

Five-Year Review Report

First Five-Year Review Report

For

**Arkwood, Inc. Site
Boone County
Omaha, Arkansas**

February 2001

Prepared By

Region 6

**United States Environmental Protection Agency
Dallas, Texas**

146340



FIVE-YEAR REVIEW

**Arkwood, Inc.
ARD084930148
Boone County, Arkansas**

This memorandum documents EPA's approval of the Arkwood Five-Year Review Report prepared by McKesson HBOC, Inc. on behalf of EPA.

Summary of Five-Year Review Findings

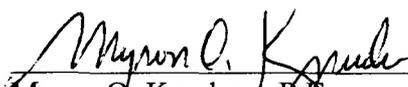
Arkwood was a wood treating site where wood treating fluids contaminated the soil. The remedy was implemented in phases. Phase I was pretreatment and storage of contaminated soil to implement the remedy specified in the ROD, and backfilling with clean soil to minimize environmental impact. Phase II was separation of contaminated soil from rock fragments and off-site incineration of the soil fines. The above procedure was followed by placement of clean topsoil and seeding. The groundwater exits immediately downgradient of the wood treating area at New Cricket Spring. PCP concentration at New Cricket Spring has decreased significantly since the soil remedy was completed. As a part of the groundwater remedy, water at New Cricket Spring is treated by an Ozone oxidation process to destroy the PCP contamination of the groundwater. The groundwater treatment installed in 1997 was upgraded in 1998 and 1999 and is able to destroy PCP in the water to level set by ADEQ (18.7 ppb daily maximum). The New Cricket Spring treatment system is continuing to operate.

Actions Needed

No major deficiencies were noted. To ensure future protectiveness, the groundwater treatment system should continue until water exiting the New Cricket meets ADEQ standards for Arkwood site.

Determinations

I have determined that the remedy for the Arkwood site is protective of human health and the environment, and will remain so provided the action items identified in the Five-Year Review Report are addressed as described above.



Myron O. Knudson, P.E.
Director, Superfund Division
U.S. Environmental Protection Agency
Region 6

3-13-01

Date

CONCURRENCES

FIVE-YEAR REVIEW

for the

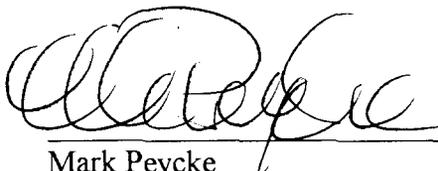
Arkwood Site

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List of Acronyms

ADEQ	Arkansas Department of Environmental Quality
ADPCE	Arkansas Department of Pollution Control and Ecology
AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chemicals of Concern
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
gpm	gallons per minute
HASP	Health and Safety Plan
IRIS	Integrated Risk Information System
mg/kg	milligram per kilogram
mg/l	milligram per liter
MMI	Mass Merchandisers, Inc.
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PCP	Pentachlorophenol
PER	Preliminary Engineering Report
PNA	Polynuclear Aromatics
PRP	Potentially Responsible Party
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RDWP	Remedial Design Work Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision

RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act of 1986
SOW	Statement of Work
µg/l	microgram per liter

EXECUTIVE SUMMARY

This is the first five-year review for the Arkwood, Inc. Site (Site) located in Boone County in Omaha, Arkansas. The results of the five-year review indicate that the remedy is protective of human health and the environment. Soil remediation was completed in 1995 followed by placement of topsoil and seeding. The vegetation is in good condition. The groundwater treatment system, located immediately downgradient at the mouth of New Cricket Spring, is functioning as designed and is meeting treatment goals. Therefore, the remedies that were implemented for soil and groundwater at the Site continue to be protective of human health and the environment.

Soil Remediation

The remedy that was implemented for soil remediation is protective of human health and the environment. The affected soil was excavated and pretreated. The affected fine-grained soils were separated from the gravel component and transported offsite for incineration. Verification sampling was conducted to ensure that the affected soil had been removed. The excavations were backfilled with clean materials, topsoil was placed and the Site was seeded. Perimeter fencing is in place and is effective in preventing unauthorized entry or use of the Site. The Site is in good condition and is inspected and maintained on a regular basis.

Groundwater Remediation

The remedy that was implemented for the groundwater is protective of human health and the environment. The Site is located in an area of karst geology that is characterized by subsurface channels hydraulically connecting the Site to New Cricket Spring. Although the main source area (Site soils) no longer exists, the groundwater continues to be impacted by residual contaminants in the subsurface channels. The groundwater contaminants will continue to naturally attenuate over time.

The region in which the Site is located has experienced drought conditions for the past several years. The result is that New Cricket Spring flows are lower than normal making it difficult to obtain high flow data. However, the existing data confirm that the treatment system is effectively removing contaminants from the water.

Five Year Review Summary Form

SITE IDENTIFICATION

Site Name: Arkwood, Inc. Site

EPA ID: AKD084930148

Region: 6

State: Arkansas

City/County: Omaha/Boone County

SITE STATUS

NPL Status Final Deleted Other (specify)

Remediation Status(choose all that apply) Under Construction Operating Complete

Multiple OUs? YES NO **Construction Completion Date:** 12/13/95

Has site been put into reuse? YES NO

REVIEW STATUS

Reviewing Agency: EPA State Tribe Other Federal Agency _____

Author Name: Shawn Ghose M.S., P.E.

