UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
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4WD-NSMB

MEMORANDUM

SUBJECT: Wrigley Charcoal, NPL Site
Wrigley, Tennessee
Five-Year Review

FROM: Loften Carr, Remedial Project Manager
North Site Management Branch

THRU: Robert Jordan, Chief
North Site Management Branch

TO: Richard D. Green, Director
Waste Management Division

I. Introduction

Attached please find the Five-Year Review report for the Wrigley Charcoal NPL site in Wrigley, Hickman County, Tennessee. Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, requires that if a remedial action is taken that results in any hazardous substances, pollutants, or contaminants remaining at the site, the Environmental Protection Agency (EPA) shall review the remedial action no less often than each five years after initiation of the remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The Wrigley Charcoal Site located in Hickman County, Tennessee, consists of five distinct areas of concern: 1) the Primary Site (35 acres), 2) Storage Basin (3 Acres), 3) Irrigation Field (40-acres) , 4) Athletic Field (3.5 acres) and 5) North Fork Creek. The Primary Site was used for industrial operations such as producing iron, charcoal, and wood distillation products intermittently from 1881 to 1966. The Storage Basin and Irrigation Field were utilized for the disposal of contaminated site waste waters beginning in the 1940s and continuing until the mid-1960s. Slag and soils derived from the Primary Site were utilized to fill the Athletic Field from 1938 to 1950 when the field was opened. Much of the waste at the Wrigley Site was disposed into the North Fork Creek. The leachate and wastes at the Primary Site and Storage Basin contained volatile organic compounds including toluene, benzene, and phenol, and polycyclic aromatic hydrocarbons. The North Fork of Mill Creek was contaminated with low levels of these contaminants. Health threats included accidental ingestion of or direct contact

with these wastes on-site. Additionally, subsequent to the completion of the interim remedial action (IRA) in 1995, the Primary Site was and is currently being utilized as a recycling facility. Plastic waste materials, cardboard boxes, debris, piles of wire and scrap metal, are stockpiled and strewn about the site. Burn areas have been noted on site and the operator received a notice of violation from the State of Tennessee in October 1998 for illegal burning.

II. Discussion of Remedial Objectives

In September 1991, EPA selected an interim remedial action (IRA) record of decision (ROD) interim remedy for the site to address the immediate threats of direct contact. In February 1995, EPA signed an amendment to the interim remedy to address the Storage Basin, and an Explanation of Significant Differences (ESD) for on-site tar pits. All remedial activities specified in the IRA and subsequent amendments have been completed. The risks of exposure through direct contact and inhalation have been substantially reduced at the Primary Site and Storage Basin by removing, treating and/or disposing of contaminated materials. Sampling of residential wells and springs conducted after completion of the action confirm that there are no impacts from the remedial activities conducted. The IRA as amended does not constitute the final remedy for the site. This is an IRA ROD, therefore review of this site and of this remedy will be continuing as part of the development of the final remedy for the Wrigley Charcoal Site.

The IRA has substantially reduced and/or prevented current and future exposure from exposed contaminants at the Wrigley Charcoal Site. The Five-Year Review noted several deficiencies and summarizes the over all protectiveness of the interim remedy to date. Subsequent actions are planned to address fully the threats posed by the conditions at the site.

III. Recommendations

All five areas of concern that were addressed in the RI/FS were quantitatively assessed on a human health basis and qualitatively assessed on an ecological/environmental basis. The quantitative human health assessments provided evidence that site levels are protective of human health at the five areas. The Primary Site and the Athletic Field do not exhibit appropriate ecological habitat and no ecological assessment is required. The Storage Basin, Irrigation Field, and North Fork Creek may provide appropriate ecological habitat and these areas did not receive quantitative ecological assessment. Therefore, there is no strong evidence that the site levels are protective of the environment in these areas. The following are recommendations for actions that should be taken between this and the next five-year review due in June 2005:

- No Further Human Health Assessment is needed at this time.
- No further ecological assessment of the Primary Site and Athletic Field is recommended.
- The North Fork Creek, Irrigation Field and Storage Basin should be screened against ecological benchmarks, secondary benchmarks and background.
- Monitoring wells and piezometers should be secured in a proper manner to prevent the possibility further contamination due improper disposal methods.

- The road to the Storage Basin should be removed.
- The distressed area of the Storage Basin cap should be re-seeded.
- As specified in the 1997 ESD, a monitoring plan for the hot spots of liquid tar should be developed.
- Clearly define groundwater, surface water and sediment clean up levels.
- Additional groundwater samples should be collected to determine status of MCL attainment at the site. Groundwater analytical protocols need to be changed such that quantitation levels are at or below MCL levels for organic and inorganic constituents.

IV. Statement on Protectiveness

EPA has determined that the IRA is and remains protective of human health.
EPA recommends that a final RI/FS be completed including a quantitative ecological risk assessment on the Storage Basin, Irrigation Field and North Forth Creek. EPA also recommends that a final remedy ROD be developed which is consistent with the IRA ROD and that the final remedy for the entire site be protective of human health and the environment.

V. Next Five Year Review

This interim action has resulted in hazardous substances remaining on site above health-based levels, The next review should be conducted by June 30,2005. This review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment.

Attachment

Approved by: _____ Date: 28 SEP 00

Richard D. Green, Director
Waste Management Division
US EPA Region 4

Wrigley Charcoal Site
Hickman County, Tennessee
Superfund Five-Year Review

List of Acronyms

BaP	benzo(a)pyrene
CAA	Clean Air Act
cy	cubic yards
CPFs	carcinogenic potency factors
EPA	Environmental Protection Agency
HTRW	Hazardous, Toxic, & Radioactive Waste
IRA	interim removal action
IRIS	Integrated Risk Information System
MCL	maximum contaminant level
NESHAP	National Emissions Standards for Hazardous Air Pollutants
ppb	parts per billion
ppm	parts per million
RfD	reference dose
ROD	record of decision
TBCs	to be considered
TCDD	tetrachorodibenzo-*p*-dioxin
teq	total equivalents
TN	Tennessee
TSDFs	treatment, storage, and disposal facility

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Hickman County, Tennessee
Superfund Five-Year Review
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Hickman County, Tennessee
Superfund Five-Year Review

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I. Introduction

The U.S. Army Corps of Engineers, Nashville District (USACE), on behalf of the U.S. Environmental Protection Agency, Region IV (EPA) has completed this report in support of the five-year review of the removal actions implemented at the Wrigley Charcoal Site in Hickman County, Tennessee. This report documents the results of that review. The purpose of five-year reviews is to determine whether the actions taken at the site are 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 recommendations to address them.

Although not required by statute, this review is being conducted in accordance with Environmental Protection Agency (EPA) policy. This site has been reviewed because guidance encourages Regions to perform a five-year review within five years of physical construction. The most recent removal action at this site was in 1995. This is the first five-year review for the Wrigley Charcoal Site.

II. Site Chronology

Chronology of Site Events	
1) Initial Site Visit (State of Tennessee (TN))	***1985***
2) Preliminary Assessment/Site Investigation	***1986***
3) Site Declared Imminent & Substantial Danger/Response Action (EPA)	***1988***
4) Authorization of Relocation of downstream Bon Aqua-Lyles District Primary Water Intake (State of TN)	***1989***
5) Remedial Investigation/Feasibility Study (EPA)	***1989 – 1991***
6) Interim Action Record of Decision (IROD)	***September 1991***
7) Interim Remedial Action (State of TN/EPA Cooperative Agreement)	***1993 – 1995***
8) Amendment to the Interim Action Record of Decision (EPA)	***February 1995***
9) Explanation of Significant Differences (EPA)	***October 1995***
10) Explanation of Significant Differences (EPA)	***October 1997***
11) Notice of Violation to Property Owner (State of TN)	***1998***

III. Background

This background information was based on the Field Investigation Report dated October 21, 1999. Portions were changed to reflect conditions at time of site visit.

Site Background and Physical Setting

The Wrigley Charcoal site (the "Site") is located in Wrigley, Hickman County, Tennessee. The Site is approximately 45 miles southwest of Nashville, Tennessee. The

Site consists of four distinct areas: 1) the 35 acre Primary Site (used for industrial operations such as producing iron, charcoal, and wood distillation products intermittently from 1881 to 1966), 2) the three acre Storage Basin located 1,400 feet west of the Primary Site (utilized for the disposal of contaminated Site waste waters beginning in the 1940s and continuing until the mid-1960s), 3) the forty acre Irrigation Field located 3,500 feet northeast of the Primary Site (also utilized for the disposal of contaminated Site waste waters), and 4) the three and one half acre Athletic Field located 800 feet southeast of the Primary Site in the east portion of the Wrigley community. The Athletic Field was constructed at the previous location of a large ravine in the town of Wrigley. Slag and soils derived from the Primary Site were utilized to fill this area from 1938-1950 when the field was opened. See Figure 1 for a Site Location Map and Figure 2 for a Primary Site Layout and Monitoring Wells Map in the Appendix.

The Site was purchased in 1966 by the Tennessee Farmers Cooperative (TFC). Portions of the Primary Site were also utilized from 1978 to 1983 for metals machining, storage of waste products obtained from other local industries, and recovery of copper from transformers. Much of the waste at the Wrigley Site was disposed into the North Fork of Mill Creek. This practice occurred until the mid-1940s when the State of Tennessee requested that the Tennessee Products and Chemical Company (TPCC) identify adequate alternatives to their waste disposal procedures. The TPCC constructed wastewater impoundments, investigated spray irrigation and trickling filter technology in an attempt to degrade waste streams that contained phenols and polycyclic aromatic hydrocarbons (PAHs). These attempts to reduce or impound contaminated waste streams inadvertently led to additional areas of contamination. In addition, the overall condition of the facility was poor and spills of volatile organic compounds and semi-volatile organic compounds were commonplace.

In 1988, EPA declared the Site an imminent and substantial danger and conducted a response action aimed at stabilizing the tar pits to prevent a major release to the North Fork of Mill Creek. In 1989, the State of Tennessee authorized the relocation of the downstream Bon Aqua-Lyles Water District primary water intake.

EPA conducted a Remedial Investigation and Feasibility Study (RI/FS) of the Site from 1989 to 1991. Significant contamination was identified at the Primary Site in abundant waste piles, soils, buildings, tar-pits, and in the above ground storage tanks (called the process tanks).

The North Fork of Mill Creek and the shallow groundwater was found to contain hazardous substances identified as phenol, 2,4-dimethylphenol, benzene, toluene, polycyclic aromatic hydrocarbons (PAHs), an abundant variety of metals, halocarbons, asbestos, and traces of furans, dibenzofurans and dioxins. Low to moderate levels of contamination were identified in the shallow groundwater at the southern end of the Primary Site. Studies indicate that there are no detectable contaminant levels in ground or surface waters off-site. In addition, all residential wells were sampled during the RI/FS and no contaminants were detected in any of the wells surrounding the Site.

The State of Tennessee Department of Environment and Conservation (TDEC) Division of Superfund (DSF) conducted an interim remedial action under a Cooperative Agreement with EPA from September 1993 through July 1995. Currently, there are several workers on-site including the property owner. The owner (R.T. Rivers) has brought his old recycling operation (R.T. Rivers Recycling) to the Site from another location, which has previously been investigated by EPA. There are boxes scattered all over the Site as well as large plastic signs and other debris. The property owner was given a notice of violation (October 1998) by the TDEC Division of Air Pollution Control for illegal burning at the Site.

All remedial activities were conducted by the Tennessee Division of Superfund (TDSF) under a Cooperative Agreement with EPA. Phase I of the Interim Remedial Action was conducted from September 1993 through February 1995. Phase I activities included: disposal of transformer carcasses and transformers filled with non-PCB containing tar; removal of waste debris from the flood plain; removal of metallic waste material from the maintenance building's bum-pit; removal of 44 cubic yards (cy) of process tank waste sludges; excavation and recycling as fuel of approximately 45 cubic yards (cy) of contaminated soil from the Still House foundation's sump; removal and disposal of visibly friable asbestos corrugated roofing material from the small building in front of the Maintenance Building; disposal of exposed wastes located in the spillway; disposal of wastes in 14 deteriorating drums and of drums; repair of the spillway; disposal of tar-cubes and other materials containing low levels of contaminants; recycling of wood tar wastes as fuels; excavation and removal of waste debris piles containing predominantly tar-cube chips and/or tar contaminated soils; and, removal of metallic and loose surficial debris from an area around the smoke stack northeast to the access road down to the North Fork of Mill Creek.

