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Record of Decision:

Penta Wood Products Inc.
Daniels, WI
9/29/1998

RECORD OF DECISION

FINAL REMEDIAL ACTION

PENTA WOOD PRODUCTS SUPERFUND SITE

TOWN OF DANIELS, WISCONSIN

SEPTEMBER, 1998

TABLE OF CONTENTS

CONTENT — PAGE NO.

DECLARATION

DECISION SUMMARY 3

I. SITE NAME, LOCATION, AND DESCRIPTION 3

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES 3

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION 5

IV. SCOPE AND ROLE OF THE RESPONSE ACTION 5

V. SUMMARY OF SITE CHARACTERISTICS 6
- A. Land Use 6
- B. Surface Water 6
- C. Geology 7
- D. Hydrogeology 7

VI. MAJOR FINDINGS OF THE REMEDIAL INVESTIGATION AND RISK ASSESSMENT 9
- A. Source Areas 10
- B. Fate and Transport of Site-Related Contaminants 12

VII. SUMMARY OF SITE RISK 15
- A. Objectives 15
- B. Human Health 16
- C. Ecological Risk Assessment 20

VIII. REMEDIATION OBJECTIVES 23

IX.. DESCRIPTION OF ALTERNATIVES 24
- A. Alternative 1 24
- B. Alternative 2 25
- C. Alternative 3 33
- D. Alternative 4 34
- E. Alternative 5 35

X. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES 36
A. Threshold Criteria 36
B. Primary Balancing Criteria 36
C. Modifying Criteria 37

XI. THE SELECTED REMEDY 40
A. Cleanup Levels 40
B. Description of Remedial Components 42
C. Long-Term Monitoring Plan 43

XII. STATUTORY DETERMINATIONS 44
A. The Selected Remedy is Protective of Human Health and the Environment 44
B. The Selected Remedy Attains ARARs 44
C. The Selected Remedy is Cost Effective 47
D. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable 48
E. The Selected Remedy Satisfies the Preference for Treatment that Permanently and Significantly Reduces the Toxicity, Mobility, or Volume of the Hazardous Substances as a Principal Element 49

XIII. DOCUMENTATION OF SIGNIFICANT CHANGES 49

TABLE OF CONTENTS
(continued)

TABLES

Table 1	Preliminary Remedial Goals and Clean Up Goals for Constituents of Potential Concern in Soil
Table 2	Preliminary Remedial Goals and Clean Up Goals for Constituents of Potential Concern in Ground-Water
Table 3	Summary of Site Risk to Human Health
Table 4	Summary of Site Risk to Ecological Receptors
Table 5	Preliminary Remedial Goals for Constituents of Potential Concern in Sediment
Table 6	Preliminary Remedial Goals for Constituents of Potential Concern in Surface Water
Table 7	Components of the Remedial Alternatives
Table 8	ARARs Criteria and Guidance for the Selected Remedy

FIGURES

Figure 1	Site Location Map
Figure 2	Site Features Map
Figure 3	Site Conceptual Model Cross Section
Figure 4	1994 and 1997 PCP Concentrations in Ground-Water
Figure 5	Excavation and Cover Areas

APPENDICES

Appendix A	WDNR Letter of Concurrence
Appendix B	Administrative Record Index and Administrative Record Locations
Appendix C	Responsiveness Summary

LIST OF ACRONYMS

REFERENCES

DECLARATION

SELECTED FINAL REMEDIAL ACTION
FOR THE
PENTA WOOD PRODUCTS SUPERFUND SITE
TOWN OF DANIELS, WISCONSIN

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Penta Wood Products Superfund Site (PWP Site) in the Town of Daniels, Wisconsin and describes the legal and technical basis for the selection. The remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, 42 U.S.C. sections 9601-9675, and is in compliance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) to the extent practicable. This decision is supported by documentation contained in the Administrative Record for the PWP Site.

The Wisconsin Department of Natural Resources (WDNR) concurs with the selected remedy.

ASSESSMENT OF THE PWP SITE

Actual or threatened releases of hazardous substances from the PWP Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), present a potential future threat to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This final remedial action addresses contamination associated with contaminated soils and sediments, surface water, a light non-aqueous phase liquid layer (LNAPL), and a ground-water plume at the PWP Site. The statutory and regulatory requirements for the remedial action at the PWP Site are to:

- Reduce/eliminate the potential risks to human health and ecological receptors associated with exposure to pentachlorophenol (PCP) and fuel oil components in surface and ground-water, and PCP/fuel oil components and metals in the soil and sediment;
- Reduce/control the source of contaminants;
- Reduce the concentrations of these compounds in the ground-water plume to PALs and;
- Satisfy Applicable or Relevant and Appropriate Requirements (ARARs).

The selected remedial alternative for the PWP Site is Alternative 3: Soil and Sediment Consolidation, Bioventing, LNAPL Collection and Disposal, Ground-Water Collection and Treatment associated with LNAPL Collection, and Monitored Natural Attenuation for the remainder of the ground-water plume. The selected remedy focuses on removing free phase LNAPL and the grossly contaminated ground-water while slowly drawing down the water table and enhancing natural biodegradation of the soils above the LNAPL by bioventing (adding air to the soils above the water table). PCP/fuel oil contaminated soils and sediments will be consolidated under a cover prior to bioventing. Arsenic/metals contaminated soil will be segregated where possible; highly contaminated soils will be solidified in cement and placed in a Corrective Action Management Unit (CAMU). The overland transport of contaminated site materials from a lagoon with a collapsing wall to an adjacent wetland, will be eliminated with a buttress, graded, and vegetation established. The natural degradation of contaminants that is occurring in the ground-water plume will be monitored. If monitoring detects that off-site receptors are threatened, or if the remedy fails to effectively reduce contaminant mass within a reasonable time period, contingency plans will be implemented. The major components of this remedy include:

- Building demolition
- Segregation, select solidification, and placement of all arsenic soils in a CAMU
- Consolidation of PCP/fuel oil soils and wood chips under a soil cover
- Bioventing PCP/fuel oil contaminated material
- Biopad removal and backfill on-site
- Erosion control measures
- Revegetation
- LNAPL removal
- Grossly contaminated ground-water collection, treatment and discharge
- Monitored natural attenuation
- Institutional controls
- Environmental monitoring/maintenance
- Point-of-use carbon treatment, if necessary
- Five-year site reviews

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedy will result in hazardous substances remaining on site above health based levels, a review will be conducted at five-year intervals after startup of the remedial action, to ensure that the remedy continues to provide adequate protection of human health and the environment. This five-year review will be conducted as long as hazardous substances are present above health-based cleanup levels.

STATE CONCURRENCE

Upon receipt, the State of Wisconsin concurrence letter will be included in the Administrative Record and Appendix A of this ROD.

Richard C Karl for — 9-29-98

William E. Muno
Superfund Division Director
U. S. EPA Region V

Date

DECISION SUMMARY
FINAL SELECTED REMEDIAL ACTION
FOR THE PENTA WOOD PRODUCTS SITE

I. SITE NAME, LOCATION, AND DESCRIPTION

The PWP site is an inactive wood treating facility located on Daniels 70 (former State Route 70) in Burnett County, Wisconsin. It is approximately 78 miles northeast of Minneapolis, Minnesota, and 60 miles south of Duluth, Minnesota (Figure 1). The Village of Siren, Wisconsin, is approximately 2 miles east of the site and there are two residences within 200 feet of the site using private wells.

The PWP property currently consists of approximately 82 acres which were actively used; 40 undeveloped acres consisting of forest were sold after the facility closed. The property is located in a rural agricultural and residential setting and is bordered to the east, west, and north by forested areas; some of these areas are classified by the State of Wisconsin as wetlands. With the exception of an 8 acre parcel, Daniels 70 forms the southern property boundary.

The PWP site is situated on a plateau with a 110-foot drop in elevation from the southern boundary to the northern boundary. The site stratigraphy consists of three layers: an upper sand, a glacial till that is not continuous throughout the site, and a lower sand. The depth to ground-water is over 100 feet on the plateau. Ground-water occurs both in a thin unconfined aquifer and within a multi-layered semiconfined aquifer system. The regional ground-water flow direction is to the north. Since the closing of the on-site production well, ground-water flow at the site has been radial, with a strong downward vertical gradient. A number of surface water bodies are present north and east of the site. Doctor Lake and an unnamed lake are located 2,000 feet east and northeast of the site, respectively. Approximately 2,137 acres of lakes, 94 acres of bogs, and 7,500 acres of wetland are located within a 4-mile radius of the site. A wetland is located within 130 feet of the northern property boundary. The Amsterdam Slough Public Hunting area covers 7,233 acres and is located 1 mile north of the site.

There are no viable PRPs capable of financing the selected remedial activity at the site. The remedy will be a fund financed remedial action.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

PWP operated from 1953 to 1992. Raw timber was cut into posts and telephone poles and treated with either a 5 to 7 percent PCP solution in a No. 2 fuel oil carrier, or with a water borne salt treatment called Chemonite consisting of ammonia, copper II oxide, zinc and arsenate (ACZA). PCP also conducted toll blending of pentachlorophenol and fuel oil on a contract basis for other industrial users just prior to closing in 1992. During its 39 years of operation, PWP discharged wastewater from an oil/water separator down a gully into a lagoon on the northeast corner of the property (Figure 2). Process wastes were also discharged onto a wood chip pile in the northwestern portion of the property. Ash from a boiler was used to berm a cooling pond. Beginning in the 1970s, WDNR investigators noted several large spills, stained soils, fires, and poor operating practices.

PWP began an environmental investigation in 1987. In 1988, the on-site production well was closed for potable use when it was found to contain 2,700 parts per billion (ppb) of PCP. The State of Wisconsin Department of Justice filed a preliminary injunction against Penta Wood Products in 1991, citing WPDES violations and violations of other State statutes regarding storage of raw materials, and waste handling practices. The facility voluntarily closed in May 1992 with the promulgation of the Resource Conservation and Recovery Act (RCRA) drip track regulations.

The site was put into the Superfund Accelerated Cleanup Model (SACM) pilot program in 1993. The site was listed on the National Priorities List on June 17, 1996. A removal action was conducted from 1994 to 1996. The ACZA treatment building and half of the oil/water separator building were demolished and remaining chemicals and sludges were disposed off-site. Grossly PCP-and metals-contaminated soils were excavated and disposed off-site, and metals-contaminated soils were excavated and mixed with cement on-site to form a 3-acre concrete biopad.

The nature and extent of contamination has been characterized in soil, sediment, surface water, and ground-water on and immediately north of the site. Subsurface soils are contaminated with the PCP/oil mixture to a depth of over 100 feet beneath the gully leading from the oil water separator to the lagoon (Figure 3). A floating PCP/oil (LNAPL) layer covers an estimated 4-acre area acting as a source of contamination to the ground-water plume. The northern lagoon wall is collapsing and overland transport of PCP/oil saturated soil and wood debris has resulted in sediment and surface water contamination in the off-site wetland. Wastewater was also discharged into wood chip piles formed during the manufacturing process. Surficial soils east of the treatment area, down to two feet deep, are contaminated with arsenic, copper, and zinc. The metals-contaminated soil extends from the treatment building into a wooded area on the eastern site boundary. PCP contamination of surface soils exist along the gully corridor and in hot spots in the treatment area, and where treated wood was stored. Emergency erosion control measures were taken in 1998 in an effort to reduce washout of contaminated wood debris from the lagoon wall into the wetlands.

Based upon currently available information, Penta Wood Products, Inc. (Penta Wood) is the only potentially responsible party at the PWP site. Penta Wood was the owner and operator of the site at the time of disposal of hazardous substances including PCP and arsenic. Legal title to the property is still held by Penta Wood.

On August 12, 1993, U.S. EPA issued a unilateral administrative order to Penta Wood pursuant to Section 106(a) of CERCLA. The order required Penta Wood to perform certain removal activities at the site. In an August 23, 1993 letter, Penta Wood's attorney advised U.S. EPA that Penta Wood did not have the financial ability to comply with the requirements of the order. U.S. EPA and Penta Wood subsequently entered into a consent decree requiring, among other things, that Penta Wood pay U.S. EPA $37,400 in partial reimbursement of its past response costs. The consent decree was entered by the United States District Court for the Western District of Wisconsin on April 11, 1996 and the complaint was filed on the same day.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

A complete chronology of community relations activities for the PWP Superfund Site is provided in the Responsiveness Summary (Appendix C). Recent activities include issuance of the Remedial Investigation/Feasibility Study (RI/FS) report and the Proposed Plan for the PWP Site. These documents were introduced into the Administrative Record in June, 1998. PWP Site documents are available to the public as part of the Administrative Record which is housed at two locations: (1) U.S. EPA Docket Room for Region V in Chicago, Illinois; (2) Burnett Community Library in Webster, Wisconsin. An information repository housing key documents, has also been established at the Grantsburg Public Library in Grantsburg, Wisconsin. The Administrative Record Index and addresses of the Administrative Record locations are presented in Appendix B.

A public comment period was held from July 7, 1998, to August 8, 1998. U.S. EPA ran a public notice on July 1, 1998, in *The Inter-County Leader* and *Burnett County Sentinel* to announce the comment period and the public meeting date. A public meeting was held July 15, 1998, at the Burnett County Government Center in Siren, Wisconsin. The meeting included a presentation on site history and the proposed remedy. No public comments were received during the public comment period. A listing of community involvement activities is included in the Responsiveness Summary (Appendix C).