Author Title: Remedial Project Mgr

Author Affiliation: EPA

Review Period: 2/94 to 2/99

Date(s) of site inspection: 4/12/99

Type of Review: Statutory Post-Sara Pre-Sara NPL-Removal only
 Policy Non-NPL Remedial Action Site
 NPL State/Tribe-lead
 Regional Discretion

Review number 1 (first) 2 (second) 3 (third) Other (specify) _____

Triggering Action:

Actual RA Onsite Construction Actual RA Start at OU # _____
 Construction Completion Previous Five-Year Review Report
 Other (specify) _____

Triggering action date: 2/94

Due date (five years after triggering action date): 2/99

Five Year Review Summary form

Deficiencies

The following deficiency was identified:

- Due to regional drought conditions, limited high flow (storm) data since the new, upgraded treatment system was installed.

This deficiency does not cause the remedy to be unprotective.

Recommendations and Follow-up Actions

One action is required to correct the deficiencies and ensure that protectiveness is maintained:

- High flow (storm) data will continue to be collected, whenever feasible, to verify the effectiveness of the treatment system.

Protectiveness Statements:

The remedial actions for the soil and groundwater are protective of human health and the environment. Since both media remedies are protective, the remedy for the site is protective of human health and the environment.

Other Comments:

The Site is in good condition and is inspected and maintained on a regular basis. No changes in land use are planned and the perimeter fence has been effective in preventing unauthorized access to the site.

Arkwood, Inc. Site First Five-Year Review Report

I. Introduction

The EPA Region 6 has conducted a first five-year review of the remedial actions implemented at the Arkwood, Inc., Site located in Omaha, Boone County, Arkansas. The review was conducted from October 2000 through November 2000, and this report documents the results of the review. The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify deficiencies found during the review, if any, and identify recommendations to address them.

This review is required by statute. The EPA must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121(c), as amended, which 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 5 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.

NCP Section 300.430(f)(4)(ii), 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 initiation of the selected remedial action.

This is the first five-year review for the Arkwood, Inc. Site. The triggering action for this review was the start of Phase I onsite construction in February 1994. Due to the fact that Site soils were remediated to industrial levels which are above levels that allow for unrestricted use and unlimited exposure, and residual contaminants remain in the karst geology features of fractures and channels beneath the Site resulting in ongoing treatment of groundwater at New Cricket Spring, five-year reviews are required.

II. Site Chronology

Table 1: Chronology of Site Events

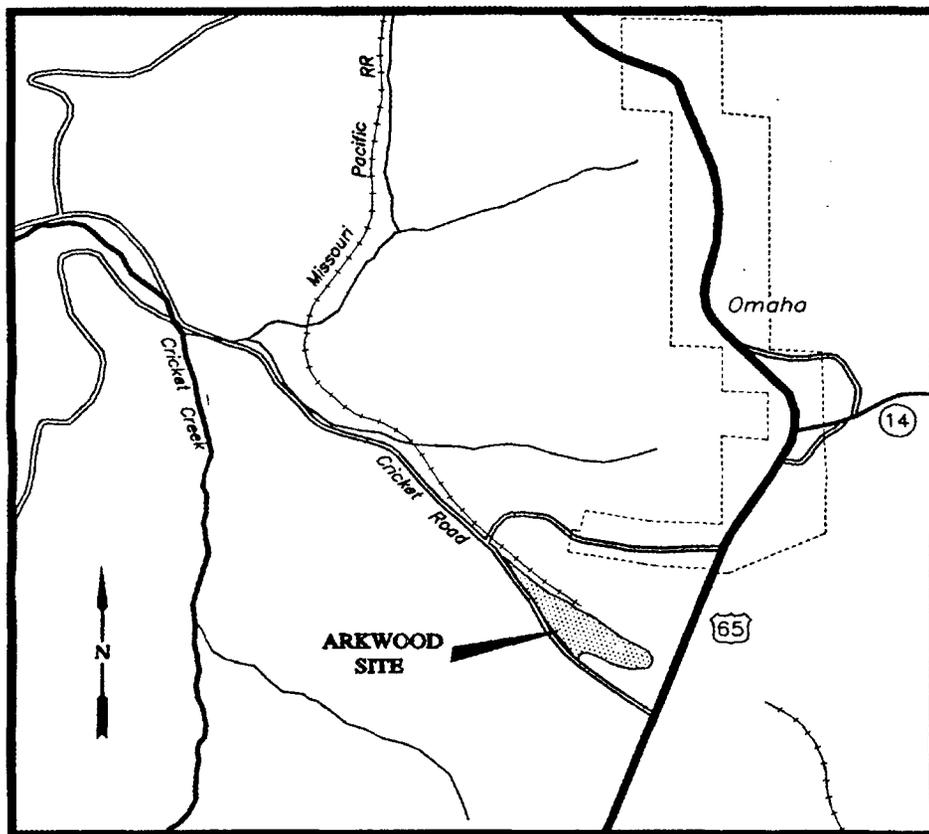
Date	Event
1962	Arkwood, Inc. commences woodtreating operations.
1973	Mass Merchandisers, Inc.(MMI) takes over operation of the plant under a lease agreement with the owner.
1981	Arkansas Department of Pollution Control and Ecology (ADPCE) receives a complaint about potentially affected water in the railroad tunnel.
1981 – 1985	Preliminary investigations by ADPCE indicate detectable levels of pentachlorophenol (PCP) in the area immediately surrounding the Site.
6/84	Plant operation ceases.
9/04/85	U.S. Environmental Protection Agency (EPA) proposes adding the Site to the National Priorities List (NPL).
5/15/86	EPA and MMI enter into an Administrative Order on Consent (AOC) for performance of a Remedial Investigation/Feasibility Study (RI/FS).
3/31/89	The Site is added to the NPL.
5/90	The RI/FS is completed by MMI.
9/28/90	EPA issues a Record of Decision (ROD) for the Site.
5/30/91	Execution of a Consent Decree (CD)
9/24/92	Entry of a corrected Consent Decree (CD) between EPA and MMI for Site remediation.
9/92	EPA approves a Remedial Design Work Plan (RDWP) for the Site.
11/16/93	A Preliminary Engineering Report (PER) is approved for the Site.
2/94	Remedial Action activities commence.
6/14/95	An Explanation of Significant Differences (ESD) is executed changing treatment of the affected soils to incineration at an offsite facility.
12/13/95	Remedial Action is complete.
5/97	An ozone pilot treatment system is installed at the Site.
11/97 – 1/98	The treatment system is upgraded with an ozone diffuser and baffles.
10/99 – 12/99	A new higher capacity ozone treatment system is installed.