Phase II of remedial activities conducted from June 1 to July 10, 1995 included: removal, aeration, and discharge of water in the Storage Basin and Overflow Basin to Hollow Creek; removal of a discrete layer of fluid-like tar material on the bottom of the Storage Basin, blending and use as a fuel blend; removal and disposal of 2,172 tons of visible contaminated soil at the tar/soil interface of the Storage Basin; removal and disposal of a small amount of material consisting of tar residues from the Overflow Basin: removal of the small earthen dam to aid Site drainage near the former retort area; and, removal and disposal of 3,113 tons of contaminated material from the former on-site tar pits.

There are boxes scattered all over the Site and behind the dryer and maintenance buildings. The contents of the boxes range from plastics to some kind of processed material. There are also drums containing jean buttons from various manufacturers, and drums of unknown contents. Other materials at the Site include cardboards, scrap metals, debris and piles of insulated wire, water hoses, among others.

Geology/Hydrology

The following information was obtained from the Remedial Investigation (RI) report for the Wrigley Charcoal Site dated June 1991. The unconfined aquifer underlying the

Primary Wrigley site is comprised largely of unconsolidated residuum and to a lesser extent, alluvial deposits. Characterization of the unconfined aquifer was derived from 18 boreholes, 6 monitoring wells, and 10 hydrocone locations where piezometers were installed.

The water table depth below the site is shallow, varying from three to eight feet below the surface. There are numerous seepage areas within the site. Contaminants have been detected in the ground water and in leachate seepage, confirming that the shallow ground water is susceptible to contamination from soil sources. Groundwater gradient areas indicate flow onto and within the site to generally be from the upland areas toward the North Fork channel, providing flow to this perennial stream.

Ground water flow from the site is toward the southwest along the North Fork valley, roughly coincident with the trace of the channel, although channel migration in the past may have altered this relationship in some reaches of the valley. The numerous seeps indicate there are complex interactions between surface water and shallow ground water, which have not been conclusively characterized. There are indications that the ground water flow is channelized. Subgrade structures are likely to be complicating those interactions. Seasonal variability of the conditions within the shallow aquifer has not been characterized, since wells have been sampled only twice and water table elevation measurements have not been regularly recorded since sampling. The presence of vertical gradients within the shallow aquifer or between the shallow aquifer and deeper ground water bearing zones has not been studied. Historical site documents indicate that one of several unused wells exists near the former Still House. One such document dated March 20, 1952 reported and onsite well 800 feet deep that exhibited artesian conditions when uncapped in the early 1950's. These conditions suggest that an upward gradient may have existed below the site, with the potential to discharge into the shallow aquifer from deeper levels.

IV. Remedial Actions

Source documents listing remedial action objectives and the remedies for the Wrigley Site include:

- *Interim Action Record of Decision: Wrigley Charcoal Superfund Site, Wrigley, Hickman County, Tennessee*, Prepared by U.S. Environmental Protection Agency, Region IV, 30 September 1991;
- *The Amendment to the Interim Action Record of Decision: Wrigley Charcoal Superfund Site, Wrigley, Hickman County, Tennessee*, Prepared by U.S. Environmental Protection Agency, Region IV, 2 February 1995; and
- *Explanation of Significant Differences and Remedial Action Update, Wrigley Charcoal Superfund Site*, Wrigley, Hickman County, Tennessee, Prepared by U.S. Environmental Protection Agency, Region IV, October 1995.

- *Explanation of Significant Differences, Wrigley Charcoal Superfund Site*, Wrigley, Hickman County, Tennessee, Prepared by U.S. Environmental Protection Agency, Region IV, October 1997.

Remedial Action Objectives - Interim Action Record of Decision

The overall objective of the interim remedial action (IRA) was to reduce and/or prevent current or future exposure from exposed contaminants at the Primary Site and Storage Basin that pose the most imminent and substantial threats to human health and the environment. Excavation, off-site treatment and disposal of wood-tar and burn-pit wastes achieve some reduction in the contamination at the Primary Site. Early final actions for wood-tar and burn-pit wastes were intended to utilize permanent solutions on a very limited basis for the Primary Site.

Remedial Action Objectives – The Amendment to the Interim Action Record of Decision (February 1995) and Explanation of Significant Differences (October 1995)

The selected remedy and subsequent modifications detailed within the Interim Record of Decision (ROD) Amendment include many off-site disposal activities instead of temporary on-site storage. This change was required since:

- much of the Site lies within the 100-year floodplain,
- larger quantities of sludges than originally anticipated were encountered in the Process Tanks and at the Still House,
- vandalism and theft at the Site has recently become a significant problem, and
- certain mixed Site wastes have passed TCLP and are suitable for disposal in RCRA Subtitle D facilities.

The flood of 1991 demonstrated that the Site floods much worse than previously thought since several areas outside of the 100-year floodplain were also affected. Many areas that were not underwater during this flood were the sites of significant soil slumping, debris flows, and small mudslides. Based upon observations, the Primary Site and Storage Basin area appeared to be unfit as potential locations for any type of on-site disposal (landfilling, etc). In light of these difficulties, EPA elected to transport and dispose of many Site wastes. Doing so provided more stable and safe Site Areas and significantly reduced the potential for site wastes entering and affecting the North Fork of Mill Creek, Mill Creek, and the Duck River Drainage Basin.

Early final actions at the Storage Basin effectively and completely eliminated visible wastes in this area. These activities also served to reduce potential complications these wastes may have on future remedial activities.

Remedial Action Objectives –Explanation of Significant Differences (October 1997)

A final inspection conducted by EPA and the State of Tennessee Division of Superfund on May 30, 1996, revealed hot spots of liquid tar in a localized area at the Primary Site. The hot spots were mostly dry but some liquid was evident. This area will be monitored, evaluated, and if needed, excavated, treated and/or disposed at an approved landfill.

Remedy Implementation

The major objective of the Interim Remedial Action (IRA) was to address the most serious threats at the Site by removing or consolidating contaminated media at the Primary Site, and restricting access at the Primary Site and the Storage Basin. Phase I and of the IRA was conducted by the Tennessee Division of Superfund (TSDF) under a Cooperative Agreement with EPA[1] from September 1993 through February 1995. During the interim remedial action, site conditions required that actions detailed in the IRA ROD, be modified. These modifications were performed during Phase I and the following Phase II of the IRA. The modifications were recorded in the Amendment to the Interim Action Record of Decision (1995) and the Explanation of Significant Differences (1995). Another Explanation of Significant Differences was issued in 1997. Modifications to the IRA are outlined in Table 1.

Phase II activities of the interim remedial action were conducted from June 1 to July 10, 1995. The following activities were conducted during Phase II activities. In February 1995 the IRA was amended to include the additional work that had occurred during phase II of the IRA (1 June to 10 July 1995).

[1] Remedial Action Report, June 1996, page 4.

Table 1. Original Remedial Activities

Table 1. Original Remedial Activities Identified in the Interim Action Record of Decision and Modifications to those Activities Detailed in Amendment to Interim Action Record of Decision (1995) and Explanation of Significant Differences (1997)

Original Activity	Modified Activity
1) Metallic wastes in the maintenance buildings' burn pit were to be excavated, transported, stabilized and disposed in an EPA approved RCRA facility. Transformers found in the maintenance building were to be staged with other transformers found at the Primary Site in an on-site consolidation area.	Interim Action Phase I remedial efforts identified 1) transformer carcasses and 2) transformers filled with non-PCB containing tar. These materials were transported and disposed in a RCRA Subtitle D facility. In addition, the State of Tennessee determined that Site waste debris could be effectively removed from the flood plain and disposed in an EPA approved RCRA facility. Given these circumstances, the on-site containment facility was not necessary.
2) Process tank waste sludge were to be excavated, transported, incinerated, stabilized and disposed in an EPA approved facility. The metallic tanks were to be decontaminated and sold as scrap.	Tank wastes were estimated at 29 yd^3. More raw sludge was encountered below solid tar wastes. The increase amounted to an additional 15 yd^3. The wastes passed TCLP and were classified as non-hazardous solid wastes which could be recycled. The concrete foundations were decontaminated, removed and disposed of as construction debris in an EPA approved landfill.
3) Black wood-tar sludge wastes on the ground from the process tanks down to the North Fork of Mill Creek was to be excavated, transported offsite, incinerated, stabilized and disposed of in an EPA approved facility.	Mixed wastes and soil was excavated, transported off-site and stabilized in an EPA approved Subtitle D facility. Due to a very steep grade of the hill, the excavated material area was graded and seeded. The adjacent area was reinforced with riprap extending approximately 20 feet down and towards the North Fork of Mill Creek. Reinforcement was needed to prevent erosion or potential failure of this excavated area into the creek.
4) The surficial wood-tars at the NE corner of the Still House were to be excavated to approximately 1 feet depth.	The Still House foundation sump was excavated per State change orders to approximately 4 feet during phase I of the Interim Action. Approximately 45 yd^3 of this material was excavated. This material passed TCLP and was classified as non-hazardous solid waste and recycled as fuel.

Table 1 (continued). Original Remedial Activities Identified in the Interim Action Record of Decision and Modifications to those Activities Detailed in Amendment to Interim Action Record of Decision (1995) and Explanation of Significant Differences (1997)	
Original Activity	**Modified Activity**
5) Friable asbestos corrugated roofing material (ACM) was to be removed and disposed of in an approved asbestos landfill. Wastes were on the small building in from the Maintenance Building and broken ACM on the ground near the Dryer Building, Maintenance Building, area near the previous location of the Still House, and in the old Tank Battery. Also, ACM contaminated soils adjacent to these wastes was to be removed to an approved asbestos disposal facility.	Visibly friable ACM was removed from the small building in front of the Maintenance Building, and ACM on the ground was placed into 20 yd^3 containers. The ACM was tested and disposed in an EPA approved landfill. Visual identification of asbestos contaminated soils was difficult in areas of extensive mixed wastes and debris piles. Therefore, removal of any asbestos contaminated soils was performed as part of more extensive excavation efforts at the Still House since the Tank Battery, Dryer and Maintenance Buildings are this area.
6) Exposed black wood-tar wastes in the spillway was to be excavated, transported, incinerated, stabilized and disposed in an EPA approved facility.	Wastes located in the spillway were determined to be predominantly soils blackened with charcoal. This material was determined not to be leachable and contains no raw wood-tar sludges. This material was excavated and disposed in a RCRA Subtitle D facility.
7) Twelve staged drums located near the Maintenance Building and two drums in the Storage Shed, were to be transported, with contents incinerated, stabilized and disposed of in an EPA approved facility.	Wastes in 14 deteriorating drums were emptied into three lined 20 yd^3 containers and sampled. Based upon the results, these wastes were destroyed at an EPA approved facility. The emptied drums were decontaminated and disposed.
8) The spillway was to be repaired and re-engineered to accommodate the significant flood waters that frequent this area. This was to involve straightening and further excavating the spillway down to the existing creek grade. This was considered to be an interim activity.	Activity Not Modified

Table 1 (continued). Original Remedial Activities Identified in the Interim Action Record of Decision and Modifications to those Activities Detailed in Amendment to Interim Action Record of Decision (1995) and Explanation of Significant Differences (1997)	
Original Activity	**Modified Activity**
9) Site surface waste/debris piles that include tar-cubes, pieces of ACM, transformer materials, crushed drums, and other miscellaneous metallic debris and tar waste were to be sorted. Pieces of ACM were to be disposed of with other ACM previously described in item 5. Metallic scrap was to be transported off-site and disposed in an EPA approved facility. Materials such as tar-cubes and wastes that could be remediated during later remedial activities were to be stored in an on-site consolidation area.	Tar-cubes were tested and passed TCLP. These cubes and other materials containing low levels of contaminants were disposed in a RCRA Subtitle D facility. Wastes debris piles were determined during sorting to contain predominantly tar-cube chips and/or tar contaminated soils. The entire remaining contents of these piles were excavated and removed from the flood plain and disposed in a Subtitle D facility. The materials did not require stabilization, since they had passed TCLP testing.
10) A limited investigation was performed at the Irrigation Fields' abandoned 3/4 acre lagoon. This activity included several soil borings/excavations (to approximately ten feet) and several additional soil samples at the previous location of the feed pipe outflow. This activity determined that wastes similar to those at the Storage Basin were not present in the deeper soils. This activity was a modification from the proposed plan and was considered an interim activity.	Activity Not Modified
11) Site access controls, including fencing and placards, were to be implemented at the Primary Site	Due to the high probability of theft, steep Site valley walls, and isolated Site location, gates and short sections of adjoining fence were utilized at the east and south entrances of the Primary Site
12) Sampling of residential wells and springs conducted after completion of Phase II confirms that there are no impacts from the remedial activities conducted.	Activity Not Modified