IV. SCOPE AND ROLE OF THE RESPONSE ACTION

The final remedy for the PWP Site provides a comprehensive, proactive approach for site remediation. The free phase floating PCP/oil LNAPL, residual soil contamination and the highly contaminated groundwater serves as a continuous source of ground-water contamination. The remedy includes removing the free phase LNAPL and associated highly contaminated ground-water, while dewatering the thin unconfined aquifer below the LNAPL area. The separated PCP/oil phase will be incinerated off-site, and the highly contaminated ground-water will be treated and reinfiltrated. The exposed residual PCP/oil in the smear zone, the 100 feet of PCP/oil-contaminated unsaturated soil column, and the consolidated soils beneath the soil cover, will be degraded by enhanced natural biodegradation using bioventing. Remaining ground-water contamination will continue to naturally attenuate and degrade. Exposure to surficial soil and sediment contaminants will be controlled by consolidating these materials under the soil cover; fencing; installing a buttress between the lagoon and the wetland; grading the slopes and revegetating the site for erosion control. The highly contaminated arsenic soil will be immobilized by solidification, and all arsenic-contaminated material will be consolidated in the CAMU. The erosion control measures will be periodically inspected, and repaired as necessary. Subsurface soil concentrations, and ground-water concentrations will be monitored as established in the Operations and Maintenance plan, to establish the progress of the remedy. Institutional controls will be used to restrict use of land and ground-water at the site. Contingency plans will be developed, and implemented as necessary, to insure timely compliance with the clean-up criteria.

These remedial actions will prevent the potential for future human health and environmental risks associated with exposure to PCP, fuel oil components, and metals in the soil, sediment, and ground-water by (1) removing the ongoing source of PCP to the ground-water (2) reducing residual PCP/oil concentrations in the vadose soils (3) immobilizing the metals-contaminated soils (4) eliminating the exposure pathway to the metals-contaminated soils and the PCP/oil-contaminated soils and sediments, while they are biodegrading (5) eliminate overland flow of contaminated materials to the wetland and (6) reducing ground-water contaminant concentrations. In the event that monitoring shows that PCP soil and ground-water concentrations are not decreasing at an acceptable rate, additional remedial action will be considered. This may include in-situ oxidation, steam heating of the smear zone to enhance draining of the PCP/oil mixture, addition of moisture and/or nutrients to enhancement bioremediation rates, in-situ chemical oxidation or other technology considered appropriate at the time. A contingency plan will be developed and implemented in the event that monitoring shows exceedences of criteria at off-site receptor locations.

V. SUMMARY OF SITE CHARACTERISTICS

A. LAND USE

Land use in the area of the PWP Site is a mixture of agricultural, industrial, residential, and recreational. There are no zoning laws in effect. Future surrounding land use is likely to be residential and recreational. Potential future land uses of the PWP Site might include light industry or a tree farm on the majority of the site not under soil cover. The abutting properties north and east of the site, which include the wetlands, are used for hunting and select logging. The primary source of drinking water in the area is private wells screened between 60 and 175 feet below ground surface (bgs), within the surficial sand and gravel aquifer.

B. SURFACE WATER

Large areas of wetlands have been mapped surrounding the site. Wetlands adjacent to the northeast corner of the site are defined as forested, coniferous, wet soil, and palustrine. The wetland area extends northeast and east of the site and is in hydrologic communication with other wetland types and surface water bodies to the north and west. Within a four-mile radius of the site are approximately 2,137 acres of lakes, 94 acres of bogs, and 7,500 acres of wetland. In particular, Doctor Lake, and an unnamed lake, are located 2,000 feet east and northeast of the site, respectively, and the 7,233-acre Amsterdam Slough Public Hunting Area is located one mile north of the site.

C. GEOLOGY

The site stratigraphy can be divided into three stratigraphic layers: an upper sand, a glacial till, and a lower sand.

The upper sand is fairly continuous across the site extending from the natural surface to depths of 90 to 120 feet. The upper sand consists of well-graded sand with some minor amounts (<10 percent) of silt and clay, well-graded sand with silt, poorly graded sand, or poorly graded sand with gravel. Discontinuous lenses of till up to 25 feet in thickness were encountered within the upper sand, at depths of about 65 or 70 feet at three locations (MW02, MW05 and MW15).

The glacial till at PWP is of variable lithology. It consists mainly of silts, silty sands to sandy silts with gravel. The unit is present beneath most of the site between elevations of 910 and 965 feet mean sea level(msl) and ranges from 3 to 45 feet in thickness. The borehole data indicate that the tills are lenticular and vertically as well as laterally discontinuous.

The till is underlain by poorly sorted sand and gravel that is similar in composition, texture and depositional environment to the upper sand unit. The top of this lower sand unit was found at elevations ranging from 978 msl in IT01 (102.5 feet bgs) to elevation 910 feet msl in MW17 (215 feet bgs). The full thickness of the lower sand has not been determined during any of the subsurface investigations performed at the site. It extends to an elevation of at least 775 feet msl (300 feet bgs) to the bottom of the deepest boring (MW18D). The lower sand may be interbedded with glacial till layers at depths between 120 and 180 feet. The lower sand tends to fine upwards from poorly sorted gravel, medium-to coarse-grained sand to silty sand. Where the till unit is missing, the lower sand is usually indistinguishable from the upper sand and consequently, by convention, is described as part of the upper sand. Regional maps indicate the Pleistocene deposits overlay Cambrian sandstones and Precambrian basalt flows (WGNHS 1990). Geotechnical analysis of the upper sands indicates the material has neutral to alkaline pH, low cation exchange capacity, and little organic carbon in noncontaminated areas.

D. HYDROGEOLOGY

Ground-water at the PWP site occurs both in a thin unconfined aquifer and within a multi-layered semiconfined aquifer system. In most areas of the site, the unconsolidated glacial deposits form a deep unsaturated zone. The continuity of the consolidated till deposits determines two distinct ground-water flow systems. Discontinuous consolidated till deposits of varying thickness have caused semiconfined conditions. Till is absent and glacial deposits function as a single water-bearing unit below the lagoon and near the PCP treatment area.

1. Unsaturated Zone

The site is situated in a ground-water recharge zone. Because of the high permeability of surficial soils, precipitation rapidly infiltrates the soil. The depth to ground-water ranges from 20 feet in the topographic low northeast of the lagoon (MW13) to greater than 150 feet south of Daniels 70 (MW15). Capillary moisture requirements are minimal in the unsaturated zone. Most of the soils were found to contain moisture near the saturation level (6 percent). Thus, water infiltrating from the surface will have to satisfy only minimal capillary requirements before downward percolation occurs. The unsaturated hydraulic conductivity probably approaches the saturated hydraulic conductivity (19.3 ft/d) during a rain event. During dry weather, the unsaturated hydraulic conductivity of sandy materials may be lower by three orders of magnitude (Hillel 1982).

Infiltration tests performed at two locations in the wastewater discharge gully found infiltration rates relatively consistent (3.6 to 5.3 ft/day) throughout the entire depth of the borings with the exception of IT01 (at 20 feet) which was found to have an infiltration rate of 200 ft/day. The later infiltration rate is considered high even for an extremely sandy material.

2. Unconfined Aquifer

The unconfined aquifer consists of a thin zone of ground-water, within the upper sand unit, perched upon the less permeable till. Beneath the lagoon and the PCP treatment area, the consolidated glacial till deposits are discontinuous. At these locations, the unconfined and the underlying semiconfined aquifers behave as a single unconfined system. The observed saturated thickness of the unconfined aquifer ranges from less than 5 feet in MW06S to greater than 25 feet in MW18.

Ground-water elevation data were collected on 33 different occasions between March 25, 1988, and February 7, 1998. Based on the water level data, the observed ground-water elevations ranged from a maximum of 994.5 feet msl at MW18 on September 8, 1994, to a minimum 979.83 feet msl in MW06S on March 31, 1994. The ground-water levels in the unconfined aquifer have generally increased over the monitoring period, with maximum elevations occurring in June 1997. The maximum water level fluctuation observed in a single well over the entire monitoring period was 10 feet in MW18. The fluctuations in the ground-water levels could not be correlated directly to precipitation events. The lack of correlation was expected because of the time required for percolation through the thick unsaturated zone and the frequency of measurements.

Average horizontal flow velocities were calculated using a range of horizontal hydraulic gradients and an average hydraulic conductivity (21 ft/day) and assuming an effective porosity for the aquifer matrix of 0.30. The horizontal velocities that were calculated based on these data range from 0.07 to 0.6 ft/day (25 to 219 ft/yr). This compares well to the estimation of ground-water velocity based on the distribution of chloride. Chloride is a conservative indicator parameter because it travels at the same rate as ground-water and does not undergo any degradation. Because chloride was discharged to a pond outside the treatment building beginning in 1953, the distance chloride has migrated can be used to estimate the ground-water velocity. Based on the chloride distribution, the ground-water velocity is estimated to be about 25 ft/yr.

3. Semiconfined Aquifer

The semiconfined aquifer system consists of the ground-water within the lower sand unit. Twelve wells and the production well (PW01) were installed in the uppermost portion of the semiconfined system. Ground-water elevation data for the semiconfined wells were collected on 30 different occasions between May 8, 1990, and February 7, 1998. Ground-water elevations range from 980.80

feet msl in MW04 on March 28, 1994, to 987.22 feet msl in MW03 on October 10, 1997. The water levels in the semiconfined aquifer also increased over time, similar to the trend seen for the unconfined aquifer. The maximum water level fluctuation observed in a single well over the entire monitoring period was 5.85 feet in MW03. Consistent with the unconfined aquifer system, the fluctuations in the water levels could not be correlated to variations in precipitation.

Average horizontal flow velocities for the semiconfined aquifer were calculated using a range of horizontal hydraulic gradients and a geometric average hydraulic conductivity (7.6 ft/day), and assuming an effective porosity for the aquifer matrix of 0.30. The horizontal velocities calculated based on these data range from 0.01 to 0.1 ft/day (3.6 to 36 ft/year).

4. Ground-Water Flow Unit Interconnection

The water levels in the unconfined aquifer are generally a foot higher than measured in the semiconfined aquifer. The data suggest that the till, where present, is acting as a confining layer.

Water elevation data collected from three monitoring well pairs in the unconfined and semiconfined aquifers (MW18/MW05, MW10S/MW10, MW16/MW12) were compared to assess the hydraulic connection between the two units. The limited data indicate strong downward vertical gradients exist between the shallow unconfined and semiconfined systems. The calculated vertical gradients ranged from 0.008 to 0.045 ft/ft. The vertical gradients between the well pairs are about an order of magnitude higher than the estimated horizontal gradients indicating a large vertical component to the ground-water flow. The strong downward vertical gradients suggest that the unconfined aquifer may be discharging to the semiconfined system in the area surrounding the lagoon.

VI. MAJOR FINDINGS - REMEDIAL INVESTIGATION AND RISK ASSESSMENT

In March 1998, the RI report for the PWP Site was issued (CH2M HILL 1998b). The nature and distribution of contaminants at the PWP Site have been investigated since the early 1980s. Industrial chemicals identified in the environment include both organic compounds and inorganic elements associated with the PCP treatment process: PCP, its impurities and byproducts, the fuel oil carrier; and compounds and elements associated with the ACZA treatment process: ammonia, copper, zinc and arsenic. The most frequently detected contaminants at the PWP Site are PCP, arsenic, and copper. Fuel oil is routinely assessed with the indicator parameters Total Petroleum Hydrocarbons (TPH) or Diesel Range Organics (DRO). Compounds in addition to PCP that have been have been detected in the ground-water above Wisconsin Preventive Action Limits (PALs) are benzene and naphthalene. Arsenic, iron, and manganese concentrations in ground-water also exceed criteria, but their presence is due to the high reducing and low pH conditions caused by oxygen utilization by microbes degrading the PCP/oil in the ground-water. Soil arsenic found in the native aquifer soils is solubilized from the soil media under reducing and low pH conditions. Select soil and boiler ash samples analyzed for dioxins did not contain dioxin equivalent levels that exceed criteria (U.S. EPA 1998).

The PCP/oil mixture discharged on the surface has traveled to the ground-water and spread horizontally as a LNAPL layer is in equilibrium with pore pressures, and is not expected to continue spreading. PCP concentrations in ground-water have been monitored at the site since 1988, and some of the wells have 11 rounds of sampling data. PCP ground-water concentrations have shown consistent declines at the majority of monitoring wells over time, although many of the wells have only been monitored for three years (Figure 4). There is a general decrease in the size of the PCP plume, and the total contaminant mass of PCP in the saturated zone has declined from 1994. Contaminated ground-water is not discharging to the wetland, or migrating below the wetland to surface water bodies.

There is evidence that PCP is biodegrading in the ground-water by the natural attenuation parameter data taken during select sampling events. The ground-water is under anaerobic (reducing) conditions in both the unconfined and semiconfined aquifer in the LNAPL plume area.

Ground-water flow patterns at the site have changed since the closure of the production wells. Horizontal ground-water movement is slow, on the order of 25 feet per year. PCP movement is retarded by a factor of 3.5 in the saturated zone, due primarily to the presence of silts and clays in the sand, as discussed later, resulting in PCP migration at an average rate of 7 feet per year.

Elevated chloride levels in wells are associated with elevated PCP content. However, chloride levels cannot be directly related to PCP degradation because of the historical discharge of chloride to the boiler cooling pond. While anaerobic biodegradation can result in chlorophenol intermediates that may accumulate, anaerobic dechlorination field studies that were conducted found no accumulation of intermediate breakdown products in water samples.