III. Background

A. Location

The Arkwood, Inc. Site is located in Omaha in Section 27, T.21N., and R.21W., in Boone County, Arkansas. The Site is approximately one-half mile southwest of Omaha, Arkansas, and lies to the west of U.S. Highway 65 (see Figure 1 below). The Site is a 15-acre parcel that slopes gently toward the northwest. It is located in a valley on Cricket Creek Road, bounded by ridges covered with native trees. The Site is generally sparsely vegetated and covered with gravel and rocks mixed with native, clayey soils. Near-surface soils were impacted by the former woodtreating operations that used creosote and pentachlorophenol in the processes. The Site is in an area of karst geology that is characterized by subsurface fractures and channels. New Cricket Spring, located down valley immediately west of the Site, is affected by the former Site activities.

Figure 1



GENERAL AREA MAP

The area immediately to the north is a steeply-sloped wooded hillside. The outskirts of the Omaha, Arkansas community starts approximately one-half mile to the north of the Site. Old Highway 65 lies to the east of the Site with woods beyond the highway. To the south is Cricket Creek Road. On the other side of Cricket Creek Road is a track of undeveloped woods. Stormwater and runoff from this area flow onto the Arkwood Site. To the east, down the valley, are scattered residences; the closest being approximately one-half mile from the Site.

B. History

The Site was developed in the 1950's when a railroad company excavated about 40 to 50 feet below natural grade to obtain fill dirt for constructing a railroad embankment. Arkwood, Inc. began woodtreating operations at the Site in 1962. The operations consisted of a millwork shop, a woodtreating plant that used creosote and pentachlorophenol (PCP) in its process, and a yard for storing treated wood products prior to sale. Woodtreating operations involved bringing untreated timber posts and poles to the Site, placing the wood materials into a treatment cylinder where the chemical preservatives were introduced under pressure.

In 1973, the site owner leased the woodtreating facility to Mass Merchandisers, Inc. (MMI). MMI continued to operate the Arkwood plant until June 1984. Subsequently, the remaining inventory was sold or removed from the site. In January 1985, MMI's lease expired and was not renewed. The owner dismantled the plant in 1986.

During its 20-plus years of operation, wastes from plant operations were disposed of onsite. From 1962 through 1970, wastes were reportedly dumped into a sinkhole adjacent to the treatment plant. The sinkhole was subsequently sealed and the wastes were placed in a ditch adjacent to the railroad until approximately 1974 when MMI began using a chemical recovery process. Other wastes included liquids used to wash the treatment plant floor and equipment. Such waste liquids were accumulated in a tank and then spread over the wood storage yard to control dust.

ADPCE initially received a complaint about the Site in 1981. Preliminary investigations revealed detectable levels of PCP in area groundwater. In 1985, EPA proposed that the Site be added to the National Priorities List (NPL). The Site was formally added to the NPL on March 31, 1989.

With EPA oversight, MMI conducted a Remedial Investigation and Feasibility Study (RI/FS) to determine the nature and extent of contamination and to investigate possible remedies for the Site. The RI/FS was conducted between 1987 and 1990 pursuant to an Administrative Order on Consent (AOC). The Regional Administrator of EPA Region 6 approved the Record of Decision (ROD) for the Site on September 28, 1990.

The 1990 ROD documented that the principle threat from the Site was direct contact with soils contaminated above health based levels. In addition, the 1990 ROD stated that these soils posed a long-term threat to groundwater. Site soils were affected with pentachlorophenol (PCP), polynuclear aromatic hydrocarbons (PNAs), and dioxin. Affected materials were defined as "all Site materials that contain greater than 300

mg/kg PCP, greater than 20 µg/kg dioxin as 2,3,7,8-TCDD equivalents (dioxin), or greater than 6.0 mg/kg carcinogenic polynuclear aromatic hydrocarbons (c-PNAs) as benzo-a-pyrene equivalents." New Cricket Spring contained concentrations of PCP above the Arkansas Water Quality Standard.

In April 1991, a Consent Decree (CD) was entered between the United States of America, on behalf of the EPA (United States) and MMI to remediate the Site. The CD includes the ROD and a Statement of Work (SOW) as Appendices A and B, respectively, (collectively the Consent Decree). A corrected CD was entered on September 24, 1992, including the same attachments.