Table 1 (continued). Original Remedial Activities Identified in the Interim Action Record of Decision and Modifications to those Activities Detailed in Amendment to Interim Action Record of Decision (1995) and Explanation of Significant Differences (1997)	
Original Activity	**Modified Activity**
13) Potential risks through dermal contact with soils at the Storage Basin were to be reduced by fencing the area. Fencing would discourage and possibly prevent entry and disturbances of this area until wastes could be appropriately eliminated during later remedial activities.	During Phase I activities EPA and Tennessee evaluated the need for immediate Storage Basin remediation. As Storage Basin waste remediation appeared imminent and some of the wood-tar was needed for a State treatability study, a State field change was made to regrade the road to the basin. Water in the Storage and Overflow Basins was removed aerated, and discharged to Hollow Creek. A discrete layer of very fluid like tar material on the bottom of the Storage Basin was removed, blended with sawdust and used as a fuel blend. 2,172 tons of visibly contaminated soil at the tar/soil interface of the Storage Basin was removed and sent to an approved landfill for disposal. A small amount of material consisting of tar residues from the Overflow basin was removed and sent to an approved landfill for disposal. Since Storage Basin wastes were completely remediated, there was no need to fence the location following cleanup activities. Remedial activities consisted of excavation and disposal of contaminated material from the Storage and Overflow Basins and the use of The Storage Basin clay berm as cover for both the Storage and Overflow Basin areas, once the tar/soil had been removed.
14) Activity not identified in Interim Action Record of Decision	An air monitoring program was implemented to monitor for, and identify any fugitive emissions that could have potentially been released during Phase 11 remedial activities. No emissions were detected.
15) Activity not identified in Interim Action Record of Decision.	Metallic and loose surficial debris was removed from an area around the smoke stack northeast to the access road down to the North Fork of Mill Creek.
16) Activity not identified in Interim Action Record of Decision.	Portions of concrete slabs, in the vicinity of the former retort pumps, were removed so waters originating from the unnamed tributary next to the Storage Shed could flow freely through this area without entering any piping associated with the Still House.
17) Activity not identified in Interim Action Record of Decision.	A final inspection conducted by EPA and the State of Tennessee Division of Superfund on May 30, 1996 revealed the presence of hot spots of liquid tar in a localized area the primary site. The hot spots were mostly dry but some liquid was evident. This area will be monitored, evaluated, if needed, excavated, treated and/or disposed at an approved landfill.
18) 3,113 tons of contaminated material was removed from the former on-site tar pits and disposed of offsite. This material consisted of wood-tar, dirt, rock and other inert materials	Activity Not Modified
19) A clay cover was installed over the on-site tar pits, after their contents were removed. A vegetative cover was established utilizing top soil and seed to prevent erosion of the clay cover.	Activity Not Modified

Systems Operation and Maintenance

With the exception of two small areas of visible wood-tar contamination, all visible wood-tar wastes have been removed from the site. Operation and maintenance activities have not been necessary for the either the Burn Pit or Storage Basin Caps.

Progress Since the Last Five-Year Review

This is the first five-year review that has been performed at the site.

V. Five-Year Review Process

Following are the team members for this five-year review:

- Lauren Heffelman, Technical Coordinator, USACE Nashville District
- Lannae Long, Risk Assessor, USACE Nashville District
- Doug Mullendore, Process Engineer, USACE Nashville District
- Gregory Mellema, Geotechnical Engineer, USACE Hazardous, Toxic, & Radioactive Waste (HTRW) Center of Expertise
- Sandy Frye, Environmental Regulatory Specialist, USACE HTRW Center of Expertise
- Steve Duncan, CADD Specialist, USACE Nashville District

This was a Level I five-year review. This five-year review consisted of the following activities: a review of relevant documents, interviews with state and federal regulatory agencies, and a site inspection. The five-year review process began with a visit to State offices to review their files. Telephone interviews were conducted with both the State's project manager, Tim Stewart; as well as the EPA project manager, Loften Carr. EPA provided both the administrative record and information gained since the 1995 removal. A site inspection took place on April 12, 2000. The State project manager accompanied the Corps team on the site visit, which gave the team an opportunity to interview him.

VI. Five-Year Review Findings

A. Interviews

Both the state project manager and federal project manager were interviewed for this review. Tim Stewart, State of TN, was interviewed telephonically, as well as face-to-face during the site inspection. Loften Carr, EPA Remedial Project Manager, was interviewed telephonically. Since no remedial activities are on-going and no operations and maintenance (O & M) is in place, no O & M interviews were possible.

Tim Stewart summarized the State's position at the site. The State contended that following the 1995 removal actions the site should go to delisting. He stated that EPA

was not satisfied that the site was at a delisting point and subsequently the EPA decided to perform additional groundwater monitoring.

Loften Carr stated that he was a relatively new project manager to this particular project. He is very interested in getting the five-year review results. He would like to perform any actions necessary to close this site out, but thinks additional work will be necessary to do this. He is also particularly concerned that Mr. Rivers operations have made site accessibility difficult. He is also concerned with Mr. Rivers past burning activities.

Both Mr. Tim Stewart and Mr. Loften Carr were very helpful in providing the review team with necessary information and data.

B. Site Inspections

The site inspection occurred on April 12, 2000. The following persons participated in this site visit:

- Lannae Long, Risk Assessor, USACE Nashville District
- Doug Mullendore, Process Engineer, USACE Nashville District
- Lauren Heffelman, Technical Coordinator, USACE Nashville District
- Gregory Mellema, Geotechnical Engineer, USACE HTRW Center of Expertise
- Tim Stewart, Project Manager, State of TN

The following describes the condition at each of the four site areas:

1) Primary Site (used for industrial operations such as producing iron, charcoal, and wood distillation products intermittently from 1881 to 1966).
   The general consensus was that Mr. River's "recycling" operations made this area unsightly. Additionally any additional investigations or construction are not possible without major efforts toward consolidation/moving materials around or from the site. No O & M operations are occurring. Site does not appear secure, since gates are not closed or locked and there is evidence of vandalism (locks cut off monitoring wells). There is some limited fencing. The monitoring wells which were found were not secure, nor did well construction appear viable (i.e. one well did not close properly, wells did not have a sloping pad). Monitoring Wells # 1 and # 6 were found. The lid on Monitoring Well # 1 can't be closed. Monitoring Well # 6 was not locked. Wells were not labeled. Monitoring Wells # 3, # 4, and # 5 were not found. The location of Monitoring Well # 2 was not shown in existing reports. Also an open piezometer was found near the alcohol tank area. The stream bed appeared stable. No erosion was noted. Riprap appeared to be in place and functional. The vegetation in the Tar-Pit area looked good. See Primary Site photographs in Appendix. Also see Five-Year Review Site Inspection Checklist in Appendix, which was developed during the site inspection.

2) Storage Basin located 1,400 feet west of the Primary Site.
   This sloping area contained tall grasses as its vegetative cover. Some areas had limited vegetation. It is probable that limited vegetation is the result of factors such

as the time of year that seeding occurred or the lack of adequate mulching of sloped areas. There was no noticeable erosion problem.

3) Irrigation Field located 3,500 feet northeast of the Primary Site (also utilized for the disposal of contaminated Site waste waters). This area appeared like a normal roadside area with small trees and underbrush.

4) Athletic Field located 800 feet southeast of the Primary Site in the east portion of the Wrigley community. This area looked like a normal ball field with little evidence of stressed vegetation or other indicators of environmental stress.

C. Standards Considered

An ARAR review was performed for the site in accordance with the draft EPA guidance document, "Comprehensive Five-Year Review Guidance", April 1999, EPA 540R-98-050.

The following removal action specific standards were identified as applicable or relevant and appropriate requirements (ARARs) in the Interim Action ROD (1991) and the Amendment to the interim Action ROD (1995):

- RCRA Subtitle C: 40 CFR 260.1, 40 CFR 262, 40 CFR 462, and 40 CFR 265.
- Standards Applicable to Transporters of Hazardous Waster: 40 CFR 263.
- Standards for Owners and Operators of Hazardous Waster Treatment, Storage and Disposal Facilities (TSDFs): 40 CFR Part 264.
- DOT Rules for Hazardous Materials Transport: 40 CFR 107, and 40 CFR 171-179.

The following location specific standards were identified as applicable or relevant and appropriate requirements (ARARs) in the Interim Action ROD (1991) and the Amendment to the interim Action ROD (1995):

- Federal Protection of Wetlands Executive Order: E.O 11990, 40 CFR Part 6, Appendix C.
- Clean Water Act (CWA): 40 CFR Part 230, 33 CFR Parts 320-330.
- The Fish and Wildlife Coordination Act: 16 USC 661, Section 404.
- The Fish and Wildlife Improvement Act of 1978: 16 USC 742a, and the Fish and Wildlife Conservation Act of 1980: 16 USC 2901.
- RCRA Locations Standards: 40 CFR 264.18.

The following chemical specific standards were identified as applicable or relevant and appropriate requirements (ARARs) in the Interim Action ROD (1991) and the Amendment to the interim Action ROD (1995):

- Reference Dose (RfD): as defined by IRIS (EPA Integrated Risk Information System). TBC for the interim action.
- Carcinogenic Potency Factors (CPFs): To be considered (TBCs) for the interim action.
- EPA Health Advisories: TBCs for the interim action.

- Clean Air Act (CAA): National Ambient Air Quality Standards 40 CFR Part 50, National Emissions Standards for Hazardous Air Pollutants (NESHAPs) 40 CFR Part 61, New Source Performance Standards (NSPS) 40 CFR Part 60. There are TBCs for the interim action.
- Clean Air Act (CAA): NESHAP standards 40 CFR Part 61 Subpart M pertains to any renovation or demolition activities concerning asbestos at the Wrigley site. This may pertain to removal of ACM from the small building adjacent to the Maintenance building. There are TBCs for the interim action.

ARARs Identified in the Interim ROD Requiring Evaluation During the Five-Year Review:
Safe Drinking Water Act Maximum Contaminant Levels (MCLs): The only chemical specific ARAR identified in the interim ROD were the Federal Safe Drinking Water Act Maximum Contaminant Levels (MCLs). Table 3 below lists the contaminants for which Federal MCLs have been exceeded. Results were based upon the 15 June 1999 sampling results.

Table 2. MCL Exceedances in Groundwater

Table 2. WRIGLEY CHARCOAL SITE MCL EXCEEDANCES IN GROUNDWATER (Based upon 15 June 1999 Sampling Results)			
Contaminant	**Federal MCL parts per billion (ppb)**	**Detected Level (ppb)**	**Well #**
Lead	15 (action level, not MCL)	43 42	WC005MW WC006MW
Benzene	5	110 6 5	WC001MW WC006MW WC706MW
Toluene	1000	1100	WC001MW

The interim ROD only identified Federal MCLs as ARARs. However, many states have developed their own MCL values that are enforceable. Tennessee MCLs are found in section 1200-5-1-.06 of the Tennessee Water System regulations. Based upon the 15 June 1999 sampling results, there are currently no exceedances of State MCLs at the site. [The state has not developed MCLs for all contaminants for which Federal MCLs have been established. For these contaminants, the Federal MCLs apply.]

Groundwater sampling data for the site indicates that the minimum quantification levels for many contaminants exceed their respective MCL levels. For example, data from the October 1999 groundwater sampling for monitoring well WC001MW is as follows:

Contaminant	Results (ppb)	Quantitation Limit (ppb)	MCL (ppb)
Vinyl chloride	U*	20	2
1,1-Dichloroethane	U	20	7
1,2-Dichlorethane	U	20	5
Carbon Tetrachloride	U	20	5
1,2-Dichloropropane	U	20	5
Trichloroethylene	U	20	5
1,1,2-Trichloroethane	U	20	5
Tetrachloroethylene	U	20	5

*U – not detected above the minimum quantitation limit

From this table it can be seen that the groundwater monitoring data collected is inconclusive in determining whether or not MCLs have been exceeded. Unless quantitation limits are at or below the MCLs, no definitive statement can be made as to whether or not MCLs have been attained. This problem occurs at several of the other monitoring wells for synthetic organic contaminants (e.g., the quantitation limit for PCBs is 25 ug/L when the MCL is 0.5 ug/L) as well as for some metals.

Other ARARS Identified in Appendix E of the Interim ROD not Requiring a Review

Other ARARs identified in the interim ROD and amendment thereto are all action- or location-specific ARARs applicable to the actual action taken at the site and are no longer germane at the current time.
Toxicological values were identified as TBC criteria.
However, the toxicological TBCs pertained to the development and analysis of alternatives.