A. SOURCE AREAS

Principle Threats:

1. Soils-Gully to Lagoon

The vadose zone soils within the two prominent arms of the gully leading from the oil/water separator to the lagoon are contaminated with PCP fuel oil mixture. This contamination is a result of spills and discharge of contaminated wastewater from the oil-water separator building to the lagoon. The ratio of PCP to TPH is about 5 percent, indicating that the PCP oil mixture is acting as a single compound in the environment. In general, PCP concentrations are highest in the first 20 feet bgs where the wood debris layer has absorbed the PCP oil mixture like a sponge, then drops until the 2 to 15 foot thick LNAPL smear zone is encountered. During test pit excavations, an oily liquid was observed seeping into the pit from the wood debris layer.

2. LNAPL

As a result of the PCP/oil mixture draining from the surface to the water table, LNAPL is present within a smear zone (i.e., zone of water table elevation fluctuation) over an estimated 4-acre area beneath the site. The LNAPL area is larger than the area of contaminated unsaturated zone midlevel soils (10 feet bgs to the water table), which is estimated to be 2.4 acres. This is a result of lateral spreading of the LNAPL once it reached the water table.

The LNAPL exists both as a free phase (i.e., floating on the water table) and as a residual phase (i.e., held immobile at residual saturation between particles in the soil). LNAPL distribution is significantly affected by water table fluctuations. As the water table rises, the mass of mobile LNAPL is reduced, as LNAPL is entrapped at a residual saturation below the water table. After the water table drops, LNAPL will drain back into the mobile LNAPL pool at the water table. The LNAPL does not completely drain from the vadose zone soil pore spaces because of surface tension effects. The LNAPL is a source of ground-water and soil contamination at the site.

The volume of LNAPL is the sum of the free-phase LNAPL and the residual-phase smear zone LNAPL. LNAPL thickness measurements in wells MW10S, MW19, and MW20, from 1994 and 1997–1998, have shown measurable LNAPL ranging from less than 1 inch to over 10 inches thick.

LNAPL thickness measured in monitoring wells can overestimate the true thickness in the formation. In one study, a sample of sandy soil similar to that at PWP, the actual thickness of mobile free phase LNAPL was near zero for measured thickness up to 3 inches in observation wells. Another sandy soil had less than 0.2 inch LNAPL at a measured observation well thickness of 9 inches (Farr et al. 1990). As a result, it is possible that free phase mobile LNAPL is overstated at the site.

The residual-phase LNAPL in the smear zone extends both above and below the present water table. The smear zone is estimated to be an average thickness of about 4 feet based on water table fluctuations.

Low Level Threats:

1. <u>Wood Chip Pile</u>

The wood chip pile located in the northwest corner of the PWP site contains both PCP-oil and metals contamination. The metals contamination consist of the ACZA components of arsenic, copper and zinc. Arsenic at 440 ppm was found in a very localized area of the wood chip pile to two feet deep. Zinc and copper were also found, but at levels below human health values. The contamination is present as a result of process wastewater discharges. Wastewater was discharged from the portable 300 gallon buggy five to six times per week for 6 to 7 years (i.e., approximately 450,000 gallons).

PCP and TPH have been detected in the wood chips at elevated levels of 1,300 mg/kg PCP and 24,000 mg/kg TPH from a depth of 4 to 7.5 feet, and 1,300 mg/kg PCP and 14,000 mg/kg TPH at a depth of 16 to 17 feet. Elevated levels of PCP were detected from the 0- to 3-inch depth at the southern toe of the wood chip pile, with concentrations of 520 mg/kg PCP, and 25,000 mg/kg PCP. PCP was not detected in the center or northern portion of the pile. PCP concentrations detected in soil boring samples from the wood chip/sand interface were minimal, with the exception of 134 mg/kg at 14 to 15 feet bgs, located near a PCP concentration of 1,300 mg/kg at

4 to 7.5 feet bgs. A ground-water grab sample collected in this area contained 6.2 µg/L PCP. MW24 contains 4 µg/L PCP, while the subsurface soil sample collected during MW24 installation at the wood chips and interface (17 to 19 feet bgs) contained 189 mg/kg PCP.

The PCP contamination is centered at the southern toe of the wood chip pile. Although significant levels of PCP and TPH were found in the wood chips, the soil interface beneath the wood chips appears minimally impacted. PCP in the wood chips ranged from 520 to 25,000 mg/kg, yet the soil beneath the pile contained a maximum of only 189 mg/kg. Similarly, ground-water samples collected at the water table in this area have minimal contamination.

2. Surficial Contamination

There are several locations on the site that have been contaminated by drippage from freshly treated lumber, and by overland transfer of this drippage by sheet run-off during rain events.

B. FATE AND TRANSPORT OF SITE-RELATED CONTAMINANTS

Metals:

Arsenic, copper and zinc, are immobile metals in the environment, and have only been found in surficial locations (to two foot depths), on the site. Overland transfer, through sheet run-off from rain events, has distributed these metals into lower lying areas, primarily the wetlands north of the lagoon. They are persistent in the environment, and will eventually be incorporated into vegetation growing on the contaminated soil. They will not leave the site unless physically removed or transformed to their soluble form under reducing conditions.

Pentachlorophenol/fuel oil:

1. Chemical Properties

Fuel oil is a mixture of low molecular weight hydrocarbons, two of which are benzene and naphthalene, compounds that contribute to both health based and environmental risks. Both benzene and naphthalene have been found on site. Both are amenable to biological degradation at chemical reactions rates greater than for PCP. They will be removed by biological activity well before the PCP concentration has been reduced to Enforcement Standards (ES) or Preventative Action Limits (PALs). Soil residual contaminant levels (RCLs) for the fuel oil components are shown in Table 1. PALs for ground-water fuel oil components are shown in table 2.

Pure PCP is a solid and heavier than water. It is practically insoluble in water (5 mg/L at 5°C, 14 mg/L at 25°C, Vesala 1979). It must first be dissolved in an organic solvent to be effective for wood treatment. The solubility of PCP in #2 fuel oil exceeds 5 percent. The specific gravity of PCP treatment mixtures is slightly above the specific gravity of #2 fuel oil (0.87 at 15°C; Kirk-Othmer 1980), so PCP dissolved in fuel oil floats on water. Once in the environment, the solubility of PCP is further influenced by the pH of the soil or ground-water. PCP is considered a weak acid, meaning its addition to water at any pH will not necessarily lead to full dissociation of hydrogen ion from the parent molecule. Specifically, PCP has an acid dissociation constant (pK_a) ranging from 4.71 to 4.92 (Kirk-Othmer 1984) at 25°C. The pK_a indicates the pH at which 50 percent of a weak acid will be dissociated. As a rule of thumb, systems with pH levels in excess of the pK_a by 2 Standard Units (S.U.) provides complete dissociation. For instance, an aqueous system with pH 6.8 will provide complete dissociation of PCP to its anion, pentachlorophenolate. This sodium salt of PCP has a solubility of 22,400 mg/L, a dramatic increase compared with the PCP molecule. Based on the latest ground-water sampling, the average ground-water pH is 7.16, and the average ground-water pH in the wells with LNAPL is 7.89. At these pHs, PCP is completely dissociated. As observed, this results in ground-water concentrations of PCP much higher than possible for pure PCP.

Solubility and sorption potential are strongly correlated (Chiou 1979). Researchers have found that sorption of the PCP molecule to mineral surfaces (clays) is 50 times greater than sorption of the pentachlorophenolate. A relative index of sorption is provided by distribution coefficients (K_d). A site-specific K_d of 17.2 was developed for the PWP site from soil washing treatability studies (Roy F. Weston 1994a) for unsaturated zone soils. This high K_d indicates that PCP, as it exists in the oil phase, will not readily leach from the soil.

2. Migration Pathways

PCP was introduced to the environment through the discharge of wastewater containing the PCP/ No. 2 fuel oil mixture from the oil/water separator into the gully and lagoon areas, the wood chip pile area, and other isolated areas. From the surface, the PCP traveled as a single phase with the No. 2 fuel oil to the ground-water table, where it spread horizontally as a LNAPL layer, until equilibrium with pore pressures was reached. Absent further LNAPL release, or changes in ground-water gradients, the LNAPL is not expected to continue spreading horizontally. The LNAPL acts as a continuous source of PCP to the ground-water. Within the saturated zone a site-specific K_d of 0.6 L/Kg was estimated based on a soil organic carbon of 0.04 percent. This indicates that the PCP is not as tightly bound to mineral surfaces as in the unsaturated zone.

Vertical migration of the LNAPL through the unsaturated zone is believed to have ceased. This is based on the lack of a substantial continuing source of pure phase LNAPL and the retention capacity of soils for fuel oil. The retention capacity of sands for light fuel oils is 4 percent of the soil volume (Dragun et al. 1991). TPH values in the contaminated soil of the unsaturated zone are much less than this value. Three samples from within the wood chips exceed 40,000 mg/kg (4 percent) TPH, although wood chips would be expected to have a much higher retention capacity. Slow releases of LNAPL from the wood chips would be retained in the sand, if the sand is below its retention capacity.

Dissolved phase PCP releases from the wood chips are expected to continue. However the rate of downward transport is minimal for PCP because of its high adsorption capacity (K_d = 17.2), and sand below its retention capacity. The more significant release mechanism for PCP is the dissolving of PCP from the LNAPL as phenochlorophenolate.

Migration pathways for the PCP in ground-water is generally expected to be in a radial pattern outward, and over a period of time in all directions, at a very slow rate. The flow directions are difficult to determine precisely from ground-water elevation data because the gradient is minimal. However, based on the distribution of the chloride and PCP contamination, it appears migration has occurred in all directions at roughly similar rates. It does appear that there will be less migration in the southwest direction as a result of the shut down of the water supply well PW-01 in May 1992. To the north, ground-water in the unconfined aquifer will eventually discharge to the wetland area.

Overland transport of contaminated soil and the PCP/oil mixture is another significant pathway, particularly in the northeast corner of the site. The northern wall of the lagoon is collapsing and wood debris from the site and fuel oil have been observed in the adjacent wetland.

3. <u>Contaminant Fate</u>

Contaminant fate processes for PCP in the subsurface include hydrolysis, volatilization, dispersion, adsorption, and biodegradation. Surficial soil and surface water PCP contamination can also be degraded by sunlight.

The rate of hydrolysis of PCP in the ground-water is not known. It is not expected that hydrolysis plays an important role in the destruction of PCP. PCP is considered a semivolatile, with a vapor pressure about four orders of magnitude less than that of volatile organic compound (VOC). As a result, volatilization of PCP is not a significant loss mechanism. Dispersion, the process by which concentrations are reduced as a result of horizontal and vertical spreading, will result in further reductions in PCP concentrations. Adsorption of PCP also occurs, which is dependent on its solubility and the soil organic carbon content. PCP is adsorbed on the organic and on the mineral portions of the soil, both significant mechanisms for retarding PCP migration. Solubility of PCP is dependent on the pH as discussed above. Within the ground-water the fraction of organic matter is considerably less than the unsaturated soils, resulting in a much lower K_d of 0.6 L/Kg, and much less adsorption. Because adsorption is a reversible process, it is not considered a remedial mechanism. It does provide additional time for natural processes to occur, however.

A K_d of 0.6 L/Kg for PCP in the saturated zone results in a retardation factor of 3.5. At an average ground-water velocity of 25 ft/yr, PCP is expected to migrate at 7 ft/yr. The estimated PCP migration velocity based on the travel distances from the perimeter of the LNAPL, and assuming the presence of LNAPL in 1960, is 10 ft/yr (based on a distance of 400 feet in 38 yrs). The estimates of migration velocity compare reasonably well. Travel times for migration of PCP from the perimeter of the plume to the nearest residential wells, a distance of about 400 feet, is on the order of 40 years. PCP has been detected once in a residential well at 2 ug/l, which is above health based Enforcement Standard in NO 140 Wisconsin Administrative Code. A duplicate sample on the same day was below the quantitation level. Subsequent sampling of this well on several occasions has not detected PCP or fuel oil constituents.

Estimates of contaminant travel times are subject to a high degree of inaccuracy because of the many simplifying assumptions. Of particular importance is the estimate of hydraulic conductivity and the K_d, both of which can vary by an order of magnitude within short distances within the sand aquifer. Actual travel times may be considerably different than the estimated average values presented.

This estimated travel time does not consider contaminant degradation. Given the long travel time for PCP to reach the ground-water and the relatively slow PCP migration velocities in ground-water, biodegradation is a significant loss mechanism. Biodegradation is the process by which microorganisms consume the PCP, either as a primary substrate or as an electron acceptor. Biodegradation of PCP may occur anaerobically or aerobically with rates generally expected to be more rapid aerobically.

Anaerobic biodegradation occurs by reductive dechlorination, a process in which the chlorine atoms are sequentially replaced with hydrogen (PCP to tetra chlorophenol to trichlorophenol to dichlorophenol to chlorophenol to phenol). Abiotic reductive dechlorination may also occur as microorganisms can release organ-metallic cofactors into the subsurface environment to catalyze the dechlorination reaction (Smith et al. 1994). Aerobic degradation pathways are less certain, although it appears that an initially hydroxyl group substitutes for a chlorine atom. Once the aromatic ring has two hydroxyl groups, the ring can be cleaved and then mineralized to carbon dioxide and water. Few intermediates other than chloride have been shown to accumulate (Rochkind, et al., 1986). Biodegradation rate constants vary considerably in the literature. Aerobic half lives range from 0.8 days to 51days.