In September 1992, EPA approved the Remedial Design Work Plan (RDWP) for the Site. The RDWP provides a definition of the predesign studies, design elements, review schedules, and deliverables to EPA for MMI to implement the CD. Pursuant to the RDWP, MMI prepared a Preliminary Engineering Report (PER), dated May 21, 1993. This PER, presented the results of certain redesign studies and certain design criteria. Based on evaluation of the results of the Pre-Design Studies documented in the PER and in the subsequent Report on Additional Field Scale Pilot Studies (dated July 23, 1993), MMI proposed a phased approach for the soil remedy.

The EPA agreed to the phased approach on November 16, 1993. Phase I of the soil project for the Site consisted of the pretreatment and storage stage of the remedy specified in the ROD and CD. Phase I also included backfilling activities that were necessary to minimize adverse environmental impacts prior to implementation of Phase II. MMI prepared an Interim Remedial Action Design (IRAD) and Preliminary Remedial Action Plan (PRAP) to describe the Phase I remedial activities. The EPA conditionally approved both the IRAD and PRAP on June 29, 1994. Preparation of the Site for Phase I activities began in February 1994 and was completed in July 1994. Phase I remediation began on August 1, 1994, and was suspended due to weather on October 14, 1994. Work performed during this period included excavation of affected soil, pretreatment of this soil, and storage of the pretreated soil for final treatment. Phase I activities performed during 1994 are documented in the Preliminary Interim Remedial Action Statement of Completion Report submitted to EPA in February 1995. Phase I remediation resumed in May 1995 and was completed by mid-August 1995.

Phase II of the project was the Final Remedial Action for the Site and consisted of off-site incineration of affected materials and Site closure, excluding groundwater issues. The ROD and CD specified onsite incineration for the remedy for affected materials at the Site. However, due to changes in conditions since entry of the ROD and CD, MMI and EPA agreed that off-site incineration was a more appropriate remedy. To document the change in the final remedy, EPA prepared an Explanation of Significant Difference (ESD) that was signed by the Regional Administrator on June 14, 1995. The Arkwood, Inc., Site soil remediation project was completed December 13, 1995.

Although none of the domestic or municipal wells sampled during the study contained confirmed evidence of wood treatment compounds, an extension to the Omaha municipal water line was constructed in 1991 to provide city water to designated

residences downgradient from the Site as a safeguard. As set forth in the CD and based on the results of the Dye Tracing Study, spring sampling was conducted quarterly for four years after the soil remediation was completed. In addition, an ozone pilot system was installed in April 1997 and data was collected during varying flow events and equipment settings. Based on the results, the treatment system was upgraded in 1997 and a new, higher capacity system was installed in 1999.

IV. Remedial Actions

C. Remedy Selection

Soil Remedy

The EPA Regional Administrator for Region 6 signed the Record of Decision (ROD) on September 28, 1990. The ROD stated that all Site materials containing greater than 300 mg/kg PCP, greater than 20 µg/kg dioxin as 2,3,7,8 TCDD equivalents, or greater than 6.0 mg/kg carcinogenic polynuclear aromatic hydrocarbons as benzo-a-pyrene equivalents were defined as affected and would be incinerated onsite. However, based on additional studies, final treatment of the affected material was changed to incineration at an offsite facility.

Groundwater Remedy

As part of the groundwater remedy, treatment at New Cricket Spring was required if, after two years following completion of the soils remedy, the water quality at the spring did not meet Arkansas Water Quality Standards. Since the spring continued to exceed standards after the two-year period, installation of a water treatment system was initiated.

The EPA determined that these alternatives were protective of human health and the environment, attained Federal and State requirements that are applicable or relevant and appropriate, were cost-effective compared to equally environmentally protective alternatives, and utilized permanent solutions and alternative treatment technologies to the maximum extent practicable.

B. Remedy Implementation

MMI managed the full remediation activities. Roy F. Weston, Inc., provided oversight for the EPA during the implementation of the soil remediation. The Remediation Actions were completed in phases.

a. Soil Remediation

Near-surface soils were impacted by the former woodtreating operations that used creosote and pentachlorophenol in the processes. The 1990 ROD specified that all sludges and affected soils would be excavated, pre-treated onsite, and then incinerated onsite. Affected soils were defined as those soils containing contaminants greater than the clean up goals. Clean up goals included the following: 300 mg/kg PCP, 6 mg/kg benzo-(a)-pyrene equivalents (c-PNAs), and 20 µg/kg tetracholorodibenzo-p-dioxin equivalents (dioxin). The pretreatment step was anticipated to produce a "coarse" material fraction separate from the fine, affected soils. The 1990 ROD provided that the coarse material be tested and, if cleanup goals were met, the material could be

coarse material be tested and, if cleanup goals were met, the material could be backfilled onsite. The 1990 ROD stipulated that coarse materials not meeting the clean up goals would be incinerated along with the fines.

Based upon information generated in the RI/FS, the 1990 ROD estimated that affected soils totaled about 20,000 cubic yards to an approximate depth of one to two feet on the main area of the Site, and four to five feet in the railroad ditch area. The 1990 ROD estimated that sludges in the railroad ditch area and material in the sinkhole totaled 425 cubic yards.