- Clean Air Act National Ambient Air Quality Standards – are not directly applicable, however, associated State Implementation Plan (SIP) requirements would have been applicable only during the removal action.

- Clean Air Act New Source Performance Standards – would not have applied during the interim removal action as no similar NSPS contaminant or source categories were promulgated at the time of the action.
- Federal Protection of Wetlands Executive Order 11990 – would have applied during actual removal action activities and it is assumed requirements of the EO were attained upon completion thereof.
- Fish and Wildlife Coordination Act (16 USC 661) – this ARAR would also have applied to any action taken at the site, but would no longer be applicable once interim removal actions were completed.
- Fish and Wildlife Improvement Act of 1978 – as with #5 above, it is assumed this location-specific ARAR was met during the actual removal actions and is no longer germane.
- RCRA Subtitle C requirements – those requirements that would apply to an off-site disposal facility would not be ARARs for the site as the facility is located off-site. RCRA Subtitle C requirements that applied to on-site treatment and/or storage actions should have been met during the action removal action and are no longer applicable.

Compliance with ARAR Summary Statement:

For the interim removal action, the site is currently in compliance with all ARARs identified in the interim ROD except MCLs. It appears that this portion of the remedy addresses only site soils and wastes and not groundwater. If future actions are planned to address groundwater contamination, it would be more appropriate to list MCLs as ARARs for those actions, in which case MCLs would not necessarily be ARARs for this portion of the 5-year review.

ARARs as currently identified in the interim ROD have not been met at the site. Contaminant levels for benzene and toluene exceed Federal MCLs and lead levels exceed the Federal action level.

D. Risk Information Review

Chemical specific standards are summarized in Table 3 *Chemical Specific Standards*.

Table 3. Chemical Specific Standards

Table 3. Chemical Specific Standards in Site Media						
Chemical	Media	Cleanup Level	units	Current Standards	units	Reference
Carcinogens						
Dioxin (*TCDD teq)	soil	0.0522	**ppb	5-20	ppb	Dioxin (TCDD teq) (1)
PAHs (carc. Total)	soil	8.17	***ppm		ppm	(2)
	GW			0.0002	ppm	MCL Federal 1996 BaP std. (3)
Non-carcinogens						
Alkyl Benzene (total)	soil	5450	ppm		ppm	(2)
Barium	soil	4330	ppm		ppm	(2)
	GW			2	ppm	MCL Federal 1996 (3)
Copper	soil	3200	ppm		ppm	(2)
	GW			1.3	ppm	Action Level Federal 1996 (3)
	SW			0.0056	ppm	(4)
Mercury	soil	26.0	ppm		ppm	(2)
	GW			0.002	ppm	MCL Federal 1996 (3)
Manganese	soil	17300	ppm		ppm	(2)
PAHs (non-carc)	soil	34600	ppm		ppm	(2)
Lead	soil	121	ppm	400-5000	ppm	(5)
	GW			0.015	ppm	Action Level Federal 1996 (3)
Phenols	soil	107	ppm		ppm	(2)
Antimony	soil	34.6	ppm		ppm	(2)
	GW			0.006	ppm	MCL Federal 1996 (3)
Zinc	soil	17300	ppm		ppm	(2)

* TCDD teq = tetrachorodibenzo-*p*-dioxin total equivalents

* *ppb = parts per billion

***ppm = parts per million

**** BaP std. = benzo(a) pyrene

(1) Approach for Addressing Dioxin in Soil at CERCLA and RCRA sites. Commercial/Industrial Cleanup Level. (1998) U.S. EPA OSWER 9200.4-26.

(2) no change

(3) Drinking Water Regulations and Health Advisories. (1996) U.S. EPA 822-B-96-002.

(4) To protect freshwater aquatic life is 5.6 ug/l as a 24 hr avg. Total recoverable copper U.S. EPA; Ambient Water Quality Criteria Doc: Copper p. B-14 (1980) EPA 440/5-80-036.

(5) 400 ppm Lead in soil screening level ONLY for residential soils, AND 400-5000 ppm depending on land use and land use controls. Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. (1994) U.S. EPA 540/F-94/043.

Human Health Assessment Findings

The Remedial Investigation included reasonable maximum exposure to initial site concentrations (before removal action) human health risk assessment scenarios for the four areas:

Storage Basin	Visitor
Athletic Field	Recreational User
Irrigation Field	Visitor
	Resident
North Fork Creek	Recreational User
Wrigley Primary Site	Visitor
	Construction Worker
	Industrial Worker
	Resident

The Storage Basin was assessed for a reasonable-maximally exposed lifetime visitor from age 2 through 70. The lifetime carcinogenic risk ($1X10^{-10}$) and toxicity hazards (0.004) are considered *de minimus*. The area currently is an open maintained grassy area used for industrial storage. The likely human receptor remains to be a visitor, thus it is reasonable to assume risks and hazards will remain at a *de minimus* level. No further human health evaluation is recommended.

The Athletic Field was assessed for a reasonable maximally exposed recreational user age 2 through 70. There were no significant carcinogenic risks. The maximally exposed recreational user hazard index was 3 due to a maximal site concentration of lead of 1000 mg/kg and a combination of PAHs. During the TDEC site interview with Tim Stewart, he indicated that PAHs were not detected beyond anthropogenic levels at the Athletic Field after the initial sampling. Maximum lead concentrations in soil are within the current standard range. Lead is also no longer assessed with RfDs, rather blood lead level modeling is what is prescribed. No further human health evaluation is recommended.

The Irrigation Field was assessed for a reasonable-maximally exposed lifetime visitor from age 2 through 70. The lifetime carcinogenic risk ($2X10^{-9}$) and the maximum toxicity hazard (0.01) are considered *de minimus*. The area currently is an open grassy new field area. The likely human receptor remains to be a visitor, thus it is reasonable to assume risks and hazards will remain at a *de minimus* level. No further human health evaluation is recommended.

The North Fork Creek was assessed for a reasonable-maximally exposed lifetime recreational user from age 2 through 70. The user was assumed to wade and fish, and consume fish caught in from the creek. The lifetime carcinogenic risk ($6X10^{-6}$) is considered to be within the acceptable exposure range. The maximum toxicity hazard (0.9) is considered *de minimus*. The creek area adjacent to the Primary and Storage Basin areas is assumed to continue to provide those same exposure pathways as that which were assessed. With source concentrations removed from soil, exposure to greater site-related

concentrations will be the same or less than the exposure level assessed in the Remedial Investigation. No further human health evaluation is recommended.

The Wrigley Primary Site was assessed for a hypothetical reasonable-maximally exposed lifetime resident from age 2 through 70, industrial worker (18-70 years of age), visitor (2-70 years of age) and a construction worker (18-70 years of age). The maximal residential scenario showed total site risk of approximately $2X10^{-4}$ and a *de minimus* toxicity hazard. With the soil source removed, residential risk should be within or less than the acceptable exposure range. The site is not a residential area, and most likely it will continue to be industrial. Under CERCLA, the land assessment should "assess the extent to which the release poses a threat to human health or the environment...for actual or potential exposure pathways through the environment" 40 CFR 300.430(d)(2). Because the site is not residential, and shows little evidence of becoming residential, it is inappropriate to assess and manage on a residential level. No further investigation is recommended on a residential standpoint, unless the property is to be sold for residential development in the future. The construction worker scenario showed potentially a carcinogenic risk of $1X10^{-3}$ and a toxicity hazard of 10 primarily due to inhalation exposure. Because OSHA rules apply to this type of worker, and source removal occurred, it is most likely the risk and hazard are over-estimated for current (2000) and future hypothetical exposure. The maximal industrial worker scenario yielded a risk of $7X10^{-6}$ and hazard of 0.02, which are within an acceptable exposure range and *de minimus*, respectively. The visitor lifetime carcinogenic risk ($2X10^{-9}$) and the maximum toxicity hazard (0.01) are considered *de minimus*.

Ecological Assessment Findings

A qualitative ecological evaluation was conducted and presented in the Remedial Investigation. A quantitative tiered-approached ecological assessment was not conducted at any of the areas of interest. What was presented was a summary of literature data, in regards to ecological effects, for the following chemicals:

- Arsenic
- Cadmium
- Copper
- Lead
- Manganese
- Zinc
- PAHs

Currently, there is U.S. EPA guidance that describes the procedure for conducting ecological risk assessments, "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments", 1997 EPA 540/R-97/006. At minimum, a screening level assessment Process step 1 and 2 should be conducted for certain areas of the site. This screening consists of screening of site-related constituents against, benchmarks, secondary benchmarks and background for North Fork Creek, Irrigation Field and Storage Basin as guided by the U.S. EPA Guidance, 1997.

Appropriate discussion, problem formulation and uncertainty analysis should accompany the screening, to give perspective to the conservative nature of the screening process. It should be noted that ecological screening levels are NOT appropriate levels for remedial action, as they are overly conservative.

North Fork Creek has habitat suitable for avian, aquatic and terrestrial ecological receptors, and site related chemical in the creek (sediment and surface water) should be screened. The Irrigation Field has received capping or removal, and may serve as part of a home range for terrestrial receptors, thus site related chemical of the land should be screened. The Storage Basin area has been filled in with soil from the Basin's earthen berm. It is unknown what site chemicals are in the berm material, and the land may serve as part of a home range for terrestrial receptors; thus site related chemical of the land should be screened. Screening or further action in an ecological realm is not recommended for the Primary Site because it consists of heavy industry, has little suitable habitat, and portions of the area were capped or filled in a way to remove any terrestrial exposure pathway. Screening or further action under an ecological assessment of the Athletic Field is not appropriate due to the land use and maintained grassy area which is not assessable ecological habitat.

E. Data Review

To date groundwater investigations have focused on the uppermost water-bearing zone, with two rounds of groundwater sampling conducted. Four groundwater monitoring wells have been sampled twice at the site. The first sampling event occurred 15 November 1989 and the second event occurred 15 June 1999. The limited number of data points makes it impossible to perform a trend analysis, so a contaminant by contaminant comparison of the 1989 to the 1999 results was performed. Groundwater at the site is contaminated by volatile organic compounds, extractable organic compounds, and in some instances pesticides. Groundwater in the vicinity of WC001MW is the most contaminated, with high levels of organic contamination. A comparison of the two sampling results, reveal that remedial actions performed at the site have had very little impact on groundwater quality. Concentration levels of contaminants, generally, were of the same order of magnitude for both the 1999 event and the 1989 event.

On August 15, 1995, the TDSF collected surface water and sediment samples from three locations along the North Fork of Mill Creek and downstream of its confluence with Mill Creek. The objective of this sampling was to determine if any contamination remained in the creek and whether or not the Bon Aqua-Lyles Utility District can reopen their old water supply intake. Halogenated volatile organic compounds were not detected in the surface water. Phenols were not detected in the creek sediments.

The Tennessee Division of Superfund performed off-site residential well sampling on 16 November, 1995. Six residential wells were sampled; no contaminants associated with the Wrigley Site were identified during analyses of the samples.

VII. Assessment

The removal of most visible waste from the site by the State of Tennessee achieved the overall remedial objective identified in the Interim Action Record of Decision and all, subsequent Explanations of Significant Differences. The interim action reduced and/or eliminated, in some cases, current or future exposure from exposed contaminants at the Primary Site and Storage Basin. These visible wastes posed the most imminent and substantial threats to human health and the environment. However, no evidence exists that cleanup levels identified in the Feasibility Study were attained during the IRA. This lack of supporting data makes it difficult to determine whether risks associated with soil contamination were reduced to acceptable levels

Assessment of groundwater remedial actions is not necessary, since no groundwater remedial actions have occurred.

VIII. Deficiencies

Deficiencies were discovered during the five-year review and are noted below. None of these are sufficient to warrant a finding of not protective as long as corrective actions are taken.

Deficiencies include:

- missing locks on monitoring wells; open piezometer
- The lack of a plan for the monitoring the conditions of the small areas of wood tar still present on the site; and
- The road leading to the Storage Basin is still in existence. It was stated in the Proposed Plan for the Interim Action Record of Decision Amendment that this road would be removed at the end of remedial activities in the Storage Basin Area.
- Approximately ½ of the Storage Basin cap is not vegetated properly.
- Lack of clearly defined groundwater, surface water and sediment cleanup levels.
- Groundwater analytical protocols do not attain adequate sensitivity to determine if MCLs have been attained. Quantitation limits exceed the MCL values.