Anaerobic half lives are more pertinent to the unsaturated zone at PWP because the high TPH concentration has resulted in sufficient biological activity to utilize the available oxygen and produce anaerobic conditions. Anaerobic half lives are more limited in literature and range from 6.1 days to 266 days (Pelorus Environmental & Biotechnology Corporation 1997). Site-specific aerobic half lives developed for treatability studies were generally on the order of 30 days (Roy F. Weston 1995a).

VII. SUMMARY OF SITE RISK

A Baseline Risk Assessment was conducted to evaluate potential risks from contaminant exposure at this facility, and determine the need for and extent of remediation. A Focused Human Health Risk Assessment Report (Ecology & Environment 1997) and a Screening Level Ecological Risk Assessment Report (CH2M HILL 1998a) were prepared. The risk assessments were conducted in accordance with U.S. EPA's guidance, including: "*Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual" (U.S. EPA 1989); "Risk Assessment Guidance for Superfund: Volume I Environmental Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors; Part B, Development of Risk-Based Preliminary Remediation Goals" (U.S. EPA 1991); and Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (U.S. EPA 1997).* These documents provide the methodology and standard assumptions used for evaluating risk and developing appropriate cleanup standards.

A. OBJECTIVES

The specific objectives of the baseline risk assessment for the PWP Site facility were to provide:

- an evaluation of potential human health and ecological risks and a basis for determining the need, as required, for remedial action at this facility;

- a basis for determining the appropriate remedial target cleanup levels for contaminants in soils, ground-water, sediments, and/or surface water, as necessary; and

- a basis for comparing the health impacts of various proposed remedial alternatives

B. HUMAN HEALTH

The Human Health Risk Assessment for the PWP Site is a quantitative evaluation, conducted in accordance with U.S. EPA and state guidance, and consists of the following components:

- Hazard Assessment;
- Exposure Assessment;
- Toxicity Assessment;
- Risk Characterization; and
- Discussion of Uncertainty.

The Human Health Risk Assessment for the PWP Site indicates that the ground-water contaminant concentrations result in carcinogenic and non-carcinogenic risk estimates greater than the U.S. EPA target risk range. Site soil concentrations also resulted in carcinogenic and non-carcinogenic risk estimates greater than the U.S. EPA target risk range.

1. Hazard Assessment

The Focused Human Health Risk Assessment (FHHRA) was prepared using the characterization data from the Emergency Response Team (ERT) investigation conducted in 1994 (Roy F. Weston 1994 and 1995). Exposure concentrations used in the FHHRA were based on pre-removal action concentrations, and were not adjusted after highly contaminated soil was removed from the site in 1996, so they should be viewed as high-end estimates. The objective of the FHHRA was to evaluate potential adverse health effects associated with site-related contaminants in the absence of remedial action. Consistent with the SACM approach, constituents of potential concern (COPCs) were determined by WDNR and U.S. EPA and the FHHRA focused on PCP, arsenic, copper, zinc, and dioxins/furans. Dioxins/furans were qualitatively evaluated (Ecology & Environment 1997). Preliminary remediation goals (PRGs) based on concentration levels corresponding to an excess cancer risk between $1x10^{-6}$ to $1x10^{-4}$, and/or a chronic health risk defined by a hazard quotient of 1 were developed for soil and ground-water for an expanded list of COPCs in the Feasibility Study (CH2M HILL 1998c). Table 1 presents COPCs for soil and compares human health and ecological PRGs with other appropriate federal and state criteria. These criteria include the human health based Wisconsin NR 720.11 RCL, and the soil concentration protective of ground-water. The latter identifies the contaminant concentration that can be left in the soil that will not exceed Wisconsin PALs if the contaminant leaches into the ground-water.

Table 2 presents COPCs for ground-water and compares risk-based levels with Wisconsin PALs, ES and Federal Maximum Contaminant Levels (MCLs).

2. Exposure Assessment

The purpose of the Exposure Assessment is to estimate the type and magnitude of potential exposure to constituent of potential concern (COPC) at or migrating from the PWP Site based on site-specific conditions. Exposure is quantified by calculating exposure doses for each exposure scenario. Exposure doses are calculated based on the exposed populations, exposure point concentrations, and exposure pathways using the equations and default values presented in U.S. EPA and state guidance (U.S. EPA 1988, 1989a, 1991). Exposure and risk estimates were generated by using conservative (health-protective) reasonable maximum exposure (RME) and average exposure values. The average case represents exposure that is most likely to occur for most of the potentially exposed population, and is evaluated with the RME case to provide a range of risk estimates. The exposure assessment focused on potential future uses of the site and conservatively included residential exposure scenarios as well as industrial and construction/excavation worker. Exposure and risks were estimated for both "general" site residents and workers (assuming random exposure across the site), and treatment area residents and workers (assuming that a residence or workplace is located in the treatment building area). The PWP Site was industrial, and it is expected that future uses will remain industrial. The property northeast of the site that contains the impacted wetland is used for hunting and logging. The two residential wells nearest the site are located south of Daniels 70; one well serves a farm with a small herd of beef cattle. Table 3 presents a summary of the media evaluated, exposed population and complete exposure pathways, and cancer and non-cancer risks for the on-site general area and the treatment area.

3. Toxicity Assessment

The toxicity assessment provides information regarding the potential for a specific COPC to cause adverse effects in humans, and characterizes the relationship between the dose of a chemical and the incidence of adverse health effects in the exposed population This assessment, therefore, identifies a dose-response value that can be used to quantitatively evaluate potential health risks as a function of chemical exposure.

Carcinogens

Carcinogenicity is quantified by the cancer slope factor (CSF). The CSF is U.S. EPA's upper-bound lifetime probability of an individual developing cancer as a result of a lifetime exposure to a carcinogen. CSFs are determined by U.S. EPA and published in an integrated risk information system (IRIS, 1998b), an on-line database for toxicity data, and health effects assessment summary tables (HEAST, 1998c). A summary of the oral dose-response information for carcinogenic effects, including the CSFs, for each COPC is provided in Appendix E of the FS report (CH2M HILL, 1998).

Non-Carcinogens

Non-carcinogens are those compounds that cause an effect (e.g., liver damage) other than carcinogenicity. Carcinogens may also have non-carcinogenic effects; these effects are considered and included with the effects of non-carcinogenic compounds. In addition, non-carcinogenic compounds differ from carcinogens in that they are believed to have threshold dosage levels below which adverse effects are not expected. U.S. EPA's preferred criterion for quantifying non-carcinogenic risk is the reference dose (RfD), which corresponds to U.S. EPA's identification of the threshold effects level with an added margin of safety. The IRIS database maintains a current listing of all the verified RfDs, which are reported in units of mg/kg-day. By definition, the RfD is an estimate of an average daily exposure level below which significant, adverse non-carcinogenic health effects are not expected. Appendix E in the FS report presents the chronic RfDs and oral dose-response information for non-carcinogenic effects for each COPC. Toxicity profiles for the COPCs are available from the IRIS database.

4. Risk Characterization

The Risk Characterization integrates the quantitative exposure and toxicity values for each exposure scenario. Table 3 presents a summary of the quantitative summary of site risk.

Carcinogenic Effects

Carcinogenic risks are evaluated by multiplying the estimated exposure dose by the CSF to obtain an estimate of incremental risk, as follows:

Carcinogenic Risk = Exposure Dose (mg/kg-day) x CSF $(mg/kg\text{-}day)^{-1}$

The cancer risks of each compound are summed within each exposure scenario. U.S. EPA's guidelines state that the total incremental carcinogenic risk for an individual resulting from exposure at a hazardous waste site should not exceed a target risk range of $1x10^{-6}$ to $1x10^{-4}$ (U.S. EPA 1990). In this risk assessment, the estimated carcinogenic risk for each exposure scenario was compared to these values. If the estimated risk is below the acceptable range, no further action is recommended. If the estimated risk is within the acceptable range, the exposure scenario is reviewed to determine whether further actions are warranted, depending on where the estimated risks fall within that range. Further actions are recommended for estimated risks exceeding the upper end of the target risk range ($1x10^{-4}$).

Non-carcinogenic Effects

Non-carcinogenic effects are quantified in terms of a Hazard Index (HI), which is calculated by dividing the exposure dose by the RfD:

Hazard Index (HI) = Exposure Dose (mg/kg-day) / RfD (mg/kg-day)

Non-carcinogenic risks are evaluated by dividing the exposure dose of each compound by its respective RfD, and summing the resulting hazard index for each compound within each exposure scenario. The resulting cumulative non-carcinogenic risk for each exposure scenario was compared to the U.S. EPA target HI of 1. If the HI is less than or equal to 1, no adverse health effects are anticipated from the predicted exposure dose level. If the HI is greater than 1, the predicted exposure dose level could potentially cause adverse effects (U.S. EPA 1989a). Table 3 presents a summary of the carcinogenic and non-carcinogenic risk estimates for each exposure scenario.

5. Summary of Human Health Risk Assessment

Based on the PWP Site conceptual model developed in the RI, four media at and surrounding the PWP Site were identified as the focus for the human health risk assessment:

- Soil;
- Ground-water;
- Outdoor Air; and
- Homegrown Produce.

Soil

Based on the results of this risk assessment and anticipated future use of this land, remedial action is necessary to protect human health due to contaminants present in surface and subsurface soils. Subsurface soils require remediation to limit leaching of contaminants to the ground-water. Contamination in soils has also extended off the PWP property along an alluvial fan ending in the wetland. A site-specific quantification of potential risks was calculated using an adult resident, a typical worker, and a construction/excavation worker scenarios. The estimated carcinogenic and non-carcinogenic risks were well above U.S. EPA target risk ranges in the treatment area, and within the target risk range for the sitewide soils. At each exposure point where a receptor may come into contact with known or potentially contaminated media, exposure point concentrations (EPCs) are determined for each COPC. For the PCP data, the 95 percent upper confidence limit (UCL) on the mean chemical concentration of the data set was used as the EPC. For the metals data, relatively few detections were observed in the samples. A probability plotting method was used to fit the data to a lognormal distribution above the detection limit and then extrapolate to values below the detection limit. The extrapolated values and detected values were combined to compute the 95 percent UCL.

Areas of soil exceeding U.S. EPA target risk ranges, and WDNR soil RCLs and soil concentration protective of ground-water are shown in Figures 2-1 through 2-4 of the FS report. PCP and arsenic are the principal threats driving the remediation; the other COPCs are within the PCP and arsenic areas. The $1x10^{-6}$ U.S. EPA industrial site worker cancer risk PRG, and the WDNR Non-residential RCL for arsenic are lower than regional background levels for arsenic. A site-specific background arsenic level will need to be determined.

Ground-Water

Ground-water is the sole drinking water source in the area. The risk assessment indicates that PCP ground-water contaminant concentrations result in carcinogenic and non-carcinogenic risk estimates greater than the U.S. EPA target risk range, based on residential drinking water scenarios.

Contamination in ground-water has been detected off site at one occasion at one residential well, and at the perimeter of the property. Future potential receptors were assumed to be residents using the on-site ground-water for drinking water. Drinking water exposure could be via ingestion or dermal contact with the ground-water.

A site-specific quantification of potential risks was calculated for ground-water using the residential drinking water scenario, and are summarized in Table 3. The estimated carcinogenic and non-carcinogenic maximum calculated risk and Hazard Index are 1.4×10^{-1} and 100 respectively. The results of the qualitative human health risk assessment indicate that over 99 percent of the risk is from PCP. Other COPCs that have been detected at or above federal drinking water standards, and NR 140 Enforcement Standards, are benzene (in 2 wells), naphthalene (in 4 wells), and arsenic (in 1 well). Elevated levels of iron, manganese, and chloride that exceed public welfare taste or odor aesthetics criteria are also present in ground-water; the arsenic, iron, and manganese are present as a result of reducing conditions in the LNAPL area that are solubilizing native metals from the soil. Chloride is elevated from the discharge of water softener salt and as a result of PCP degradation.

Outdoor Air

Based on the results of the risk assessment, no remedial action is necessary to protect human health relevant to inhalation of outdoor air at the site, even within the treatment area with a future residential land use.

Homegrown Produce

The risk assessment indicates that contaminant concentrations present sitewide would result in carcinogenic risks at 5.5×10^{-5} for the ingestion of homegrown produce by residents. Contaminant concentrations in the treatment area result in carcinogenic and non-carcinogenic risks that exceed U.S. EPA target risk ranges for the ingestion of homegrown produce.

C. ECOLOGICAL RISK ASSESSMENT

The objective of the Screening Level Ecological Risk Assessment is to evaluate the current and future potential ecological risks that may exist at the PWP Site in the absence of any remedial action. The risk assessment process follows procedures as described in *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Final* (U.S. EPA 1997). Risk is characterized on the basis of several conservative exposure assumptions, utilizing maximum concentration data. A problem formulation phase served to develop a conceptual model of site contaminants, potential exposure pathways and receptors. The outcome of the problem formulation phase was the identification of appropriate assessment and measurement endpoints for the quantitative risk assessment. COPCs were identified, and ecological effects data was assessed to develop ecological exposure estimates for each representative receptor of concern. Hazard quotients (HQs) were calculated which compare point estimates of ecotoxicity values to exposure values for each receptor based on food, soil, and surface water ingestion. As the HQs generally greatly exceeded 1, ecological PRGs for the COPCs were developed in the FS report. The PRGs were also compared to federal and state environmental criteria or guidance levels.