In order to optimize the design as well as the implementation of the soils remedy, the Remedial Design (RD) and Remedial Action (RA) activities outlined in the CD were completed in two phases. The CD Statement of Work (SOW) outlined the initial consideration of a phased approach, to be determined during the preliminary design (SOW, Section II(A)(21), p. 17). EPA correspondence with MMI dated November 16, 1993, approved a phased approach and detailed the split of remedial activities for each of 2 phases. The EPA issued a fact sheet to describe the approved phased approach on May 6, 1994.

The phased approach allowed remedial activities to be started one year ahead of the original RD/RA schedule provided in the CD. Implementation of the phased RD/RA project also provided information which helped determine that the volume of affected fines was much less than that estimated in the ROD (3,500 cubic yards as compared to 7,000 cubic yards), prior to the completion of the remedial design for Phase II. This information was used to plan and complete an Explanation of Significant Differences (ESD) on June 14, 1995, which changed one aspect of the soils remedy. Rather than constructing an onsite incinerator, the small volume of fines (and other affected debris) could be shipped off-site for incineration and disposal.

The ESD provided resource savings for EPA and the PRP in completing the soils remedy two years ahead of the CD schedule and eliminated the concerns about constructing an incinerator in close proximity to the Omaha school.

The Phase I RD/RA included excavation, pretreatment, and temporary storage onsite. The Phase I RA was initiated in the spring of 1994 and was completed in the summer of 1995. The Phase II RD/RA included off-site incineration and site closure activities. The Phase II RA was initiated upon completion of Phase I and all soil remedial activities were completed on December 13, 1995. A total of approximately 8,700 cubic yards of soil was excavated and pretreated resulting in approximately 5,200 cubic yards of clean coarse material and 3,500 cubic yards of affected fine soil. The affected soil was transported offsite and incinerated.

b. Site Closure Activities

As a part of Site closure activities, MMI performed the following activities:

1. Constructed a perimeter fence along the north boundary of the Site (the rest of the Site was fenced previously);

2. Backfilled and regraded the remediated areas. An additional 600 cubic yards of topsoil was brought to the Site in addition to the approximately 11,000 cubic yards of topsoil stockpiled during the Site preparation period;
3. The Site was seeded with a variety of grasses; and
4. A complete survey of the Site was completed.

The EPA, ADPCE and MMI performed a final inspection on December 13, 1995. Site maintenance activities included inspecting the Site regularly to assess the condition of the vegetative cover, stormwater ditches and perimeter fencing.

c. Groundwater Remediation

A major conclusion from the Arkwood Remedial Investigation Report prepared April 4, 1990 concerning ground water is quoted as:

"It was determined that the site is underlain by a shallow, unconfined karst aquifer within the St. Joe Formation. Water movement appears to be dominated by conduit flow through fractures and other features that have been widened and enlarged by solution activity. A diffuse flow component of the aquifer appears to transport water from zones of storage within the deeper residuum clays and subcutaneous zone to the larger conduit network. The apparent lack of a well-defined water table complicates the determination of aquifer characteristics such flow direction, gradient and velocity. The affected ground water emerging from New Cricket Spring provides evidence to indicate that this spring is hydraulically downgradient of the Arkwood site and that it is formed by the only major conduit to which affected groundwater has been shown to be converging. Pentachlorophenol (PCP) levels detected in New Cricket Spring have been found to range from 1.0 to 2.3 mg/l."

The 1990 ROD specified that New Cricket Spring would be monitored for two years following completion of the soils remedy. If the concentration of PCP did not meet the Arkansas Water Quality Standard via natural attenuation at the end of the two year monitoring period, treatment of the spring would be required.

During the intervening two years, the PCP concentrations at New Cricket Spring dropped significantly. However, since the levels remained above Arkansas Water Quality Standards, a pilot treatment system was installed in April 1997. The system was upgraded in late 1997/early 1998 by installation of an ozone diffuser and a stainless steel baffle system. In the fall of 1999, a new higher capacity treatment system was installed.

Sampling of Springs

Based on the dye tracing studies, four springs were identified for monitoring: New Cricket Spring, Walnut Creek Spring, Cricket Creek Spring, and Railroad Tunnel Spring. As shown in Table 2 below, these springs were sampled quarterly from 1996 through

1999 except during periods of insufficient flow. In year 2000, spring sampling was reduced to only New Cricket Creek since this is the only spring that continues to be impacted with PCP.

Table 2
Spring Samples 1996 – 2000

Date	Flow (gpm) New Cricket Spring	PCP Concentrations (in µg/l)			
		New Cricket Spring	Walnut Creek	Cricket Creek	Railroad Tunnel
6/20/96			11	ND	111
7/2/96	112	688			
10/11/96	2	651	IF	IF	IF
1/20/97	34	681	ND	ND	148
3/16/97	34	330	ND	ND	ND
7/18/97	2	775	IF	IF	IF
9/30/97	50	560	ND	ND	ND
1/20/98	42	561	ND	ND	ND
5/7/98	65	196	ND	ND	ND
7/23/98	3	561	IF	IF	IF
11/4/98	8	570	ND	ND	ND
1/29/99	60	288	ND	ND	ND
7/12/99	42	ND	ND	ND	ND
3/8/00	5	284			
5/15/00	2	272			
6/23/00	75	389			
7/28/00	3	627			
8/25/00	2	424			

ND = non detect IF = insufficient flow

New Cricket Spring Flow Dynamics

The volume of water flow at New Cricket Spring has been measured over the past five years. Flows vary from less than 1/2 gallon per minute (gpm) to over 1,000 gpm. From the spring of 1999 through summer 2000, a drought affected the mid-west and south-eastern United States. Table 3 and Figure 1 below present average spring flows during 1996 through 1998 compared to flows during 1999 and 2000. Flows during 1999 and 2000 are substantially lower than the previous four years. The relatively low flows during the past two years have made it difficult to confirm the capacity of the new

treatment system. Data that has been collected demonstrate that the system is operating as designed and achieving treatment goals.

