities.

   On-site annually to conduct annual groundwater monitoring. Inspection of groundwater
   monitoring wells ensure installation controls are functioning and are in place.

6) Have there been any significant changes in the O&M requirements, maintenance
   schedules, or sampling routines since start-up or in the last five years? Yes: No X

If so, do they affect the protectiveness or effectiveness of the remedy?

Please describe changes and impacts.
### Construction / O&M Questionnaire
5 May 2009

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>7) Have there been unexpected O&amp;M difficulties or costs at the site since start-up or in the last five years?</td>
<td>No X</td>
</tr>
<tr>
<td>If so, please give details.</td>
<td></td>
</tr>
<tr>
<td>8) Do you have any comments, suggestions, or recommendations regarding this project?</td>
<td>No. Mr. Nelson feels everything is going well at the site.</td>
</tr>
</tbody>
</table>
# Community Interview Questionnaire

**Community Questionnaire**  
**14 May 2009**

---

## FIVE-YEAR REVIEW FOR FORMER WELDON SPRING ORDNANCE WORKS COMMUNITY INTERVIEW QUESTIONNAIRE

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Name (Last, First, M.I.):</td>
<td>Mr. X</td>
</tr>
<tr>
<td>Title: Mr. X Mrs. X Ms. X</td>
<td></td>
</tr>
<tr>
<td>Greiner, Christopher, Principal of Francis Howell High School</td>
<td></td>
</tr>
<tr>
<td>2) Home Address:</td>
<td></td>
</tr>
<tr>
<td>744 Thunder Hill Dr</td>
<td></td>
</tr>
<tr>
<td>O'Fallon, Missouri 63368</td>
<td></td>
</tr>
<tr>
<td>Number of years at the above address: 3</td>
<td></td>
</tr>
<tr>
<td>Number of years have you lived in the Weldon Spring area: 3</td>
<td></td>
</tr>
<tr>
<td>3) Do you work in the vicinity of Weldon Spring Ordnance Works (WSOW)?</td>
<td>No</td>
</tr>
<tr>
<td>If yes, what is your work address?</td>
<td></td>
</tr>
<tr>
<td>Francis Howell High School</td>
<td></td>
</tr>
<tr>
<td>7001 S Hwy 94</td>
<td></td>
</tr>
<tr>
<td>St Charles, Missouri 63304</td>
<td></td>
</tr>
<tr>
<td>Number of years you have worked at this address: 8</td>
<td></td>
</tr>
<tr>
<td>4) Are you affiliated with any local community organizations or agencies?</td>
<td>No</td>
</tr>
<tr>
<td>If yes, which ones, and what are your organization's local government's responsibilities relative to the WSOW?</td>
<td></td>
</tr>
<tr>
<td>Mr. Greiner is the principal of the Francis Howell High School</td>
<td></td>
</tr>
<tr>
<td>5) What is your overall impression of the operations at the WSOW?</td>
<td></td>
</tr>
<tr>
<td>Mr. Greiner does not have any knowledge of the Weldon Spring Ordnance Works Site</td>
<td></td>
</tr>
<tr>
<td>6) Have you ever been on the WSOW site?</td>
<td>No</td>
</tr>
<tr>
<td>If yes, please describe?</td>
<td></td>
</tr>
<tr>
<td>7) Have ever worked or trained at WSOW?</td>
<td>No</td>
</tr>
<tr>
<td>If yes, please describe?</td>
<td></td>
</tr>
<tr>
<td>7) What effects have WSOW cleanup operations had on the surrounding community?</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Response</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>8) Are you aware of any community concerns regarding the site or its operations and administration? If so, please give details.</td>
<td>NA</td>
</tr>
<tr>
<td>9) Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response for local authorities?</td>
<td>No</td>
</tr>
<tr>
<td>If so please give details.</td>
<td></td>
</tr>
<tr>
<td>10) Do you feel well informed about the site’s activities and progress?</td>
<td>No</td>
</tr>
<tr>
<td>11) Are you aware of any significant changes in the land use around the site?</td>
<td>NA</td>
</tr>
<tr>
<td>If so, please describe.</td>
<td></td>
</tr>
<tr>
<td>12) Do you have any comments, suggestions, or recommendations regarding the site’s management or operations?</td>
<td>NA</td>
</tr>
</tbody>
</table>
## FIVE-YEAR REVIEW FOR FORMER WELDON SPRING ORDNANCE WORKS COMMUNITY INTERVIEW QUESTIONNAIRE

1) **Name (Last, First, M.I.):**
   
   Meiners, James A. Jr., Trustee of Weldon Spring Heights

2) **Address:**
   
   No. 6 Weldon Spring Heights
   St. Charles, MO 63304

   Number of years at the above address: 10

3) **Do you work in the vicinity of Weldon Springs Ordnance Works (WSOW)?**
   
   Yes [X] No [ ]

   If yes, what is your work address?
   
   108 N Eapherton
   Chesterfield, MO 63005

   Number of years you have worked at this address: 11

4) **Are you affiliated with any local community organizations or agencies?**
   
   Yes [X] No [ ]

   If yes, which ones, and what are your organization's / local government's responsibilities relative to the WSOW?
   
   Mr. Meiners is a trustee of Weldon Spring Heights (WSH). WSH has community meetings that are held at the Weldon Spring Interpretive Center (DOE).

5) **What is your overall impression of the operations at the WSOW?**
   
   Very nice. No negatives

6) **Have you ever been on the WSOW site?**
   
   Just the WS Site Interpretative Center (DOE).

   If yes, please describe?

7) **Have ever worked or trained at WSOW?**
   
   Yes [X] No [ ]

   If yes, please describe?