1. Problem Formulation

The environmental setting of the PWP Site consists of a hardwood and coniferous forest, with numerous water bodies and associated wetlands nearby. On and immediately adjacent to the PWP site are three distinct community types; upland scrub/grassland (previously active portion of the site), upland mesic/dry mesic forest, and forested wetland. Areas of significant aquatic habitat are not present immediately adjacent to the site. Contaminated soils or sediments have been detected in each of the community types. Ground-water is located from over 100 feet below ground surface at the southern portion of the site to the surface water interface where it discharges to the wetland. Contaminated ground-water is not accessible to ecological receptors, as contaminated ground-water does not extend to the wetland. Surface water in the wetland is contaminated as a result of overland transport of contaminated material. The same COPCs identified for the FHHRA were used as ecological COPCs, i.e., PCP, arsenic, copper, and zinc.

Receptors may be exposed to site contaminants through routes that include incidental ingestion of surface soil, sediment and surface water; direct contact with surface water, sediments and surface soils; and possible inhalation of soil particles. Use of contaminated wood chips for nest building may also bring bird species in direct contact with contaminants. Ground burrowing may also bring mammals in contact with contaminated materials.

Plants growing on and adjacent the PWP site may come into direct contact with soil-associated contaminants. Arsenic and PCP are both known to be phytotoxic. Some indication of phytotoxicity is already present on and adjacent to the site.

Ingestion of food items which may have accumulated site-related contaminants may represent an exposure pathway, however this exposure route is considered less likely given the nature of contaminants present. Arsenic is taken up by plants through the root system, but typically not at levels that are toxic to consumers such as herbivores. PCP in soil can also be taken up by root tissue, however, translocation to the inner portions of the plant are negligible (Ecology and Environment 1997). As a result, food chain transfer of site-related contaminants through plants is not considered significant. In contrast, PCP bioaccumulation in earthworms has been demonstrated to range from 3.4 to 13 for uptake of PCP adsorbed to soil particles, with much higher values reported for tests on the basis of PCP in soil solution (ASTDR 1994). PCP is rapidly excreted, however, and there is little tendency to persist in tissue (Eisler 1989). This tendency may limit the potential for food chain transfer to secondary consumers such as small mammals and birds.

Although PCP is known to bioaccumulate in aquatic organisms it is not known to biomagnify. There is also limited evidence of bioaccumulation of the compound in the aquatic food chain, as it does not persist in living tissue (ASTDR 1994). The limited amount of aquatic habitat on or adjacent to the site would preclude bioaccumulation in fish as a significant exposure pathway.

Wildlife species known in Burnett County include 94 breeding bird species, 35 reptile and amphibian species, and 72 species of mammals. The representative receptor species chosen based on the exposure pathways of concern and the amount and quality of toxicity information available for the receptor were deer mouse, short-tailed shrew, raccoon, and American robin.

2. Evaluation of Protected Species in Burnett County

The U.S. Fish and Wildlife Service (FWS) identified three rare, threatened, or endangered species known to occur in Burnett County: the bald eagle, gray wolf and Karner blue butterfly. The FWS concluded that none of the listed species are expected to be affected by the site (Attachment A, Ecological Risk Assessment). The WDNR identified three threatened bird species (bald eagle, osprey, and red-shouldered hawk) and one endangered plant species (sand violet). The on-site communities are not expected to provide significant habitat area for the animal species. Although a site specific survey has not been conducted, the disturbed condition of the PWP site makes the presence of the sand violet unlikely.

3. Effects Evaluation and Exposure Estimates

Screening level ecotoxicity values for each contaminant of concern at PWP was developed from the available literature. When possible, screening ecotoxicity values represent a no-observed-adverse-effect-level (NOAEL) determined through long-term (chronic) exposures scenarios. If NOAELs (preferred) were not available then lowest-observed-adverse-effect-level (LOAELs) were used with a correction factor of 0.1 applied. If LOAELs are not available then LC_{50} or EC_{50} values were reviewed for appropriate application to this risk assessment.

Table 6 in the Ecological Risk Assessment report summarizes the toxicity information on arsenic, copper, zinc, and PCP considered to be suitable for risk characterization given factors such as test duration, test species and state or formulation of test material. From this information screening ecotoxicity values were developed for use in risk calculations. When appropriate, correction factors were applied to derive a specific NOAEL value.

Exposure estimates were calculated for each receptor of concern at PWP. Ingestion was considered the primary route of exposure of site contaminants to potential receptors. Exposure estimates in the form of an exposure dose were calculated for each receptor and contaminant. Exposure doses were was derived by multiplying the ingestion rate for the test species by the maximum observed concentration of a contaminant (in mg/kg).

Estimates of body weight and food ingestion rates of receptor animals were obtained from USEPA's *Wildlife Exposure Factors Handbook* (USEPA 1993). Rates of incidental soil and water ingestion for each receptor were also developed following the USEPA approach as described in the *Handbook*.

4. Ecological Risk Characterization

The HQ approach, which compares point estimates of screening ecotoxicity values and exposures values, was used as the primary approach for Risk Characterization. Screening ecotoxicity values are equivalent to a documented and/or best conservative estimated chronic NOAEL. Thus, for each contaminant and environmental medium, the hazard quotient is expressed as the ratio of a potential exposure level to the NOAEL. An HQ less than one (unity) generally indicates that the contaminant alone is unlikely to cause adverse ecological effects. Hazard quotients were calculated for each receptor under each of the four exposure scenarios using the following equation:

$$HQ = \text{exposure point concentration/adjusted toxicity reference concentration}$$

HQ values for each receptor based on food, soil, and surface water ingestion at PWP are presented in Table 4. Calculations of exposure levels for each of the four receptors under each of the four exposure scenarios resulted in several HQ values which exceeded one (unity).

Erosion and drainage from on-site areas into surrounding woodland and wetland has resulted in elevated levels of PCP and arsenic within the wetland area. The risk appears greatest from exposure to PCP and arsenic, with lesser risk levels associated with copper or zinc. These elevated levels appear to represent a risk to ecological receptors inhabiting areas adjacent to the site. As habitat quality in these areas can be considered relatively high, the potential for receptor exposure can also considered relatively high.

Additional characterization of potential ecological risk at PWP can be made based on comparison of contaminant concentrations with available media-specific criteria or benchmarks. Although aquatic habitat sufficient to support fish and a diversity of aquatic invertebrates is generally lacking on or immediately adjacent the site, wetlands down gradient of the washout gully may support some aquatic or semi-aquatic species. Several existing benchmark or criteria for COPCs in sediments and surface water are summarized in Tables 5 and 6, respectively.

Contaminant concentrations in the sediment and surface water were compared to available criteria or benchmarks as an additional characterization of potential risk at the site. Contaminants detected at concentrations above available benchmarks may be considered to represent additional risk to receptors at the site. Maximum concentrations of PCP and arsenic in surface waters collected from the off-site wetland exceed chronic water quality criteria. Benchmark values for PCP, arsenic and copper in freshwater sediments are also exceeded.

5. Summary of Ecological Risk Assessment

Based on the screening level risk assessment, subsequent development of a range of site-specific PRGs, and the comparison of contaminant concentrations to the site-specific PRGs and established federal and state criteria, it is concluded that the contaminant concentrations on-site, and off-site in the wetland pose a threat to the environment. Table 5 and Table 6 summarize the PRGs for COPC in sediment and surface water, respectively.

VIII. REMEDIATION OBJECTIVES

Pentachlorophenol and arsenic are the primary risk drivers at the site. Pentachlorophenol is present in soils down to ground-water, is a major component of the LNAPL, and is present in the ground-water plume. Arsenic is present primarily in surface soils and in wetland sediments.

Pentachlorophenol: The remedial objective is to reduce the PCP content in soils and ground-water to achieve compliance with ch. NR 720, Wisconsin Administrative Code, and in ground-water to achieve compliance with PALs, as established in ch. NR 140, Wisconsin Administrative Code, within a reasonable period of time, by removing the free phase LNAPL, and associated highly contaminated ground-water, remediating the PCP in the soils, and monitoring the intrinsic remediation of PCP in the ground-water. Provisions will be installed to reduce direct contact exposure potential during the remedy. Site erosion control systems will also be constructed.

Arsenic: Highly contaminated arsenic soils will be immobilized and consolidated with other arsenic contaminated soils (above background), and secured, to achieve compliance with ch. NR 720. Soil contaminated with arsenic and other metals will be managed to essentially eliminate the direct contact exposure route and to protect ground-water. Performance of the metals consolidation area will be monitored.

Erosion Controls: An Erosion Control Plan will be implemented and maintained to prevent physical transport of contaminatination off-site and to protect the cap and consolidated areas from damage. The erosion control measures will be periodically inspected, and repaired as necessary.

These remedial actions will prevent the potential for future human health and environmental risks associated with exposure to PCP, fuel oil components, and metals in the soil, sediment, and ground-water by (1) removing the ongoing source of PCP to the ground-water (2) reducing residual PCP/oil concentrations in the smear zone and vadose soils (3) immobilizing the metals-contaminated soils (4) eliminating the exposure pathway to the metals-contaminated soils; (5) eliminating the exposure pathway to PCP/oil-contaminated soils and sediments while they are biodegrading (6) eliminating overland flow of contaminated materials to the wetland and (7) restoring the ground-water to PALs.

IX. DESCRIPTION OF ALTERNATIVES

Thirty four potential remedial technologies were identified in the FS Report (Tables 3-1 through 3-3 of the FS). Seven options were retained for detailed analysis for the soil media, five options were retained for detailed analysis for the LNAPL, and nine options were retained for detailed analysis for the ground-water media. These remaining technologies were assembled into five soil alternatives and five ground-water/LNAPL alternatives that range from No Action (used as a baseline to compare with the other alternatives) to containment to permanent treatment. Soil alternatives were combined with ground-water/LNAPL alternatives and five alternatives were selected for the Proposed Plan and are discussed below. Table 7 presents the key components of each alternative.

A. ALTERNATIVE 1 - NO ACTION

This alternative was developed and evaluated in the FS to serve as a baseline with which to compare the other remedial alternatives. For the No-Action Alternative, no institutional controls would be implemented and no remedial actions would be conducted. This alternative would not implement institutional controls to prevent the potential for future exposure to contaminated ground-water, soil, sediments and surface water and would not include remedial action statutory and regulatory requirements to reduce ground-water contaminant concentrations to PALs. Off-site transport of PCP- and metals-contaminated soil to the wetland would continue.

Given the 4-acre LNAPL area that contains an estimated 550,000 gallons of residual-phase and free-phase LNAPL, continual loading of contaminants to the ground-water would likely occur for hundreds of years. It is unlikely natural attenuation processes would reduce PCP concentrations in the center of the LNAPL area to PALs within a time frame regarded as reasonable.

Estimated Time to Design and Construct = No remedial activities required
Estimated Remedial Time Frame = Hundreds of years
Estimated Capital Cost = $0
Estimated Operation and Maintenance Costs (net present worth) = $0
Estimated Total Cost (net present worth) = $0

B. ALTERNATIVE 2 - SOIL CONSOLIDATION AND COVER WITH SOIL, NATURAL ATTENUATION, GROUND-WATER AND LNAPL COLLECTION AND TREATMENT AND MONITORED NATURAL ATTENUATION OF GROUND-WATER

In this alternative, soil remedial objectives are met through prevention of direct contact to soils, preventing continued erosion of contaminated soils and allowing natural processes to reduce the PCP in soil. Small isolated areas of PCP-and arsenic-contaminated soil, will be excavated and consolidated over the LNAPL area. This area will be covered with 1 foot of clean soil and vegetation established. Figure 5 presents the layout of the soil cover.

Ground-water remedial objectives are met by removing the free phase LNAPL and treating the grossly PCP-contaminated ground-water plume. The remainder of the PCP plume will be restored by natural attenuation, consistent with ch. NR 140 standards, within a reasonable period of time.

LNAPL removal will consist of isolating and collecting the LNAPL and storing it. It will then be sent off site to a RCRA compliant incinerator for disposal. Ground-water treatment will consist of contaminant removal (VOC, semivolatiles, PAH) by carbon adsorption. The treated ground-water will be discharged on-site through infiltration galleys, or by use of injection wells, in accordance with the substantive requirements for a WPDES permit and section NR 140.28, Wisconsin Administrative Code, outside the area of soil and ground-water contamination. Pore exchange modeling estimates show that over 90 percent of the PCP in the ground-water would be removed after 5 years (Appendix F of the FS).

This alternative would consist of the following components:

- Building demolition
- Solidification of highly contaminated arsenic soils
- Segregation and placement of other arsenic soils above background in a CAMU
- Consolidation of PCP/fuel oil soils and wood chips under a soil cover
- Bioventing PCP/fuel oil contaminated material

- Biopad removal and backfill on-site
- Erosion control measures
- Revegetation
- LNAPL removal
- Grossly contaminated ground-water collection, treatment and discharge
- Monitored natural attenuation
- Institutional controls
- Environmental monitoring/maintenance
- Point-of-use carbon treatment, if necessary
- Five-year site reviews

1. Building Demolition

Existing buildings will be demolished. This includes the former PCP treatment building and the oil/water separator building. Asbestos may be of concern in the former treatment building, which may increase demolition costs. Demolished buildings would be disposed of in a nearby solid waste landfill, salvaged, or used for on-site fill, if the demolition debris is below Toxicity Characteristic Leaching Procedure (TCLP) for arsenic and PCP. Debris that contains PCP or arsenic above TCLP levels for arsenic and PCP, will be disposed of either in a special waste landfill or a hazardous waste landfill.