Table 3
New Cricket Spring
Average Flow Rates 1996 – 2000

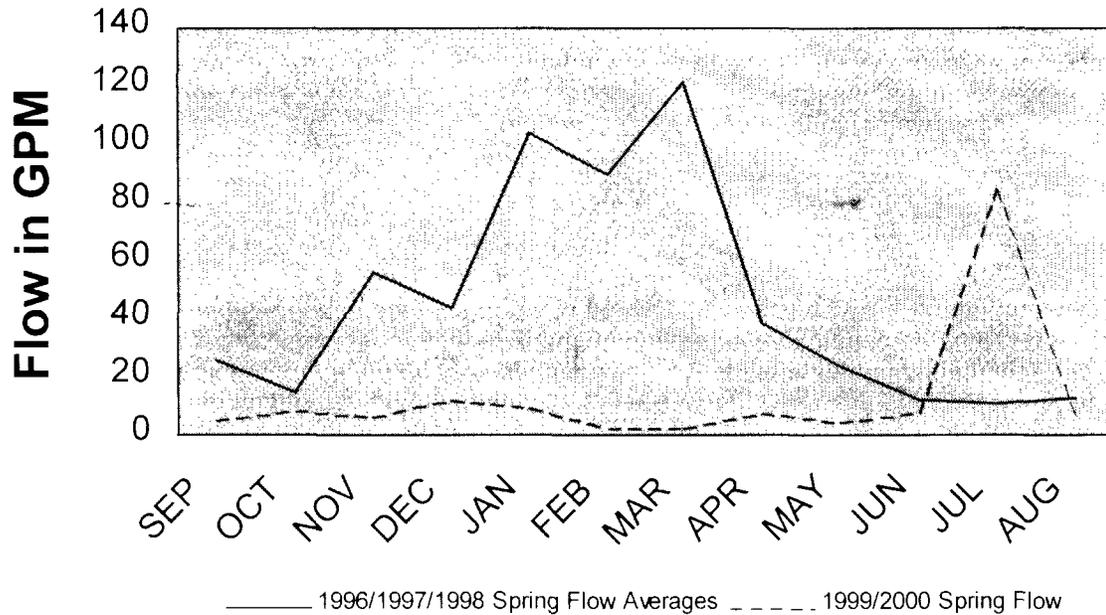
	Average Flow Rates in GPM					1996 - 1998	1999 - 2000
	1996	1997	1998	1999		Spring Flow Averages	Spring Flow Averages
JAN		29	179	3	JAN	104	10
FEB		104	76	2	FEB	90	3
MAR		115	127	8	MAR	121	2
APR		42	36	5	APR	39	8
MAY	15	18	40	8	MAY	24	5
JUN	6	21	9	84	JUN	12	8
JUL	12	12	9	6	JUL	11	84
AUG	7	12	20		AUG	13	6
SEP	50	16	12		SEP	26	5
OCT	12	13	20		OCT	15	9
NOV	127	30	12		NOV	56	6
DEC	58	41	33		DEC	44	13

Average Flow Rates 1996 – 1998 = 46.2 GPM
Average Flow Rate 1999 – 2000 = 13.25 GPM

Figure 2

Figure 2

New Cricket Spring Flow Rates



Treatment System Operations

The groundwater treatment system is an ozone oxidation system. Groundwater from the spring is piped to a sump adjacent to the treatment building. The treatment system is composed of an ozone generator and two mass transfer systems. The two mass transfer systems are designed to accommodate low flow rates with the small skid, medium flow rates with the large skid, and high flow rates with both skids operating in parallel. The affected water is processed through the treatment system and the treated water is discharged over a weir into the receiving stream. Table 4, below, presents the results of operational data for 2000.

TABLE 4
Treatment System Operation

Date	Lbs Ozone/Day	Spring Flow	PCP- Influent	PCP - Effluent
Original System				ND
1/22/98	4	27	656	ND
1/30/98	2	27	905	13.5
3/6/98	2	82	228	ND
3/13/98	4	94	360	14.7
5/7/98	4	102	196	ND
7/23/98	1.2	6	521	ND
10/22/98	2.4	1180		ND
11/3/98	1.2	9	520	ND
11/4/98	2.4	9	520	ND
11/12/98	1.6	34	570	ND
12/10/98	2	50	885	ND
12/12/98	1.2	34	529	ND
12/17/98	2	42	416	ND
12/22/98	2	42	408	ND
3/11/99	4	82	236	ND
3/24/99	2.8	70	549	ND
4/8/99	4	94	139	ND
Upgraded System				
3/6/99	1.2	11	635	3.7
3/8/99	.5	5	284	4.1
5/15/99	.5	2	272	ND
5/25/99	1.3	20	901	ND
5/27/99	1.3	40	803	ND
6/17/99	6.3	200		ND
6/18/99	6.3	511	ND	ND
6/23/99	4	75	389	ND
6/26/99	3.3	25		ND
7/27/99	.5	3	627	ND
3/6/00	1.2	11	635	3.7
3/8/00	.5	5	284	4.1
5/15/00	.5	2	272	ND
5/25/00	1.3	20	901	ND
5/27/00	1.3	40	803	ND
6/16/00	3.7	100	ND (252)*	7.7
6/17/00	6.3	200		ND
6/18/00	6.3	511	ND (252)	ND
6/23/00	4.0	75	389	ND
6/26/00	3.3	25		ND
7/27/00	.5	3	627	ND