IX. Recommendations and Follow-up Actions

The following are recommendations:

- No further human health assessment is needed at this time.
- No further ecological assessment of the Primary Site and Athletic Field is recommended.
- The North Fork Creek, Irrigation Field and Storage Basin should be screened against ecological benchmarks, secondary benchmarks and background. Appropriate problem formulation discussion, and uncertainty analysis should accompany the screening to give perspective to the overly conservative nature of ecological

screening. It should be noted that ecological screening levels are conservative, and are not appropriate for clean-up levels.

- Monitoring wells and piezometer should be secured in a proper manner to prevent the possibility of further contamination due to improper disposal methods.
- The road to the Storage Basin area should be removed.
- Distressed area of Storage Basin cap should be reseeded.
- As specified in the 1999 Explanation of Significant Differences, a monitoring plan for the "hot spots of liquid tar" at the primary site, should be developed.
- Clearly define groundwater, surface water, and sediment cleanup levels.
- Groundwater analytical protocols need to be changed to achieve greater sensitivity such that quantitation levels are at or below MCL levels for organic, synthetic organic and inorganic constituents (e.g., protocol changes may include the use of a 25 ml purge volume vs. 5 ml, etc.). When appropriate protocols are established, it is also recommended that additional groundwater samples be collected to determine the status of MCL attainment at the site.

X. Protectiveness Statements

There are five areas of concern that were assessed in the RI/FS of the Wrigley site: Primary Site, Storage Basin, Irrigation Field, Athletic Field and North Fork Creek. All areas were quantitatively assessed on a human health basis, and qualitatively on an ecological/environmental basis. The quantitative human health assessments provided evidence that site levels are protective of human health. The areas did not receive a quantitative ecological assessment, so there is no strong evidence that the site levels are protective of the environment. The Primary Site and Athletic Field do not exhibit appropriate ecological habitat, thus there is not environmental quality to protect in these areas, and no ecological assessment is required at these areas. The Storage Basin, Irrigation Field and North Fork Creek may provide appropriate ecological habitat, and no formal quantitative ecological assessment has been conducted, thus there is not evidence on record showing that these areas are protective of the environment. The existing data should be screened against ecological benchmarks, secondary benchmarks and background; the data and screening comparisons should have uncertainty analyzed; and the assessment should be similar to Steps 1 and 2 (Ecological Screening Level Assessment) of the "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments", 1997 EPA 540/R-97/066.

To summarize, the remedies at each location of the Wrigley Charcoal site are protective of human health, based on current land use. The remedies at the Primary Site and the Athletic field are protective of the environment. Based on site information to date, it is unknown whether remedies at the Irrigation Field, Storage Basin and North Fork Creek are protective of the environment.

XI. Next Review

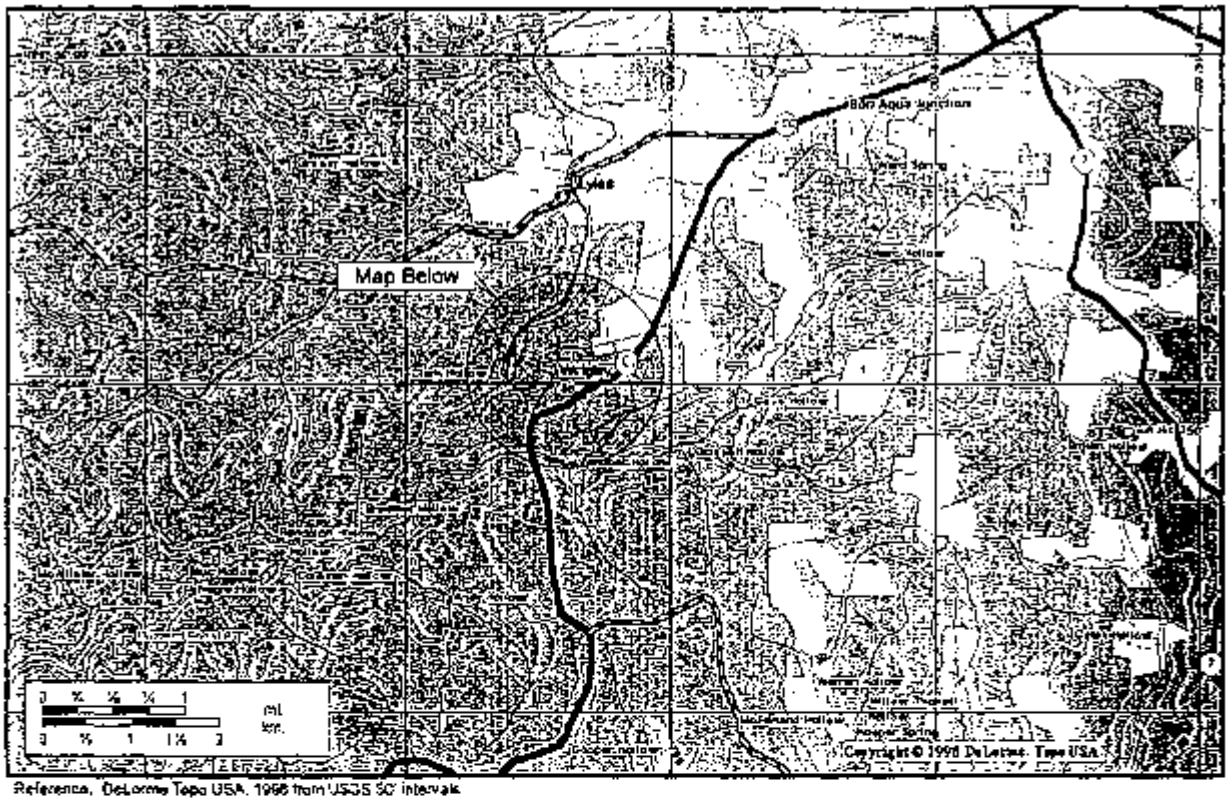
The next review should be completed by 30 June 2005, unless the site is delisted prior to this.

Appendices

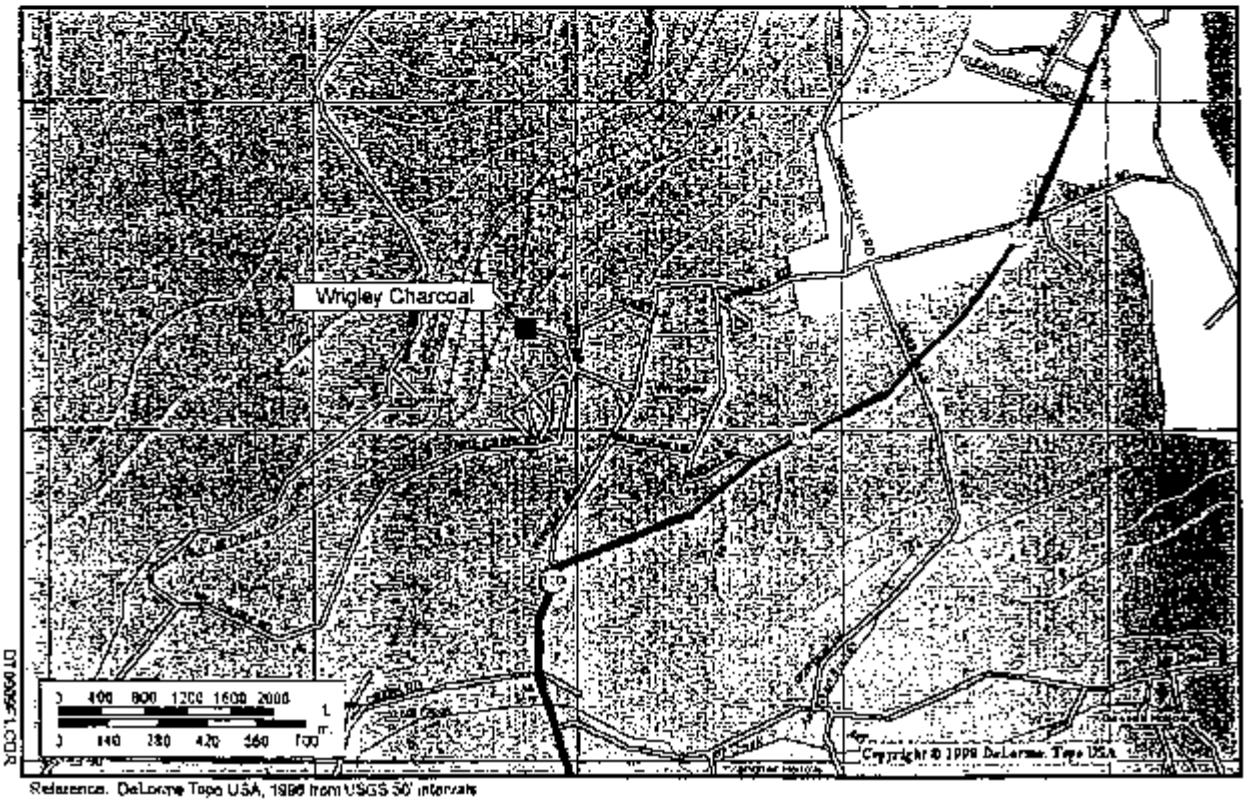
Attachment A – Site Maps

Figure 1 – Site Location Map

Figure 2 – Primary Site Layout and Monitoring Wells Map



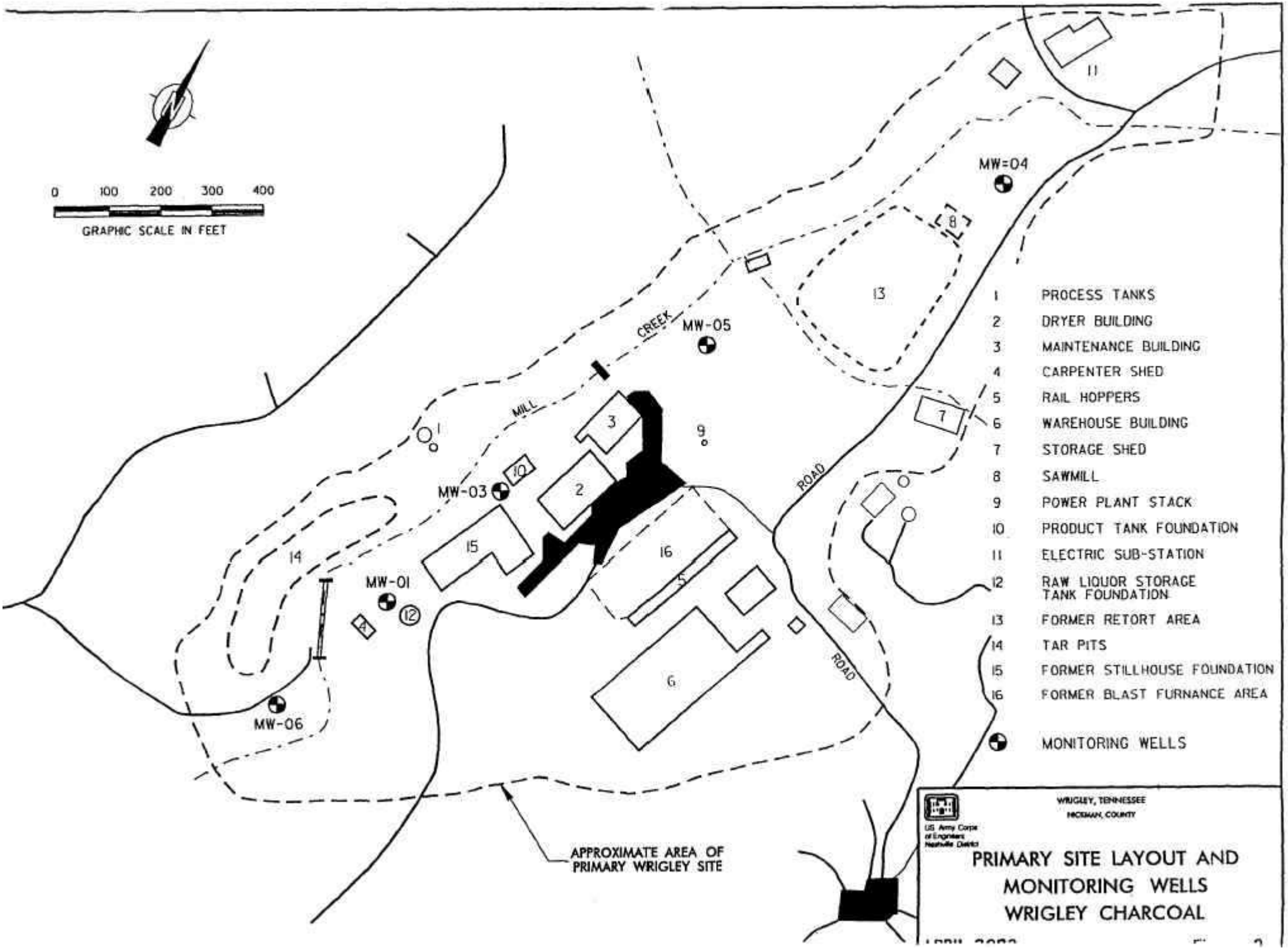
Reference: DeLorme Topo USA, 1998 from USGS 50' intervals