2. Solidification of Arsenic Soils

The objective of this component is to excavate arsenic-contaminated soils, treat the grossly contaminated soils using solidification, and dispose on-site in an area separated from the organic contamination. The area of soil contamination will be designated as a Corrective Action Management Unit (CAMU) in accordance with ch. NR 736, Wisconsin Administrative Code, to allow consolidation of soils containing listed hazardous waste without triggering Land Disposal Restrictions (LDRs). Since both the ch. NR 720 Non-industrial and Industrial Direct Contact Residual Contaminant Levels (RCLs) are at or below background, arsenic-contaminated soils exceeding background (to be established) will be consolidated in the metals disposal area. Previous investigations at the site have shown that solidification will reduce the arsenic contaminated soil's leachability to below the TCLP limit for arsenic (Roy F. Weston December 1994a). After solidification, the cemented soil would be disposed of in manageable pieces on-site within a designated area in the CAMU. Forty thousand cubic yards of arsenic contaminated soil may require solidification. Confirmatory sampling will be conducted to determine actual volumes. All site arsenic containing waste will be consolidated into one small area which will be monitored.

3. Consolidation and Soil Cover

The area of soil consolidation will be designated as a CAMU, to allow consolidation of soils containing listed hazardous waste without triggering Land Disposal Restrictions (LDRs). A soil cap will allow percolation of rain water, and will introduce moisture that is necessary for biological activity. A RCRA cap would eliminate infiltration of moisture, and therefore restrict biological activity while remediation is in progress.

A soil cover will be placed over the CAMU. Areas on the site exceeding arsenic and PCP/Fuel Oil RCLs (PRGs), in soil and sediment will be excavated to the appropriate ch. NR 720 Residual Contaminant Level, and consolidated within the CAMU, prior to placement of the soil covers (Refer to Figure 5). Co-mingling of arsenic and organics will be avoided to the extent possible. Portions of the wood chip pile will also be excavated and consolidated within the CAMU. A fence will be erected around the soil cover areas.

Removal of trees will be necessary in the area north and east of the lagoon prior to excavation. Efforts will be made to save mature trees. The source areas will initially be covered with 6 inches of clean soil from the uncontaminated areas west of the lagoon area. Following installation of the erosion control measures and the lagoon and dam repair, an additional 6 inches of soil, with sufficient organics to allow revegetation, would be placed on the soil cover area, and other areas disturbed by the consolidation activities.

4. Biopad Removal

The biopad will be broken up into manageable sized blocks and used as backfill to support the lagoon wall. This will also eliminate the potential of spreading arsenic contaminated concrete chips into the wetland.

5. Erosion Control Measures

Severe surface water erosion is occurring at the PWP site. The apparent cause of most of this erosion is rapid overland flow of water in the absence of vegetation and other natural flow barriers at the site. Evidence of this erosion is seen by the gullies and channels that have formed in areas where drainage paths have coalesced.

An erosion control plan for the PWP site will be developed and implemented. This plan will involve controlling surface-water runoff such that the volume and velocity of overland flow is reduced to a level that will eliminate erosion of surface soils. This goal will be achieved by constructing drainage ditches and water detention or infiltration basins at several locations on the site. The number and type of erosion control structures will be determined in the design phase, and will take into account the effect of interim surface control measures implemented by the U.S. EPA Emergency Response Branch (ERB). Soil replacements, amendments and reinforcement may be necessary. The design of drainage ditches will likely involve use of geotextiles and rip rap to prevent erosion of the sandy material below and along the sides of the ditches during water flow. Check dams constructed of rip rap will likely be used in steeper areas to slow the velocity of water flow. The gullies on the north side of the PWP site may require some type of conveyance structures (e.g., corrugated metal culverts) to convey water from the PWP site to the bottom of the sloped area.

Serious erosion has occurred on the downstream face of the lagoon dam embankment. This erosion has resulted in the deposition of sand and wood debris that can be found 1000 feet downstream of the dam, and the formation of gullies on both sides of the dam. The gullies coalesce into a single gully 40 to 50 feet downstream of the crest of the dam. Cracks occur in several areas at the crest of the dam, suggesting that future failures are imminent.

The lagoon dam repair and recontouring plan will involve stabilizing the existing gully area and diverting some or all of the surface water that currently reaches the lagoon to detention or infiltration basins, or to other drainage areas. The goal of the lagoon dam repair effort will be to create a uniform slope of about 15 to 20 percent, consistent with the slopes on either side of the existing gully. The amount and type of material to achieve acceptable slope conditions downstream of the lagoon will be determined during design.

6. Revegetation

A revegation plan will be developed and implemented in conjunction with the Erosion Control Plan. Much of the PWP site is currently devoid of or sparsely covered with vegetation. Soils exposed at the site are primarily sands and gravels with limited capacity to support plant growth. Following consolidation of contamination from areas on the eastern side of the site, and excavation of areas on the western side of the site for cover soil, reestablishing vegetation will be necessary over much of the site.

The amount and type of revegetation will be consistent with the anticipated end use of the site and surrounding land use. Several options are presented in the FS: one option that is proposed as part of Alternative 2 is consistent with future commercial or industrial use, and involves importing 6 inches of organic rich soil to promote plant growth to allow rapid revegetation of the soil cover area. In the excavated areas not provided with a soil cover, the grading and erosion control measures would allow vegetation to reestablish. This plant growth would likely consist of grasses, thistles, and bushes within the central area of the PWP site, and pine and other trees around the perimeter of the site.

7. LNAPL Removal

The objective of LNAPL system is to remove a source of PCP to the ground-water. Investigations have identified a measurable LNAPL source just north of the Oil/Water Separator process area.

The designated LNAPL recovery system will consist of LNAPL recovery pumps, LNAPL sensing probes, connecting pipes, controls, and a storage tank. The controls will be located within the ground-water treatment building and will include on-off operation, storage tank high-level shutoff, and remote sensing alarms. Other ground-water extraction wells will be designed and installed to depress the water table in the LNAPL zone to promote LNAPL removal. All PCP contained in the extracted ground-water will be removed or treated.

Initially the ground-water level in the LNAPL zone would be dropped slowly to study the effect on the system, while removing the majority of the LNAPL. When the rate of LNAPL removal decreases the water table would be dropped close to the elevation of the semi-confining till lens.

Operation of the LNAPL recovery system will be continuous. Routine maintenance of the system will be required. LNAPL is a F032-listed hazardous waste, and the LNAPL will be sent off site for incineration at a permitted RCRA Subtitle C Treatment, Storage, and Disposal (TSD) facility.

8. Grossly Contaminated Ground-Water Treatment

The objective of this component is to collect and treat the most concentrated portions of the dissolved PCP/ Fuel Oil ground-water plume to a level which allows natural attenuation to achieve ch. NR 140 standards within a reasonable period of time. The ground-water extraction treatment system will consist of extraction wells, extraction pumps, connecting piping, oil-water separator, controls, granular activated carbon (GAC) treatment train, metals treatment if necessary to meet groundwater discharge standards, building, and infiltration basin(s).

Based on a previous pump test in the deeper confined aquifer, an extraction flow of 10 gpm yields a radius of influence of approximately 200 feet (Conestoga-Rovers & Associates 1992). Therefore, five extraction wells in the vicinity of the gully and lagoon source area will be required. More recent well development data suggests that flows could be more on the order of 3 to 5 gpm in the unconfined aquifer. It is assumed that the combined flow rate from each well is 10 gpm, resulting in a total collection system flow rate of 50 gpm. The wells will be constructed of 6-inch polyvinyl chloride (PVC) pipe with 40 feet of screen below the water table and 10 feet above—a total of approximately 140 feet well depth. The extraction pumps will be submerged and capable of pumping a range from 2 to 10 gpm against 200 feet of total head.

Ground-water will be discharged to the oil/water separator, where the organic phase liquid will be separated from the aqueous phase. The organic phase would be pumped to a storage tank. The aqueous phase would be fed through the GAC vessels to remove residual dissolved organics, and then pumped out to the infiltration areas. Metals removal will be implemented if necessary to meet discharge requirements. Controls will include on-off operation, high level alarms on the oil/water separator, and shut down of the system should the infiltration areas become clogged. It is anticipated that the system will be operated for 10 years to remove the majority (90 percent) of the PCP contaminant mass (see Appendix F of the FS).

9. Monitored Natural Attenuation

This alternative includes natural attenuation for control and remediation of PCP/fuel oil to restore the the bulk of the ground-water.

PCP concentrations in ground-water have been monitored at the site since 1988. Some of the wells have 11 rounds of sampling data. PCP ground-water concentrations have shown consistent declines at the majority of monitoring wells over time. There is a general decrease in the size of the PCP plume, and the total contaminant mass of PCP in the saturated zone as measured in 1997 has declined compared to the 1994 data. Contaminated ground-water is not discharging to the wetland, or migrating below the wetland to surface water bodies.

The belief that PCP is biodegrading in ground-water is supported by the natural attenuation parameter data collected at the site. This data consists of redox potential values, oxygen concentrations, iron, nitrate, chloride and sulfate values that are indicative of reductive dechlorination conditions. The ground-water plume is under anaerobic conditions in both the unconfined and semiconfined aquifer in the LNAPL area. The anaerobic plume is not expanding.

The aerobic biodegradation at the aerobic/anaerobic interface has a faster decay rate than in the anaerobic zone, apparently limiting plume spread. Estimated remediation time for the anaerobic plume is decades if the LNAPL is not removed.

No estimates have been done on the site specific natural attenuation rates of benzene or naphthalene in groundwater. These constituents are not wide spread in the ground-water, and it is believed that these constituents naturally attenuate at a rate sufficient to limit their detection.

10. Institutional Controls

Institutional controls are necessary to ensure that the remedy is protective of public health, welfare and the environment and will consist of land-use restrictions for the areas with a soil cover and groundwater use restrictions for the entire site. It is anticipated that deed restrictions in the form of an enforceable restrictive covenant will be used to: (1) identify the areas with the soil cover (treatment area, gully and lagoon source areas) and the metals disposal area and specify that the area is contaminated with PCP, Fuel Oil and/or arsenic, that excavation within the area must comply with Occupational Safety and Health Administration (OSHA) requirements for health and safety protection, that any excavated soils be managed as hazardous waste in accordance with applicable laws, that buildings are not permitted within the soil cover or metals disposal areas, and that activities threatening the long-term integrity of the soil cover or the metals disposal area not permited; and (2) restrict installation of wells other than ground water monitoring wells within the plume of groundwater contamination or within proximity to the plume that could affect plume migration until the groundwater has been restored to compliance with ch. NR 140 standards. Institutional controls other than or in addition to a restrictive covenant may be imposed if necessary.

11. Environmental Monitoring/Maintenance

An Environmental Monitoring Plan will be developed and implemented to evaluate (1) the effectiveness of naturally occurring processes in the subsurface soil and ground-water, (2) compliance with State ARARs (ch. NR 140 and NR 720), and (3) evaluating the change in risks to human health and the environment over time.

The objective of the soil environmental monitoring program is to assess the degree of natural bio-intrinsic remediation of PCP/fuel oil constituents, and to determine whether the soil cover and erosion control measures are preventing transport of arsenic and PCP/fuel oil. Environmental monitoring of soil for Alternative 2 will include:

- Lysimeter sampling
- Ground-water sampling of the contaminant plume
- Routine inspection of cover and sampling if necessary

The existing lysimeter nests LY02 and LY03 will be sampled on an semi-annual basis for the first five years to determine whether observable trends in pore water PCP/fuel oil constituent concentrations are evident, and to determine the amount of electron acceptors and donors and degradation byproducts. Subsequent sampling, if necessary, will be based on these initial results.

Analysis will include PCP, VOCs, semivols, TPH, chloride, nitrate, sulfate, dissolved iron, hydrogen, oxidation/reduction potential, and pH.

Environmental monitoring of ground-water will assess the effectiveness of LNAPL removal and ground-water treatment, and to follow the course of natural attenuation. The objective of the monitoring program is to collect sufficient information to track the lateral and vertical extent of the PCP/fuel oil contaminant plume, monitor benzene and naphthalene concentrations, and follow the biodegradation of PCP/fuel oil constituents. The program will also allow assessment of continued releases from the source area. If monitoring data indicate further spreading of the plume above remedial goals, or that remediation goals will not be met within the 30-40 year estimated clean-up time frame, treatment process modifications, such as the installation of additional extraction wells, or other more aggressive remedy alternates mentioned in section IV of this ROD, will be considered.

The ground-water monitoring network for Alternative 2 will include the following wells:

- Unconfined monitoring wells 1, 2, 6S, 9, 10S, 13, 16, and 19
- Semiconfined monitoring wells 3, 4, 5, 7, 8, 10, 11, 12, 14, 15, 17
- Three residential wells

The monitoring wells will be sampled semi-annually for 10 years and then at least annually until remediation goals have been met. The environmental monitoring plan will be adjusted every five years and as needed to assess performance of the remedial systems, progress toward meeting the remediation objectives, residual risks to human health and the environment, project clean up times, and other factors identified during the monitoring period. The samples will be analyzed for PCP, petroleum VOCs including benzene and naphthalene and Target Analyte List (TAL) metals and for the following natural attenuation indicator parameters::

- Dissolved Oxygen (DO)
- pH, temperature, and specific conductance
- Oxidation/reduction potential
- Alkalinity
- Nitrate-and nitrite-nitrogen
- Sulfate-and sulfide-sulfur
- Total iron, ferrous iron, and ferric iron
- Manganese
- Carbon dioxide
- Chloride

A smaller set of five monitoring wells (MW 3, 10, 10S, 13, 15) will be sampled and analyzed for the above parameters on a quarterly basis for five years and then annually until the remedial objectives have been accomplished. Further monitoring requirements will depend on the overall assessment of the on-going analytical results.