* ND (252) – not detected (elevated detection level)

V. Five Year Review Process

Shawn Ghose, EPA Remedial Project Manager for the site, led the Arkwood, Inc., Site five-year review.

The five-year review consisted of reviewing the data against the established criteria and an earlier inspection of the site.

VI. Five Year-Review Findings

A. Interviews

Ms. Jean Mescher, Arkwood Project Coordinator and Director of Environmental Services at McKesson HBOC (former owners of MMI) was contacted by telephone as part of the five-year review. Ms. Mescher stated that the vegetative cover at the Site continues to improve with minimal stress locations. The Site is inspected every week. The groundwater treatment system located at the mouth of New Cricket Spring is operating well and is successfully meeting treatment goals. She is hopeful that there will be higher rainfall this year enabling further evaluation of the new treatment system capacity. Ms. Mescher stated that there have been no complaints or inquiries concerning the site.

B. Site Inspection

Representatives of EPA, ADPCE and McKesson HBOC conducted an inspection of the Site on April 12, 1999. Within the perimeter of the Site fence, the inspection included an evaluation of the surface condition, vegetation, stormwater drainage system, buildings, perimeter fence, and gates. The groundwater treatment facilities onsite and at the mouth of New Cricket Spring were also inspected.

The Site was found to be in good condition. There was no evidence of topsoil erosion or surface cracks and the vegetative cover is healthy. The stormwater drainage ditches were free from debris and in working order. The perimeter road was in good condition and there was no evidence of unauthorized access to the Site.

The onsite treatment building and associated equipment as well as the pump house and equipment at the mouth of New Cricket Spring were all in good condition. Equipment was well maintained and in good working order. Monthly operational samples are collected at the mouth of New Cricket Spring and at the effluent point following treatment with ozone.

C. Risk Information Review

The following standards were identified as applicable or relevant and appropriate requirements (ARARS) in the Record of Decision. The standards were reviewed for changes that could affect the protectiveness of the remedy.

Federal

Resource Conservation and Recovery Act
Comprehensive Environmental Response, Compensation, and Liability Act
Superfund Amendments and Reauthorization Act

State

Arkansas Water Quality Standards

ADPCE Regulation 2 sets a water quality standard for PCP based on pH. Based on ADEQ Regulation 2 and as calculated by Masoud Arjmandi, Arkwood Project Manager for ADEQ (see Attachment 1), the State Water Quality Standards for pentachlorophenol at the point of discharge are currently 9.3 µg/l and 18.7 µg/l for monthly averages and daily maximums, respectively.

The Arkwood, Inc., Site continues to be in compliance with the Federal and State ARARS. The remedial action involved excavation and transportation of affected soils to an offsite incinerator. Affected ground water is treated at New Cricket Spring to Arkansas Water Quality Standards.

D. Data Review

A review of records and monitoring reports through June 2000 indicates that the concentration of PCP emanating from New Cricket Spring has decreased significantly since the soil remediation was completed. It is anticipated that the PCP concentration will continue to attenuate over time. In the meantime, groundwater discharging at New Cricket Spring is collected and treated to Arkansas Water Quality Standards.

VII. Assessment

The following conclusions support the determination that the implemented remedy at the Arkwood, Inc., Site is continuing to be protective of human health and the environment.

Question A: *Is the remedy functioning as intended by the decision documents?*

Institutional Controls and Other Measures: Institutional controls are in place and there are no changes or planned changes in land use. Fences and gates are

maintained and provide an adequate means to restrict access. There is no observable evidence of unauthorized access to the Site.

Remedial Action Performance: The soil remediation, including excavation and offsite incineration of the affected soils, has been effective in minimizing the potential for dermal contact with the Chemicals of Concern (COC) and has removed the source area for groundwater impacts. The only deficiency noted is lack of regional precipitation that has resulted in limited high flow equipment usage. However, since the existing data support the treatment capabilities, this deficiency does not affect the performance or integrity of the Site remedial action.

System Operations and Maintenance (O & M): Groundwater treatment system operations are conducted by a full-time onsite operator. The operator is responsible for maintaining the groundwater treatment system in good operating condition and collecting monthly operational samples, as well as, inspecting the Site fencing, vegetative cover, stormwater drainage system and buildings.

Early Indicators of Potential Remedy Failure: There is no indication of remedy failure. The Site is inspected on a regular basis and operation and maintenance activities of the groundwater treatment system are performed daily.

Question B: Are the assumptions used at the time of remedy selection still valid?

Changes in Standards To Be Considered: This five-year review did not identify any changes in Federal or State standards that impact the soil or groundwater remedies at the Arkwood, Inc. The Site is in compliance with the State Water Quality Standards for PCP of 9.3 µg/l for a monthly average and 18.7 µg/l for a daily maximum.