Reference: DeLorme Topo USA, 1998 from USGS 50' intervals

Figure 1

Site Location Map
Wrighley Charcoal
Wrigley, Tennessee


0 100 200 300 400
GRAPHIC SCALE IN FEET
MW-04
MW-05
MW-03
MW-01
MW-06
MILL CREEK
ROAD
ROAD
APPROXIMATE AREA OF PRIMARY WRIGLEY SITE
1 PROCESS TANKS
2 DRYER BUILDING
3 MAINTENANCE BUILDING
4 CARPENTER SHED
5 RAIL HOPPERS
6 WAREHOUSE BUILDING
7 STORAGE SHED
8 SAWMILL
9 POWER PLANT STACK
10 PRODUCT TANK FOUNDATION
11 ELECTRIC SUB-STATION
12 RAW LIQUOR STORAGE TANK FOUNDATION
13 FORMER RETORT AREA
14 TAR PITS
15 FORMER STILLHOUSE FOUNDATION
16 FORMER BLAST FURNANCE AREA
MONITORING WELLS
US Army Corps of Engineers Nashville District
WRIGLEY, TENNESSEE
HICKMAN, COUNTY
PRIMARY SITE LAYOUT AND MONITORING WELLS WRIGLEY CHARCOAL

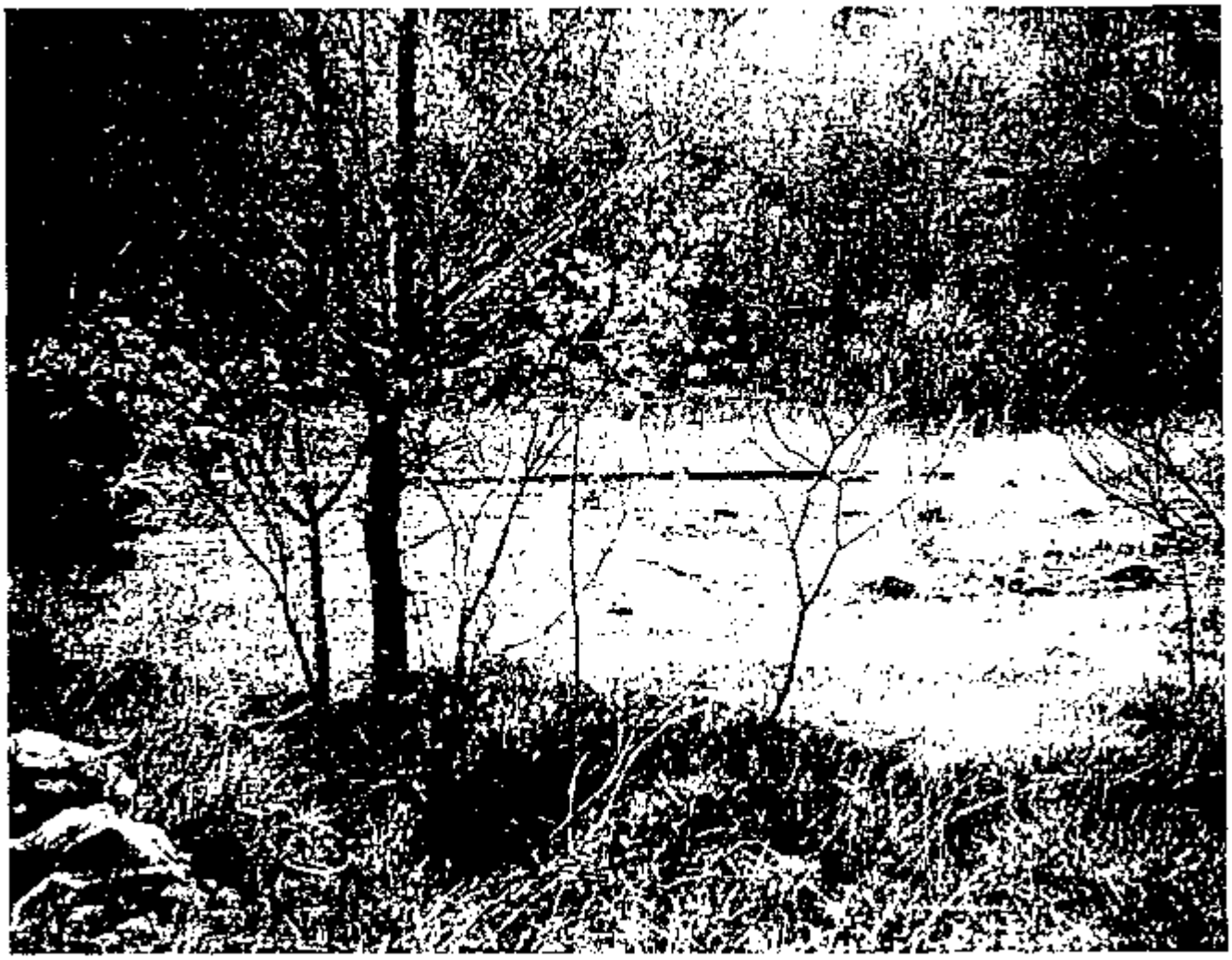
Attachment B - Primary Site Photographs from April 12, 2000 Site Visit

View of Former Dryer Building

View Facing North looking toward Main Building; Former Product Tank Foundation to the left

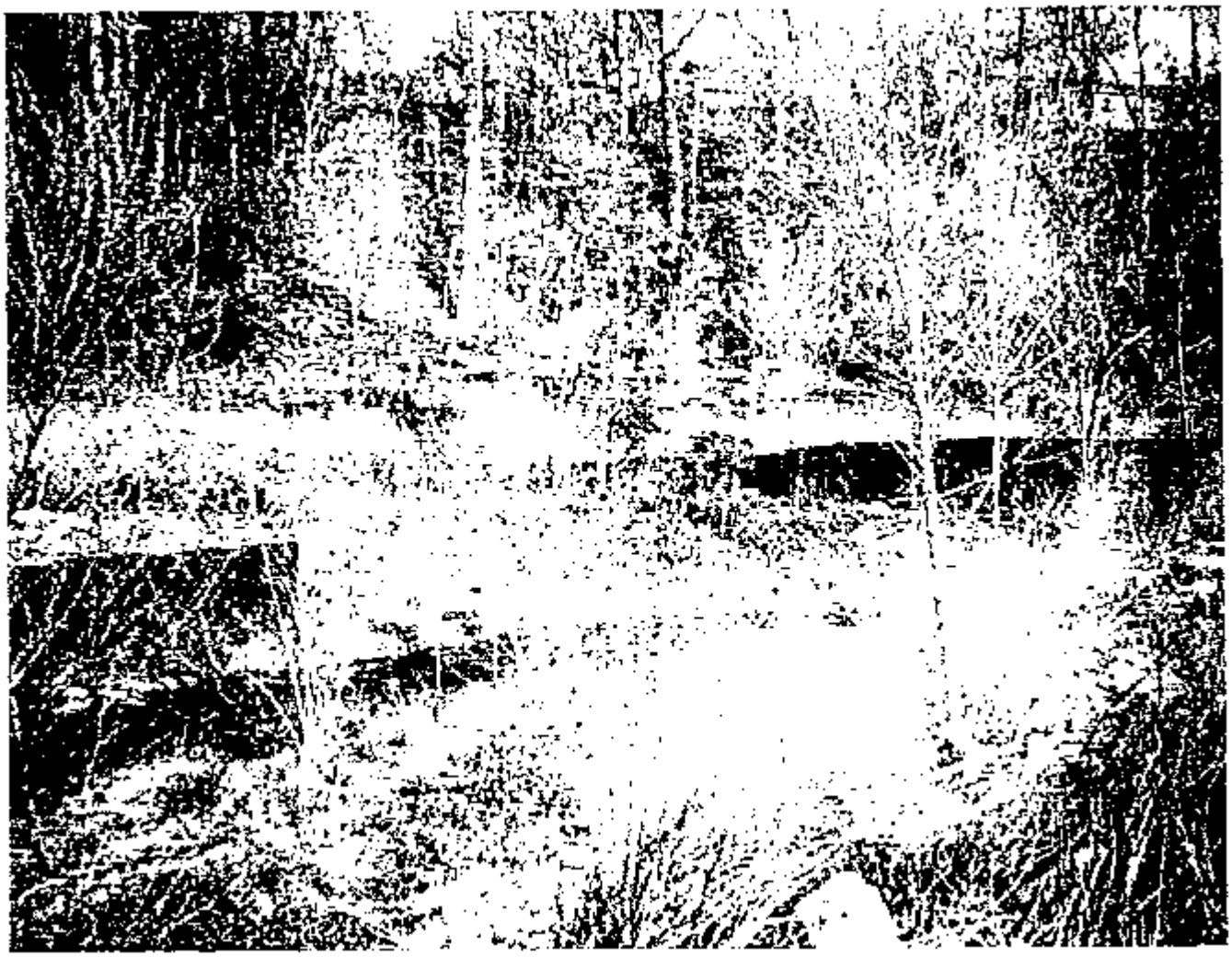
View Facing North looking toward Main Building; Former Product Tank Foundation to the Left