A surface water sampling plan will be designed and implemented to assess remediation of the wetland. Designated surface water sampling points will be sampled for PCP, petroleum VOCs, including benzene and napthalene. PAH and ACZA metals. Descriptive water quality parameters such as pH, hardness, ammonia nitrogen, COD will be collected and compared to background.

A monitoring plan will be designed to assess performance of the arsenic/metals disposal area.

This alternative includes development of a ground-water flow and solute transport model to allow prediction of contaminant transport, degradation rates and remedial time frames. The model will be updated annually based on actual monitoring results.

12. Point-of-Use Carbon Treatment or Well Replacement

Point-of-use carbon treatment or well replacement for the residential wells bordering the site may be necessary if PCP exceeds Ch. NR 140 ground-water quality standards at these wells. The choice of remedy will be dependent on the preference of the well owner, aesthetic water quality, and expected well life. The Brethorst, Crosby and Skold Residential wells on Daniels 70 will be monitored semi-annually at a minimum, and more frequently if there are indications of plume movement toward these wells during remediation.A typical treatment system may consist of two canisters installed in series. The upstream canister will be replaced on a schedule that will insure safe drinking water standards are being met. This schedule will be established using conservative carbon adsorption chemical-specific modeling. The treatment system installation will meet the substantive requirements of Wisconsin plumbing codes for point of use treatment systems.

13. Five-Year Site Reviews

Five-year site reviews, consisting of cover inspections, evaluation of all prior surface soil, lysimeter and ground-water sampling analysis, will be conducted to assess the effectiveness of erosion control measures, impacts of contaminants to ground-water and performance of the remedial measures. The evaluation will be used to update the estimated restoration time frame, examine the feasibility of implementing any improvements or contingencies and to evaluate potential risks to human health and the environment. The five-year review requirement will be terminated when the ground-water quality has been restored to compliance with ch. NR 140 and soils have been remediated in compliance with ch. NR 720.

Residual risks will remain at the PWP Site from contaminants in subsurface soil and ground-water within the anaerobic plume. Institutional Controls will restrict the potential future access to and use of ground-water and soil under the cover, thereby eliminating the contact and ingestion pathways as a source of residual risk.

- Estimated Time to Design and Construct = 2 years
- Estimated Remedial Time Frame for Soils near Water Table = Decades
- Estimated Remedial Time Frame to meet PALs in LNAPL area = Decades
- Total Capital Costs = $2.3 million
- Total Operation and Maintenance Costs (net present worth) = $2.9 million
- Total Costs (net present worth) = $5.2 million

C. ALTERNATIVE 3 - SOIL CONSOLIDATION AND COVER, BIOVENTING, GROUND-WATER AND LNAPL COLLECTION AND TREATMENT, AND MONITORED NATURAL ATTENUATION OF GROUND-WATER

This alternative consists of the same 13 components as Alternative 2 with the addition of bioventing to enhance aerobic degradation processes, and shortening the time to reduce PCP soil levels to cleanup values. In this alternative, the LNAPL residual zone will be dewatered, improving the conditions for bioventing degradation of PCP. The biovent zone will be extended about 10 feet deeper into the currently saturated zone by lowering the LNAPL surface during the LNAPL removal process.

This alternative includes the following, in addition to those described in Alternative 2:

- Bioventing Construction
- Bioventing Operation
- (additional) Environmental Monitoring

The objective of bioventing is to enhance aerobic degradation of PCP-contaminated soil by injecting air into the unsaturated zone above the ground-water table. Bioventing will be conducted in the gully and lagoon source area after the soil solidification, soil consolidation, biopad relocation and cover is completed.

1. Construction

The bioventing system will consist of air injection wells, inner-connecting piping, blower, controls, treatment building, and piezometers. Approximately 10 injection wells will be installed in the lagoon and gully area. The air injection wells will be constructed of 4-inch diameter PVC pipe with 125 feet of screen terminating below the ground-water table. The wells will be connected to piping that will be located below the frost line. The piping will provide individual flow control to each well.

The blower, located in the treatment building, will be capable of supplying each well with an air flow of approximately 500 standard cubic feet per minute (scfm) at 10 pounds per square inch gauge pressure. The controls will be programmed for automatic operation, emergency shutoff, on-off timer control, and remote sensing.

Piezometers at varying depths will be installed in discrete locations. The purpose of the piezometers is to allow for the monitoring of soil gas composition to assess effectiveness in delivering air to the affected subsurface regions.

2. Operation

Length of operation of the bioventing system is based on the estimated time to reach ch. NR 720 RCL for PCP. PCP aerobic degradation rates at PWP could range from 0.1 to 0.75 ppm/day (Section 2 of the FS). Average PCP concentrations in the unsaturated soil and LNAPL residual zone are 150 mg/kg and 1,500 mg/kg respectively (Section 2 of the FS). Based on the higher PCP concentration and an average degradation rate of 0.5 mg/kg per day, the estimated time to reach the preliminary PRG for protection of ground-water of 4.6 mg/kg is approximately 10 years.

3. Environmental Monitoring

The objective of the Alternative 3 environmental monitoring program is to assess the degree and effectiveness of PCP removal and whether the soil cover and erosion control measures are preventing transport of arsenic and PCP/fuel oil. Environmental monitoring for Alternative 3 will include:

- Soil gas analyses and soil sampling in the bioventing treatment area
- Routine inspection of cover and sampling if necessary
- Performance monitoring of the arsenic/metals disposal area
- Lysimeter and ground-water sampling will be performed as in Alternative 2.

Soil gas analyses will be conducted semi-annually at a minimum. Analyses for oxygen, carbon dioxide, methane, temperature, and moisture will be measured in the piezometers and the monitoring wells identified for ground-water sampling. If levels are out of acceptable ranges, process modifications may be proposed. For example, insufficient soil moisture may facilitate the installation of air sparging wells in the bioventing treatment areas to augment the moisture content, as well as provide additional oxygen to the more stagnant air near the water table.

Soil samples for PCP, VOC including Napthalene, and PAH, and the degradation indicators of chloride and pH, will be collected at 3, 5, 7 and 10 years. Samples will be collected at discrete locations and at various depths. More aggressive remedial action will be considered in accordance with the contingency plan if site monitoring data demonstrates that remedial objectives set forth in Section VIII of this ROD will not be met within 30-40 years.

- Estimated Time to Design and Construct = 2 years
- Estimated Remedial Time Frame for soils above the water table = 10 years
- Estimated Remedial Time Frame to meet PALs in ground-water = 30-40 years
- Total Capital Costs = $3.8 million
- Total Operation and Maintenance Costs (net present worth)= $4.4 million
- Total Costs (net present worth) = $8.2 million

D. ALTERNATIVE 4 - SOIL CONSOLIDATION AND COVER, BIOVENTING, GROUND-WATER AND LNAPL COLLECTION AND TREATMENT THROUGHOUT PLUME

Alternative 4 is the same as Alternative 3, with the exception that the entire plume of PCP-contaminated ground-water (> 1 µg/L PCP) would be collected and treated, instead of allowing the plume to naturally attenuate. Fourteen ground-water extraction wells would be required instead of five wells: thirteen in the vicinity of the gully and lagoon source area, and one in the vicinity of MW-8. The system is assumed to be operated for the entire 30 year present worth cost estimating period.

- Estimated Time to Design and Construct = 2 years
- Estimated Remedial Time Frame for soils near water table = 10 years
- Estimated remedial time frame to meet PALs in LNAPL area = Decades
- Total Capital Costs = $4.6 million
- Total Operation and Maintenance Costs (net present worth) = $4.6 million
- Total Costs (net present worth) = $9.2 million

E. ALTERNATIVE 5 - SOIL CONSOLIDATION AND COVER, BIOVENTING, AND STEAM INJECTION WITH SOIL VAPOR EXTRACTION

The objective of Alternative 5 is to remove the bulk of the PCP/LNAPL residual zone area using steam injection in conjunction with Soil Vapor Extraction (SVE). The remainder of the PCP plume will be allowed to naturally attenuate. It is estimated approximately 90 percent of the PCP in the LNAPL residual zone will be recovered with steam injection/SVE. The remaining components of Alternative 5 are identical to Alternative 3.

1. Steam Injection in Conjunction with SVE

The objective of this component is to inject steam to recover the PCP/LNAPL mixture through subsurface volatilization. Steam would be injected into wells that are screened in the zone of the PCP/LNAPL residual. The steam moves in a thermal front towards the SVE wells, first physically displacing the LNAPL towards the SVE wells, and then volatilizing the PCP/LNAPL (USEPA 1998a). The physically displacing and steam-volatilized PCP/LNAPL mixture is withdrawn from these SVE wells and recovered at the surface. Ground-water is also pumped out of these wells to provide for capture of the PCP/LNAPL mixture that may have re-solubilized. Soil treatment will be conducted sequentially in 100 by 100-foot cells because of the high costs associated with the process equipment and fuel.

Steam injection would consist of injection and extraction wells, connecting piping, boiler, blower, catalytic oxidizer, and ground-water extraction pumps. Approximately 120 total wells would be installed in the 4-acre LNAPL residual zone area, half of which will be used to inject steam and the other half to extract the volatilized PCP/LNAPL mixture. The injection and extraction wells would be 4-inch diameter, and constructed with approximately 10 feet of stainless steel screen and 100 feet of cast iron risers. The wells would be inner-connected to piping to and from the treatment system process equipment.

The boiler would be capable of producing 10,000 lb/hr of steam to the injection points. Water would be pumped from a separate ground-water supply well, which would be installed in an uncontaminated area in the western portion of the site. Boiler make-up water would need to be treated prior to use. Liquid propane would be used as fuel.

The condensed PCP/LNAPL would be seperated from the water phase and sent off site to a RCRA Subtitle C TSD facility. The water phase would be treated and recycled to the boiler. Air emissions from the condenser would be catalytically oxidized.

Ground-water recovery will also be necessary to control and capture PCP/LNAPL that may mobilize. Approximately eight wells would be used for ground-water recovery. The ground-water would be treated via carbon adsorption and either re-used as boiler make-up or discharged to infiltration trenches on-site. For costing purposes, it is assumed that treatment for both the condensate and the ground-water would total about 60 gpm.

Length of operation of the steam injection system is based on reducing the PCP to the extent practical within reasonable costs. Based on vendor-supplied information, a treatment time of three months in each cell should be sufficient to reduce PCP/LNAPL about 90 percent, the practical limit. This corresponds to a total treatment time of about seven and one half years based on the 30 cells. Additional bioventing of the residual PCP may be required after the free liquid has been removed. This possibility, and subsequent costs, have not been included in this remedy.

- Estimated Time to Design and Construct = 2.5 years
- Estimated Remedial Time Frame for soils near water table = 10 years
- Estimated Remedial Time Frame to remove recoverable PCP = 7.5
- Total Capital Costs = $7.5 million
- Total Operation and Maintenance Costs (net present worth)= $10.1 million
- Total Costs (net present worth) = $17.6 million

X. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

The relative performance of each remedial alternative was evaluated in the FS using the nine criteria set forth in the NCP at 40 CFR Section 300.430. A remedial action providing the "best balance" of trade-offs with respect to the nine criteria is determined from this evaluation.

A. THRESHOLD CRITERIA

1. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. **Compliance with ARARs** describes how the alternative complies with chemical-, location-, and action-specific ARARs, or other criteria, advisories, and guidance.

B. PRIMARY BALANCING CRITERIA

The following five criteria are used to compare and evaluate the elements of one alternative to another that meet the threshold criteria.

3. **Long-term effectiveness and permanence** evaluates the effectiveness of alternatives in protecting human health and the environment after response objectives have been met, in terms of the magnitude of residual risk and the adequacy and reliability of controls.

4. **Reduction in toxicity, mobility, or volume through treatment** evaluates the treatment technologies by the degree of expected reduction in toxicity, mobility, or volume of hazardous material. This criterion also evaluates the irreversibility of the treatment process and the type and quantity of residuals remaining after treatment.

5. **Short-term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until the remedial action objectives are achieved.

6. **Implementability** assesses the ability to construct and operate the technology; the reliability of the technology; the ease of undertaking additional remedial actions; and the ability to monitor the effectiveness of the remedy. Administrative feasibility is addressed in terms of the ability to obtain approvals from other agencies. This criterion also evaluates the availability of required resources, such as equipment, facilities, specialists, and capacity.

7. **Cost**evaluates the capital and operation and maintenance costs of each alternative, and provides an estimate of the total present worth cost of each alternative.

C. MODIFYING CRITERIA

The modifying criteria are used in the final evaluation of remedial alternatives after public comment on the RI/FS and Proposed Plan has been received.

8. **State acceptance** addresses whether, based on its review of the RI/FS and Proposed Plan, the state concurs with, opposes, or has no comment on the proposed remedial alternative. The State of Wisconsin has provided comments on the RI/FS and the Proposed Plan, and has documented its concurrence with the remedial action in its letter of concurrence, and is presented in Appendix A.

9. **Community acceptance** addresses whether the public concurs with the Proposed Plan. Community acceptance of the Proposed Plan is typically evaluated based on comments received at the Public Meeting and during the public comment period. This is documented in the Responsiveness Summary presented in Appendix C.

The section below presents the nine criteria and a brief summary of each alternative and its strengths and weaknesses according to the comparative analyses.