Changes in Exposure Pathways: This five-year review did not identify any changes in exposure pathways since the completion of the soil remediation. Institutional controls have been effective in preventing any current or planned changes in land use. There is no indication that the treated wastes were not properly characterized, removed and treated during the soil remediation. There is no indication that the groundwater hydrology was not adequately characterized prior to the implementation of the groundwater remedy.

Changes in Toxicity and Contaminant Characteristics: Toxicity or other characteristics have not changed for the contaminants of concern.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that questions the protectiveness of the remedy.

VIII. Deficiencies

The only deficiency identified is limited high flow treatment equipment usage due to regional drought conditions. The existing data do support that the treatment system is operating as designed and treating affected water to water quality standards. This deficiency is not significant and the remedy remains protective.

IX. Recommendations and Follow-up Actions

It is recommended that additional data continue to be collected during periods of high flow, e.g. storm events, to provide additional treatment equipment efficiency and effectiveness information. Obviously, this recommendation is dependent upon weather conditions and does not impact the protectiveness of the remedy.

X. Protectiveness Statements

The remedies that were implemented for soil and groundwater at the Arkwood, Inc., Site continue to be protective of human health and the environment. Since the remedies for soil and groundwater are protective of human health and the environment, the remedy for the Site is protective of human health and the environment.

Soil Remedy

The remedy that was implemented for the affected soils is protective of human health and the environment. The excavation and offsite incineration of the affected soil has been effective in preventing exposure due to direct contact and fugitive dust and has improved groundwater conditions by removing source material. Perimeter fencing is in place and is effective in preventing unauthorized entry or use of the Site. The surface vegetation at the Site is in good condition and is inspected and maintained on a regular basis.

Groundwater Remedy

The remedy that was implemented for the groundwater is protective of human health and the environment. The ground water continues to be collected and treated to water quality standards at the mouth of New Cricket Spring. Since the affected soil at the Site has been removed, the ground water should continue to attenuate naturally over time.

XI. Next Five-Year Review

The next five-year review will be conducted in 2004. The scope of the next review may be limited to an inspection of the Site to ascertain that unauthorized entry to the site is controlled and the surface vegetation continues to be in good condition and an inspection of the groundwater treatment system to ensure that it is in good working order.

Attachment 1
Arkansas Water Quality Standards Calculations



STATE OF ARKANSAS
DEPARTMENT OF POLLUTION CONTROL & ECOLOGY
HAZARDOUS WASTE DIVISION
8001 NATIONAL DRIVE, P.O. BOX 8913
LITTLE ROCK, ARKANSAS 72219-8913
PHONE: (501)682-0744 FAX: 682-0880



January 30, 1998

RECEIVED

FEB 09 1998

Jean Mescher, Project Coordinator
Director, Environmental Services
McKesson Corporation
One Post Street
San Francisco, CA 94104-5296

ENV. & ENCL. SERVICES

RE: New Cricket Spring
Arkwood Superfund Site, Omaha, Arkansas

Dear Ms. Mescher:

Based on pH of 7.38 for the nearest station to the New Cricket Spring (Station WHI67), the State Water Quality Standards for pentachlorophenol (PCP) at the point of discharge are as follows:

1. Monthly average: 9.3 $\mu\text{g/l}$
2. Daily Maximum: 18.7 $\mu\text{g/l}$

Moreover, pH values of the treated water of the New Cricket Spring shall not be below 6.0 or above 9.0

If you have any questions, please call me at (501) 682-0852.

Sincerely,

Masoud Arjmandi
Engineer II, Superfund Branch

cc: Mike Bates, Chief, HWD
Jean Koeninger, Superfund Branch Manager, HWD
Kin Siew, Engineer Supervisor, Superfund Branch, HWD
Mo Shafii, Engineer II, NPDES Branch, WD
Cynthia J. Kaleri, Project Manager, EPA Region 6 (6SF-LP)

Attachment 2
Documents Reviewed

DOCUMENTS REVIEWED

Arkwood, Inc. Site, Activity Report, July 1996 – September 1997, R2P5 Environmental Remediation, Inc., October 1997.

Arkwood, Inc. Site, Activity Report, July 1997 – September 1998, R2P5 Environmental Remediation, Inc., October 1998.

Arkwood, Inc. Site, Activity Report, July 1998 – September 1999, R2P5 Environmental Remediation, Inc., November 1999.

Arkwood, Inc. Site, Activity Report, July 1999 – September 2000, R2P5 Environmental Remediation, Inc., November 2000.

Corrected Consent Decree, United States of America, Plaintiff, v. Mass Merchandisers, Inc., Defendant, September 23, 1992.

Explanation of Significant Differences, Arkwood, Inc. Site, Environmental Protection Agency Region 6, June 14, 1995.

Interim Remedial Action Design, Arkwood, Inc. Site, The Forrester Group, June 29, 1994.

Preliminary Engineering Report, Arkwood, Inc. Site, The Forrester Group, May 21, 1993.

Preliminary Remedial Action Plan, Arkwood, Inc. Site, The Forrester Group, June 29, 1994.

Record of Decision, Arkwood, Inc. Site, Environmental Protection Agency, Region 6, September 28, 1990.

Report on Additional Pilot Scale Field Studies, Arkwood, Inc. Site, The Forrester Group, 7/23/93.

Site Closeout Report, Arkwood, Inc. Site, The Forrester Group, July 1996.