View Facing North East; Mill Creek



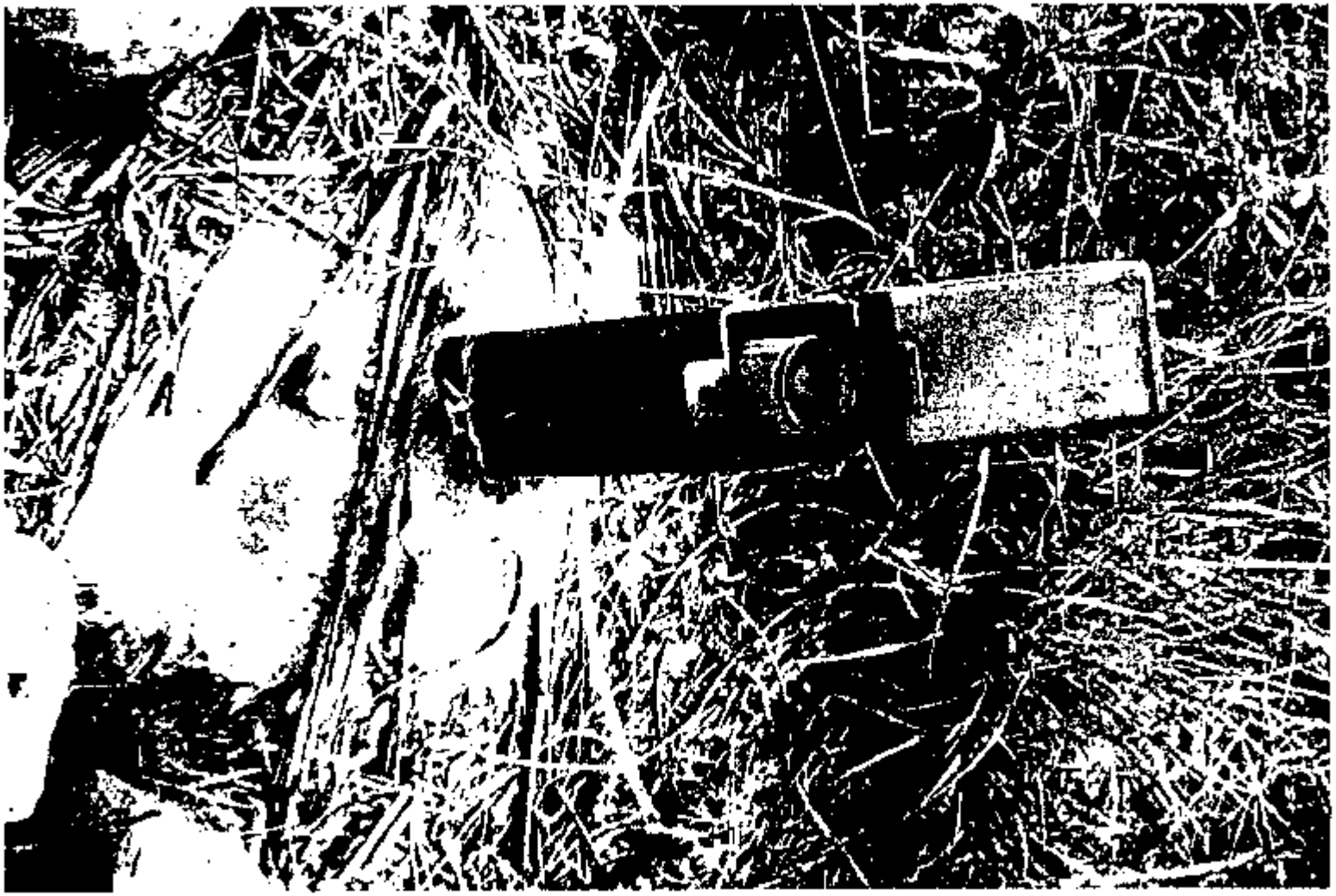
View facing South; Former Tar Pit Area

View facing South; Former Carpenter Shed



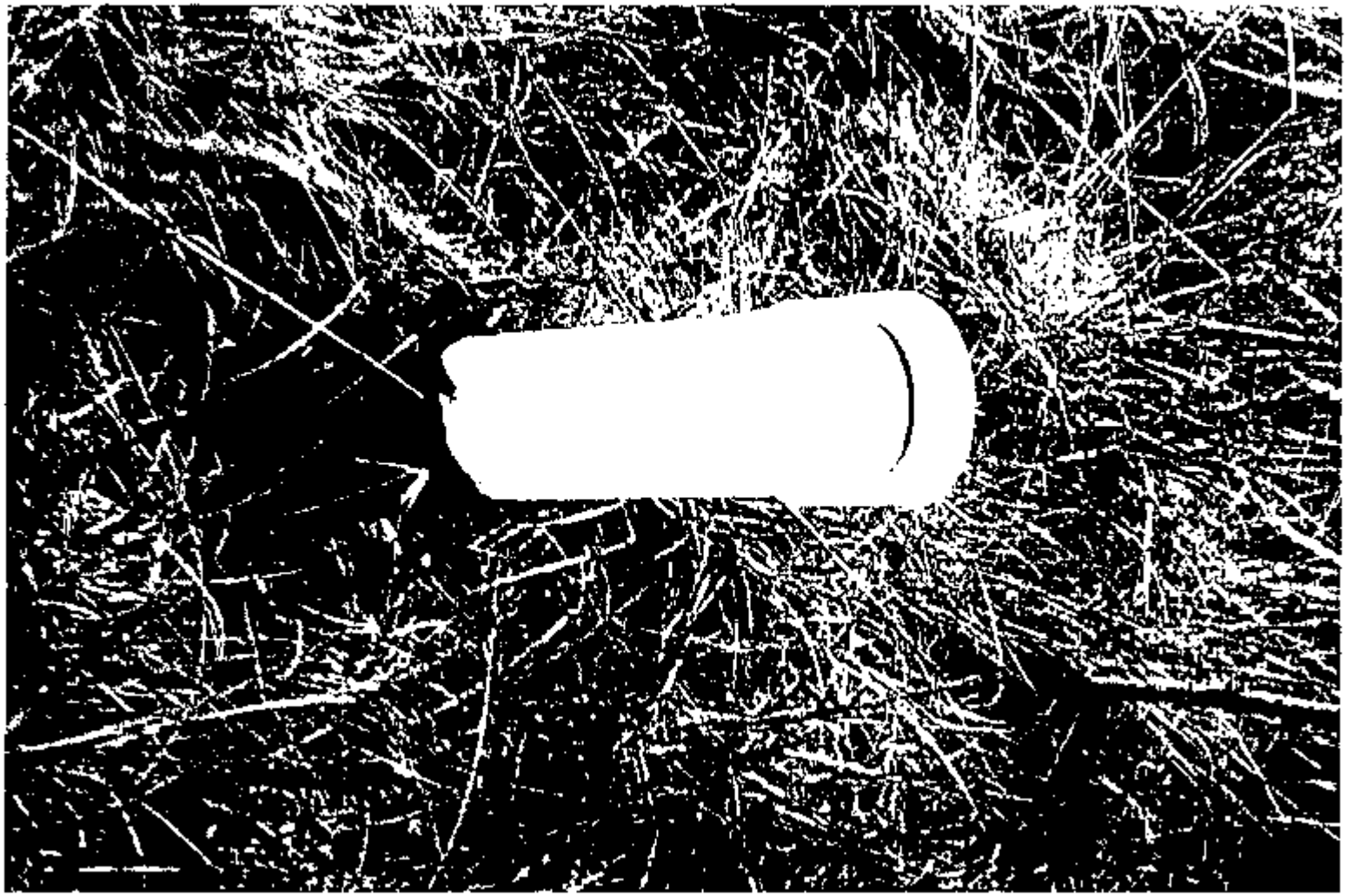
Sheet Piling Along Bank of North Fork of Mill Creek; View facing North West

Monitoring Well # 6 between Fence Rip Rap; facing South West



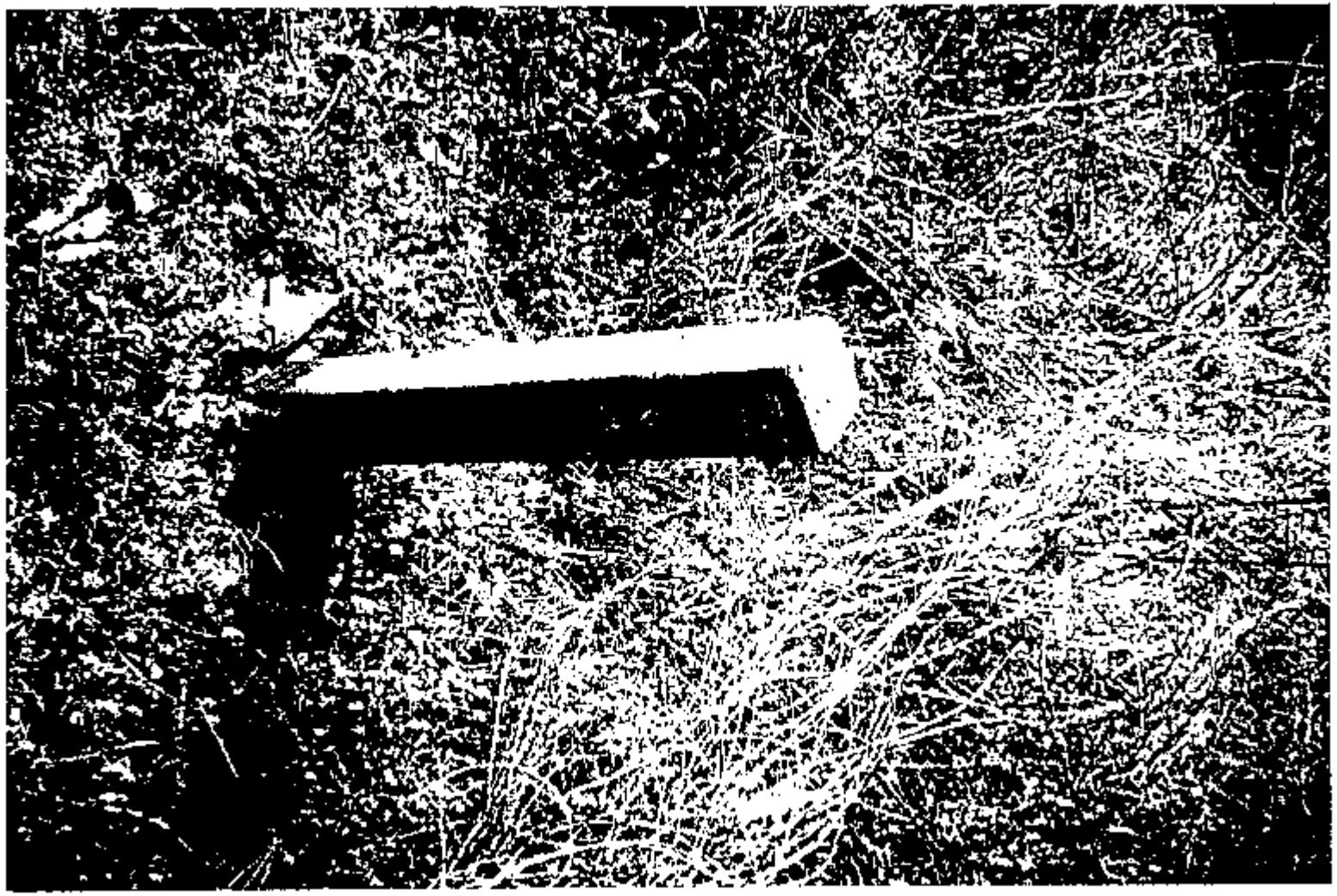
Monitoring Well # 1

Monitoring Well # 1; Lid does not close



Old pvc piezometer; No known #; Near alcohol tank

Cap of Tar Pit; facing South



Monitoring Well # 6

“Recyclables” along North Fork of Mill Creek; View facing South

More “Recyclables”

Area between Warehouse Monitoring Well # 6; View facing North

Building to left is Former Dryer: Smokestack is to the right

Attachment C – Five-Year Review Site Inspection Checklist

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the five-year review report as supporting documentation of site status. "N/A" refers to "not applicable".)

I. SITE INFORMATION	
Site name: WRIGLEY CHARCOAL	**Date of inspection:** 4/12/00
Location and Region:	**EPA ID:**
Agency, office, or company leading the five-year review:	**Weather/temperature:**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other – GW Monitoring.

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** N/A _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** N/A _____ _____ _____
   Name Title Date
   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 STATE OF TENNESSEE
Contact Tim Stewart _____ _____ 615/532-0984
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency LOCKEN CARE / EPA
Contact _____ RPM _____ 404/562-8804
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	**O&M Documents**			
	☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
	☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
	☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	☐ Readily available	☐ Up to date	☒ N/A
	☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
3.	**O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
4.	**Permits and Service Agreements**			
	☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
	☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
	☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
	☐ Other permits	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
5.	**Gas Generation Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
6.	**Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
7.	**Groundwater Monitoring Records**	☒ Readily available	☐ Up to date	☐ N/A
	Remarks Limited Monitoring done at site.			
8.	**Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
9.	**Discharge Compliance Records**			
	☐ Air	☐ Readily available	☐ Up to date	☒ N/A
	☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			
10.	**Daily Access/Security Logs**	☐ Readily available	☐ Up to date	☒ N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**
   ☐ State in-house ☐ Contractor for State
   ☐ PRP in-house ☐ Contractor for PRP
   ☐ Other N/A.

2. **O&M Cost Records** N/A.
   ☐ Readily available ~~☐ Up to date~~
   ☐ Funding mechanism/agreement in place
   Original O&M cost estimate _____ ☐ Breakdown attached

   Total annual cost by year for review period if available

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost
   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A
   Remarks Limited fencing, gates at access roads, but 3 don't have gates.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
   Remarks —

C. Institutional Controls

1. **Implementation and enforcement**
   Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☒ N/A
   Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☒ N/A

   Type of monitoring (e.g., self-reporting, drive by) _____
   Frequency _____
   Responsible party/agency _____
   Contact _____ _____ _____ _____
   Name Title Date Phone no.

   Reporting is up-to-date ☐ Yes ☐ No ☐ N/A
   Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

   Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
   Violations have been reported ☐ Yes ☐ No ☐ N/A
   Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☐ N/A
   Remarks _____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
   Remarks —

2. **Land use changes onsite** ☐ N/A
   Remarks Operator moved in 2 years ago, "recycling" operation is active at the site.

3. **Land use changes offsite** ☒ N/A
   Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
   Remarks_____

B. Other Site Conditions

Remarks The condition of the site is looking worse due to storage and stockpiles of various plastics & fiberglass materials, etc. Site access in many locations is difficult due to materials on site.

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks_____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
Areal extent_____ Height_____
Remarks_____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☐ N/A
(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.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☐ N/A
(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.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs O&M ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
☐ Good condition ☐ Needs O&M
Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
☐ Good condition ☐ Needs O&M
Remarks_____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)
☐ Good condition ☐ Needs O&M ☐ N/A
Remarks_____

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident
Remarks_____

2. **Erosion** Areal extent_____ Depth_____
☐ Erosion not evident
Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
Remarks_____

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES	☐ Applicable	☒ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines	☐ Applicable	☐ N/A
1. **Pumps, Wellhead Plumbing, and Electrical** ☐ Good condition ☐ All required wells located ☐ Needs O&M ☐ N/A Remarks_____		
2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs O&M Remarks_____		
3. **Spare Parts and Equipment** ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks_____		
B. Surface Water Collection Structures, Pumps, and Pipelines	☐ Applicable	☐ N/A
1. **Collection Structures, Pumps, and Electrical** ☐ Good condition ☐ Needs O&M Remarks_____		
2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs O&M Remarks_____		

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks_____

C. Treatment System ☐ Applicable ☒ N/A

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 O&M
☐ 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 O&M
Remarks_____

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs O&M
Remarks_____

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs O&M
Remarks_____

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

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs O&M ☐ N/A
Remarks_____

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs O&M ☐ N/A
   Remarks Not all MWs located. MW #6 needs lock + lable. MW #1 can not close properly.