7) **What effects have WSOW cleanup operations had on the surrounding community?**
   
   Mr. Meiners is not aware of any effects.
### 8) Are you aware of any community concerns regarding the site or its operations and administration? If so, please give details.

The town of St. Charles purchased military officer's buildings (housing). There was some community concern about the water source (deep well). The community was informed that the water is tested monthly, and there have never been any issues.

### 9) Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response for local authorities? Yes □ No X

If so please give details.

### 10) Do you feel well informed about the site’s activities and progress? Yes X No □

### 11) Are you aware of any significant changes in the land use around the site? Yes □ No X

If so, please describe.

### 12) Do you have any comments, suggestions, or recommendations regarding the site’s management or operations?

No issues, good neighbors.
### FIVE-YEAR REVIEW FOR
FORMER WELDON SPRING ORDNANCE WORKS
COMMUNITY INTERVIEW QUESTIONNAIRE

<table>
<thead>
<tr>
<th>1) Name (Last, First, M.I.):</th>
<th>Title: Mr. X Mrs. □ Ms. □</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daubel, Karl, J., Retired</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2) Address:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>15022 Willow Lake Ct.</td>
<td></td>
</tr>
<tr>
<td>Chesterfield, MO 63017</td>
<td></td>
</tr>
<tr>
<td>Number of years at the above address:</td>
<td>~20 years</td>
</tr>
<tr>
<td>Number of years have you lived in the Weldon Spring area:</td>
<td>Same as above</td>
</tr>
</tbody>
</table>

| 3) Do you work in the vicinity of Weldon Springs Ordnance Works (WSOW)? |                           |
| Worked at WSTA for 10 years (1988-1998)                  |                           |

| If yes, what is your work address?                     |                           |
| 7301 Hwy 94S, St. Charles, MO 63304                    |                           |
| Number of years you have worked at this address?      | 10 years                  |

| 4) Are you affiliated with any local community organizations or agencies? | Yes X No □ |
| If yes, which ones, and what are your organization's / local government's responsibilities relative to the WSOW? |                           |
| On weekends, Mr. Daubel and his wife, work for S.M. Stoller Corp (contractor to DOE) at the Weldon Spring Site Interpretive Center (DOE) conducting tours. |                           |

| 5) What is your overall impression of the operations at the WSOW? |                           |
| Mr. Daubel thinks there were excellent recovery activities (cleanup) since WWII. He also thinks the army did an excellent job of incineration of the soil and pipeline. |                           |
| Although the army did an excellent and extensive job of cleaning up the site, he wouldn't be surprised if something (i.e., munitions, other...) is found at some point. |                           |

| 6) Have you ever been on the WSOW site? | Yes X No □ |
| If yes, please describe? Please see response to question No. 4. |                           |

| 7) Have ever worked or trained at WSOW? | Yes X No: |
| If yes, please describe? Please see response to question No. 4. |                           |

7) What effects have WSOW cleanup operations had on the surrounding community?
Mr. Daubel is glad they conducted the cleanup – help keep everyone safe.

8) Are you aware of any community concerns regarding the site or its operations and administration? If so, please give details.

Army needs to have a UIC number assigned to the installation. This will make the installation eligible to get funding from property tenants (tenants pay to use the land). The funding could then be used for the general upkeep of the site (i.e., mowing, upkeep of drainage pipes, power for security lights, etc.).

9) Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency response for local authorities? Yes X No.

If so please give details.

Not recent, but when Mr. Daubel worked at the site, there were 2 cases of theft 1) in his office and 2) the contractors office. Equipment was stolen.

10) Do you feel well informed about the site's activities and progress?

Somewhat, however, due to the high turnover rate of site personnel there are understandably causes of concurrence issues.

11) Are you aware of any significant changes in the land use around the site? Yes X No.

If so, please describe.

Explorer Pipeline Company constructed a booster station on the pipeline. Size of building is approximately 1 acre. Station is located near access road of the WSTA.

12) Do you have any comments, suggestions, or recommendations regarding the site's management or operations?

See response to questions No. 8.

One concern of Mr. Daubel's is how sanitary waste will be handled for the construction that is being built (Naval and National Guard buildings). Where is waste going and how is it going to be treated.

Overall, Mr. Daubel thinks the army has done a very good job. Personnel is very diligent when looking into things.
ATTACHMENT 5

SITE INSPECTION PHOTOGRAPHS
31 MARCH 2009
Photograph 1: View of area T-13 located on the Weldon Spring Training Area (WSTA)

Photograph 2: One of two caution signs at area T-13

CAUTION - DO NOT DIG

This area is known as T-13. Institutional controls are in effect in this area to protect human health and the environment. Soils at T-13 are contaminated with nitroaromatic compounds in concentrations above remediation goals. Consult with Army Reserve Environmental staff before digging any holes or disturbing ground cover.

CAUTION - DO NOT DIG

Photograph 2: One of two caution signs at area T-13
Photograph 3: Debris and missing vegetation (see arrow) at area T-13

Photograph 4: Monitoring well MW12S located on the WSTA

Five-year Review Report - 26
Photograph 5: Monitoring well cluster MW16 located on the WSTA

Photograph 6: Monitoring well cluster MW 103 located on the Weldon Spring Conservation Area
Photograph 7: Monitoring well USGS4 located on the August A. Bush Memorial Conservation Area

Photograph 8: Spring SP5603 located on the Weldon Spring Conservation Area

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Photograph 9: Spring SP5602 located on the Weldon Spring Conservation Area

Photograph 10: Road erosion near Monitoring Well cluster MW103 Located on the Weldon Spring Conservation Area