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

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.).

Remedy consisted primarily of various removal actions with limited GW monitoring. GW sampling results indicate some contamination of phenols, PAHs, + some metals. State is leaning toward site close out at this time.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

In general, there is no O+M at the site.

C.	**Early Indicators of Potential Remedy Failure**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. N/A.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. N/A.

Attachment D — Concentration of Detected Parameters in Groundwater

VOLATILES		WC001MW		WC003MW		WCOO5MW		WCOO6MW	
		11/15/1989	6/15/1999	11/15/1989	6/15/1999	11/15/1989	6/15/1999	11/15/1989	6/15/1999
Acetone	Fg/L	180 J	610			100			
Azulene	Fg/L								
Benzene	Fg/L	90	110	6	1 J	5	1 J	4 J	6 J
Benzene, (1-Methyl-2Cyclopropyl)	Fg/L				9 NJ				
Benzene, 1-Ethyl-2-Methyl	Fg/L								11 NJ
Benzofuran	Fg/L		600 JN						
Benzofuran, 2-Methyl-	Fg/L						17 NJ		
Cyclopentanone, 2, 5-Dimethyl	Fg/L								5 NJ
Dihydromethylinden	Fg/L				9 NJ				
Dimethylfuran	Fg/L		900 JN						
Ethyl Benzene	Fg/L	550	350	9	4 J	22	8 J	8	
Ethylmethylbenzene	Fg/L				9 NJ				
Furan, Tetrahydro-	Fg/L				9 NJ				
Indane	Fg/L		300 JN						
Indene	Fg/L		200 JN						
Isopropylbenzene	Fg/L		12 J						
Methyl Butyl Ketone	Fg/L	65	120						1 J
Methyl Ethyl Ketone	Fg/L	150 J	590						
Methyl Isobutyl Ketone	Fg/L		33						
Methylethylbenzene	Fg/L		200 JN						
N-Butylbenzene	Fg/L		12 J						
N-Propylbenzene	Fg/L		41 J						
O-Xylene	Fg/L		510						
Semi-TCL	Fg/L				9 NJ		17 NJ		
Substituted Benzene	Fg/L				9 NJ				
Toluene	Fg/L	1,300	1,100			25	8 J		
Total Xylenes	Fg/L	1,900			5 NJ	100	28		23
Trimethylbenzene	Fg/L				9 NJ				
Unknown Alkene	Fg/L								6 NJ

EXTRACTABLES		WC001MW		WC003MW		WCOO5MW		WCOO6MW	
		11/15/1989	6/15/1999	11/15/1989	6/15/1999	11/15/1989	6/15/1999	11/15/1989	6/15/1999
(3-and/or 4-) Methylphenol	Fg/L	14,000	260,000						
16 unidentified compounds	Fg/L						64 J		
	Fg/L								
2 Substituted Phenols	Fg/L				46 JN		9 JN		
2-Trimethyl Phenol Isomers	Fg/L						11 JN		
2,4 DimethylPhenol	Fg/L	4,000	49,000		1 J	27	4 J		
2-Cyclopenten-1-one, 3,4,5-T	Fg/L				19 NJ				
2-Methylnapthalene	Fg/L		530						
2-Methylphenol	Fg/L	4,700	27,000						2 J
2-Propanone, 1- (4-MethoxyPhenyl)	Fg/L				15 NJ				
22 Unidentified compounds	Fg/L				520 J				
27 Unidentified compounds	Fg/L								610 J
3 Trimethylphenol Isomers	Fg/L				81 JN				
4-Nitroaniline	Fg/L		380 J						
Acenaphthene	Fg/L				1 J				
Benzene, 1-Propnyl	Fg/L						2 NJ		
Benzofuran, 2-Methyl-	Fg/L				15 NJ		5 NJ		
Cyclopent-2-ene-1-one, 2,3,4	Fg/L								79 NJ
Dimethylphenol	Fg/L						3 JN		
Dimethylphenol (not 2,4-)	Fg/L		3,000 JN						
Ethylmethyl Benzene	Fg/L						3 JN		
Ethylmethylphenol	Fg/L		1,000 JN						
Isophrone	Fg/L		170 J						

EXTRACTABLES (continued)		**WC001MW**		**WC003MW**		**WCOO5MW**		**WCOO6MW**	
		11/15/1989	6/15/1999	11/15/1989	6/15/1999	11/15/1989	6/15/1999	11/15/1989	6/15/1999
Methoxymethylphenol	Fg/L		2,000 JN						
Naphthalene	Fg/L	520	860			8 J	3 J		5 J
Naphthalene, 1-Methyl-	Fg/L						2 NJ		
Phenol	Fg/L	1,400	22,000	470					
Propylphenol	Fg/L		1,000 JN						
Substituted Phenol	Fg/L								16 JN
Thymol	Fg/L								
Trimethylbenzene	Fg/L						4 JN		
Trimethylphenol	Fg/L								14 JN

PESTICIDES		WC001MW		WC003MW		WCOO5MW		WCOO6MW	
		11/15/1989	6/15/1999	11/15/1989	6/15/1999	11/15/1989	6/15/1999	11/15/1989	6/15/1999
4,4'-DDD (P,P'-DDD)	Fg/L				0.222				0.021 J
Alpha Chlordane	Fg/L				0.007				
Beta-BHC	Fg/L								
Delta-BHC	Fg/L						0.029 J		
Gamma-BHC (Lindane)	Fg/L								0.045 J
Gamma-Chlordane	Fg/L								0.070 J
Heptachlor Expoxide	Fg/L				0.017				

METALS		WC001MW		WC003MW		WCOO5MW		WCOO6MW	
		11/15/1989	6/15/1999	11/15/1989	6/15/1999	11/15/1989	6/15/1999	11/15/1989	6/15/1999
Aluminum	Fg/L	780	610	10,000				27,000	
Arsenic	Fg/L								8.0 J
Barium	Fg/L	140	210	130	84	48	29	520	110
Calcium	Fg/L	140,000	200	55,000	51,000	47,000	47,000	270,000	97,000
Chromium	Fg/L	10	32 J	27		14		68	
Copper	Fg/L						4.3J	20	
Iron	Fg/L	1,700	4.7	28,000	4,400			81,000	23,000
Lead	Fg/L			9 J			43 J	25 J	
Magnesium	Fg/L	710	5.4	4,400	3,400	3,300	3,500	60,000	8,600
Manganese	Fg/L	8,000	120	410	170	560	21	1600	1,600
Molybdenum	Fg/L		14						
Nickel	Fg/L	150	16					60	
Potassium	Fg/L	7,700	7.8	5,600	5,000	2,200	770	44,000	6,200
Sodium	Fg/L	15,000	21	5,200	3,000	1,700	1,400	110,000	18,000
Strontium	Fg/L		530						
Titanium	Fg/L		340						
Total Mercury	Fg/L								
Vanadium	Fg/L	12	160	36				110	
Zinc	Fg/L						16	280	7.8 J

Attachment E - US Army Corps' Responses to US Environmental Protection Agency's Comments on the Draft Final 5-Year Review Report

Wrigley Charcoal Five-Year Review Comments
Loften Carr 8/11/2000
Responses by US Army Corps 9/20/00

1) P. 8, para. 1, typo nitid – 1960's should be mid-1960's

Agree; will change

2) P.12, "Remedy Implementation" para. 1, Modifications to the IRA are outlined in Table 1 (not Table 2.)

Agree; will change

3) P.14, Table 1, #8 "Modified Activity" is blank. Does this mean no modified activity occurred? If so, put something in the blank like "None" or "Activity Not Modified." Table 1 #'s 10 and 15, Same Comment.

Agree; will add explanations in each blank area of table.

4) P. 16, Table 1, #13, "Original Activity" portion of Table is Blank and subsequent activities are not numbered and their corresponding "Modified Activity" are blank (see comment 3 above).

Agree; will add explanations in each blank area of table.

5) P. 17, V. Five-Year Review Process, What is "HTRW"? Put on Acronym page

Hazardous, Toxic and Radioactive Waste. Spelled out at 1st occurrence and added to acronym page.

6) My Name is spelled Loften

Will correct.

7) P.20, "ARARs Identified in the ROD Requiring Evaluation During the Five-Year Review," Please refer to the ROD as the Interim ROD, because the final ROD has not been completed yet. Please apply this comment throughout the document.

Applied this comment throughout the document.

8) P.20/21, The most of the organic and inorganic parameters in question were analyzed for but not detected. Please check the analytical data sheets included with the report in question.

Received data sheets from US EPA subsequent to receiving these comments from EPA & reviewed them. Based on this review the following changes will be made:

a) Will replace the paragraph at the bottom of page 20 that starts with, "The 15 June 1999 groundwater sampling report..." with the following paragraph:

Groundwater sampling data for the site indicates that the minimum quantification levels for many contaminants exceed their respective MCL levels. For example, data from the October 1999 groundwater sampling for monitoring well WC001MW is as follows:

Contaminant	***Results (ppb)***	***Quantitation Limit (ppb)***	***MCL (ppb)***
Vinyl chloride	U*	20	2
1,1-Dichloroethene	U	20	7
1,2-Dichloroethane	U	20	5
Carbon Tetrachloride	U	20	5
1,2-Dichloropropane	U	20	5
Trichloroethylene	U	20	5
1,1,2-Thrichloroethane	U	20	5
Tetrachloroethylene	U	20	5

** U - not detected above the minimum quantitation limit*

From this table it can be seen that the groundwater monitoring data collected is inconclusive in determining whether or not MCLs have been exceeded. Unless quantitation limits are at or below the MCLs, no definitive statement can be made as to whether or not MCLs have been attained. This problem occurs at several of the other monitoring wells for synthetic organic contaminants (e.g., the quantitation limit for PCBs is 25 ug/L when the MCL is 0.5 ug/L) as well as for some metals.

b) Will add to following deficiency statement to the list of deficiencies bullets on page 26 (Section VIII) as well as to the list of deficiencies provided in the Signature Cover at the beginning of the report:

- *Groundwater analytical protocols do not attain adequate sensitivity to determine if MCLs have been attained. Quantitation limits exceed the MCL values.*

c) Will also add the following recommendation to the recommendations (Section IX) on page 26 as well as to the Signature Cover at the beginning of the report:

- *Groundwater analytical protocols need to be changed to achieve greater sensitivity such that quantitation levels are at or below MCL levels for organic, synthetic organic and inorganic constituents (e.g., protocol changes may include the use of a 25 ml purge volume vs. 5 ml, etc.). When appropriate protocols are established, it is also recommended that additional groundwater samples be collected to determine the status of MCL attainment at the site.*

9) P.23 “Risk Information Review,” Table 3, not Table 2.

Will correct.

10) P.28, “X. Protectiveness Statements” The sentence “Based on site information to date, it is unknown whether remedies at the Irrigation Field, Storage Basin, and North fork creek are protective of the environment.” Is vague. Elaborate and make it clearer as to why it is unknown whether “remedies” are protective.

The following explanation was added to this section for clarification. There are five areas of concern that were assessed in the RI/FS of the Wrigley site: Primary Site, Storage Basin, Irrigation Field, Athletic Field and North Fork Creek. All areas were quantitatively assessed on a human health basis, and qualitatively on an ecological/environmental basis. The quantitative human health assessments provided evidence that site levels are protective of human health. The areas did not receive a quantitative ecological assessment, so there is no strong evidence that the site levels are protective of the environment. The Primary Site and Athletic Field do not exhibit appropriate ecological habitat, thus there is not environmental quality to protect in these areas, and no ecological assessment is required at these areas. The Storage Basin, Irrigation Field and North Fork Creek may provide appropriate ecological habitat, and no formal quantitative ecological assessment has been conducted, thus there is not evidence on record showing that these areas are protective of the environment. The existing data should be screened against ecological benchmarks, secondary benchmarks and background, the data and screening comparisons should have uncertainty analyzed; and the assessment should be similar to Steps 1 and 2 (Ecological Screening Level Assessment) of the “Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments”, 1997 EPA 540/R-97/066.