Overall Protection of Human Health and the Environment

Site conditions currently pose risks to human health and the environment via soil, sediment, and surface water exposure pathways. The potential also exists for future human health risks associated with exposure to ground-water. All the alternatives except Alternative 1 prevent erosion and direct contact with soil and sediments, and remove the contaminated material from the wetland. Alternatives 3 through 5 actively treat the subsurface soils and smear zone, reducing residual risks quicker, and reduce the contaminant mass available to leach into the ground-water. Alternative 2 relies on natural processes to degrade the subsurface soil contaminants. Alternatives 2 through 4 pump-and-treat ground-water, with Alternatives 2, 3 and 5 relying on monitored natural attenuation to treat the low level PCP content of the plume. Alternative 4 treats the entire plume. Alternative 5 uses a different technology approach to remediate the LNAPL area.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternatives 3, 4 and 5 will comply with chemical-specific ARARs (ch. NR 140 and ch. NR 720) within a reasonable period of time (i.e., within 30 to 40 years). For Alternatives 2 through 5, Wisconsin NR 680 exemptions and/or Wisconsin NR 600 waivers may be necessary to meet ARARs associated with classification, treatment, disposal, and/or placement of listed hazardous wastes, or a CAMU may be established and accepted under chapter NR 636 Wisconsin Administrative Code.

Long-term Effectiveness and Permanence

The bioventing alternatives (Alternatives 3 through 5) are the best alternatives in long-term effectiveness and permanence because they reduce the PCP content and therfore reduce the leaching of PCP from soils near the water table into the ground-water.

The long-term effectiveness and permanence of the steam injection in conjunction with the SVE alternative (Alternative 5) is better than the other alternatives, because Alternative 5 actively removes the PCP mass causing the ground-water contamination. The ground-water collection and treatment alternatives (3 and 4) are similar in their long-term effectiveness and permanence. Only minimal additional PCP is removed in Alternative 4 compared to alternative 3.

Metals contaminated soil will be placed in a CAMU designed to prevent the transformation of metals to a more soluble state.

Reduction in Toxicity, Mobility, or Volume through Treatment

The bioventing alternatives (Alternatives 3 and 4) offer the best Toxicity, Mobility, or Volume (TMV) reduction for the soils. About 80 to 90 percent of the estimated 120,000 lbs of PCP is expected to be reduced in about 10 years. This treatment is irreversible. All alternatives (except no-action) include solidification of arsenic-contaminated soil that tests above NR 720 RCL for ground-water protection. The biopad containing solidified arsenic-contaminated soil will be broken up into pieces and placed under the soil cover cap. This will eliminate the threat of surface transport of arsenic as the pad weathers and pieces flake off over time.

For Alternative 2, active soil treatment is not used. Reduction in TMV through natural biodegradation would occur, but the degradation rate is slow and could take many decades.

Steam injection (Alternative 5) is comparable in TMV reduction for ground-water to Alternatives 3 and 4. The ground-water collection and treatment for the entire plume (Alternative 4) affects a larger zone, but removes only marginally more PCP than Alternative 3. Alternative 5 is predicted to remove up to 90 percent of the 500,000 gallons of LNAPL and 26,000 lb of PCP in the saturated zone. The predicted TMV reduction for Alternatives 3, 4 and 5 is the same, but Alternatives 3 and 4 may take longer.

Short Term Effectiveness

The no-action alternative has no impact because the alternative involves no remedial construction. All the other alternatives have minimal impacts with respect to the protection of workers during remedial construction, protection of community during remedial action, and environmental impacts of remedial action. The primary environmental impact is during wetland consolidation. This would be minimized by following guidance set forth by the Army Corp of Engineers.

Odors and fugitive dust may result because of the excavation and handling of the contaminated soil/wood debris during excavation and consolidation. Risk to construction workers will be minimized through air monitoring and use of emission control techniques as necessary (e.g. dust suppressants). Short-term nuisance noise impacts and safety-related risks to the community caused by truck traffic will be minimal.

Implementability

Technical or administrative implementability problems are not expected to be significant for any of the alternatives. Exemptions and/or waivers with respect to classification, treatment, disposal, and/or placement of listed hazardous wastes, or State acceptance of a CAMU, will be necessary.

Cost

The capital, operation and maintenance costs, and net present worth costs are presented for each alternative in the Description of Alternatives (Section IX). The cost estimates have been developed strictly for comparing the five alternatives. The cost estimates are order-of-magnitude estimates having an intended accuracy range of +50 to -30 percent; the specific details of remedial actions and cost estimates would be refined during final design. The operation and maintenance (O&M) costs are based on a 30 year duration. Net present worth for O&M costs is calculated using a seven percent discount rate.

The no-further-action alternative has no cost, while the steam stripping with SVE and bioventing alternative has the highest cost. Of the alternatives that actively remediate the LNAPL smear zone, Alternative 3 is the least costly.

State Acceptance

The State of Wisconsin has provided comments on the RI, FS and the Proposed Plan and has documented its concurrence with the remedial action as stated in Section IX. A copy of the State's letter of concurrence is included as Appendix A.

Community Acceptance

Community acceptance of the Proposed Plan was evaluated based on comments received at the Public Meeting and during the public comment period. There were no comments concerning the Proposed Plan. There was no opposition raised to the Selected Remedy. This is documented in the Responsiveness Summary presented in Appendix C.

XI. THE SELECTED REMEDY

U.S. EPA has selected Alternative 3 as the remedy for the PWP Superfund Site. Alternative 3 addresses soil, sediment, ground-water and source areas associated with the site. Alternative 3 includes:

> **Alternative 3 - Soil consolidation and cover, bioventing, ground-water and LNAPL collection and treatment, and monitored natural attenuation of ground-water.**
>
> - Estimated Time to Design and Construct = 2 years
> - Estimated Remedial Time Frame for soils above the water table = 10 years
> - Estimated Remedial Time Frame to meet PALs in ground-water = 30 to 40 years
> - Total Capital Costs = $3.8 million
> - Total Operation and Maintenance Costs (net present worth)= $4.4 million
> - Total Costs (net present worth) = $8.2 million
>
> (Appendix G of the FS presents a detailed break down of costs)

U.S. EPA and WDNR have determined that the selected remedy provides the best balance amongst the nine criteria. The selected remedy meets the requirements of CERCLA and has received no public opposition.

A. CLEANUP LEVELS

WDNR PALs were selected as cleanup goals for the PWP Site ground-water to the extent practicable as the most stringent federal or state promulgated drinking water standards. The results of the baseline risk assessment indicate that potential future exposure to ground-water results in an unacceptable "exposure level" to human health. Compounds are present at concentrations associated with a noncarcinogenic risk greater than an HI equal to 1 and/or carcinogenic risk greater than 10^{-4}.

Cleanup levels for soils are based on varying PRGs dependent on the specific COPC. The PRGs considered are shown in Table 1 and include health-based risk levels, soil concentrations protective of ground-water, background levels, and quantitative ecological risk-based levels.

1. Ground-Water

Four ground-water COPCs (PCP, benzene, naphthalene, and arsenic) are present at concentrations associated with elevated risk estimates, and three COPCs (iron, manganese, and chloride) are present at levels above taste or odor aesthetics levels. Exposure to PCP accounts for over 99 percent of the baseline carcinogenic risk and baseline noncarcinogenic risks estimated in the FHHRA. Remedial actions taken to reduce exposure to or concentration of the PCP/oil layer will result in a concurrent reduction of exposure to other compounds present in the ground-water. Benzene and naphthalene are associated with the fuel oil carrier, and the elevated arsenic, iron, and manganese levels are native minerals solubilized due to reducing conditions caused by the presence of the LNAPL source. Table 2 lists the federal MCL and state ground-water quality standards for these COPCs. At the completion of the remedial action the ground-water will comply with Wisconsin PALs, and the ground-water will have been restored to its highest beneficial use.

2. Soils

Only arsenic and PCP are present at concentrations associated with elevated human risk estimates. Copper and zinc are present at concentrations associated with elevated ecological risk. Table 1 presents the cleanup goals for these constituents, as well as other compounds that have been detected at the site, but do not exceed soil health-based criteria. The shallow soil clean up goals are based on a $1x10^{-6}$ cancer risk level and/or a HI of 1. The clean up goals for copper and zinc were established to be in the midrange of the ecological PRGs. Soil COPCs also have a subsurface soil clean up goal designed to be protective of ground-water. At the completion of the remedial action the majority of the site will be available for productive use. The area inside fenced area will be restored to beneficial use when the soils no longer cause ground-water contamination exceeding ch. NR 140 PALs for PCP. The small area inside the fenced area containing immobilized arsenic wastes will have very limited long range utility (e.g. a parking lot).

3. Sediments

Ecologically-driven numerical clean up goals for sediments need to be balanced with consideration of the habitat destruction that accompanies physical removal of the contaminated sediments. The selected remedy balances these conflicting threats to the wetland environment by blocking the source of contamination (the collapsing lagoon wall), and removing sediments from the toe of the western lobe to approximately 200 feet from the contaminant entrance point. Visible signs of fuel oil will also be removed. Remaining PCP contamination in surface water will degrade naturally by photolysis. At the completion of the wetland remedial action, monitoring will confirm that the area will meet the ecological and human health based risk goals.

B. DESCRIPTION OF REMEDIAL COMPONENTS

The selected remedial alternative for the site actively treats the principal threat in soil, sediment, and ground-water and acknowledges the natural biodegradation processes occurring within the aerobic area of the ground-water plume. Environmental monitoring will be conducted to evaluate the continued effectiveness of natural attenuation processes. Institutional controls will be implemented to protect public health by restricting future use of contaminated soils and ground-water during the time that is needed to reach clean up goals. The components of this alternative were described in Section IX-Description of Alternatives. The following discussion provides additional detail for some of the key components of the alternative.

1. Environmental Monitoring

The details of establishing progress toward aquifer and soil restoration will be developed in a Long Term Monitoring Plan as part of the Remedial Design. Individual contaminants will be evaluated at each monitoring event to establish the trend (improving or deteriorating) of the ground-water and soil restoration. A contingency plan will be provided in the Long-Term Monitoring Plan and will be implemented to protect human health and the environment if environmental monitoring and modeling predicts or detects exceedences of health/ecological based values. For trends that predict exceedences, this plan will require an evaluation of the impacts of the exceedence, potentially leading to increased monitoring, or the implementation of one of remedial options identified in the FS, or other suitable remedies, to prevent further release of contaminants. These measures may include: installing point-of-use carbon treatment or well replacement on residential wells; ground-water pump-and-treat throughout the whole plume; steam heating and/or thermal removal of the LNAPL zone; enhanced bioremediation; in-situ oxidation; a combination of these procedures; or other technology as approved by the U.S. EPA, in consultation with WDNR.

The remedial action will be continued until the ground-water has been restored to PALs, or an appropriate exemption or waiver is issued.

2. Institutional Controls

Institutional controls in the form of ground-water use restrictions and land use restrictions will be implemented to prohibit site ground-water use and restrict activities in the fenced soil cover area and metals disposal area. Institutional controls will be drafted, implemented, and enforced in cooperation with the property owner and the federal, state, and local governments.

3. Treatment/Natural Attenuation

The selected remedial alternative includes active remediation of the LNAPL source, treatment of grossly contaminated groundwater, bioventing of the soils above the LNAPL and natural attenuation for treatment of PCP in and at the perimeter of the ground-water plume. Alternate remedial technology will be considered if monitoring data indicate that the remedial objectives will not be meet within 30-40 years. Extensive site characterization data indicate that natural attenuation is effectively containing the spread of contamination by reducing contaminant concentrations. Natural attenuation is an appropriate remediation method only where it is fully protective of human health and the environment, and where it can be demonstrated capable of achieving site-specific remediation objectives (e.g., PALs) within a reasonable time frame. The NCP states that remediation time frame for restoring ground-water to its beneficial use should be developed based on specific site conditions. Under these natural attenuation processes, the time to achieve PALs is dramatically shortened once the LNAPL and highly contaminated ground-water has been removed. With institutional controls to prohibit use of the ground-water on the site, the time frame projections shown are reasonable if bioventing is effective in reducing contaminant mass in the soils above the water table, and LNAPL removal reduces the source of ground-water contamination.

4. Five-year Site Reviews

Under CERCLA Section 121(c), a remedial action that results in hazardous wastes, pollutants, or contaminants remaining on site must be reviewed every five years. Data collected during the monitoring program will be used to assess potential impacts of contaminants, and evaluate whether human health and the environment continue to be protected. To the extent that U.S. EPA's five-year review indicates that it is not technically or economically feasible to achieve PALs, s. NR 140.28, Wisconsin Administrative Code, provides for substantive standards for granting exemptions from the requirements to achieve PALs. Such exemption levels may be no higher than the ES. If U.S. EPA in consultation with WDNR determines that it is technically impracticable to achieve PALs or other standards within a reasonable period of time, and for some reason the exemption allowed with s. NR 140.28 is not appropriate, a Technical Impracticable applicable or relevant and appropriate requirements (ARAR) waiver under CERCLA may be granted for the site.

5. Soil Cover

The soil cover above the LNAPL source area, and lagoon erosion control features, will be visually inspected annually and repaired as necessary (e.g., resurfaced, patched). This cover will eliminate the potential of recontaminating the wetland after the sediment and washout soil removal, and reduce potential access/direct contact to contaminated soils by human and ecological receptors.

6. Operation and Maintenance Plan

An operation and maintenance plan will be designed and implemented to address all post construction related site activities, including the criteria identified in NR 636.40(5). This includes activities that pertain to sampling and analysis, inspection schedules, contingency plans and a closure plan when remedial goals have been met.

C. LONG-TERM MONITORING PLAN

The Long-Term Monitoring Plan will present specific details of the long-term sampling and analysis requirements for compliance monitoring as required by the selected remedy. This plan will present the location of each sampling point, sampling protocol, analytical method, analytical level, data evaluation level employed for each sampling location during the long-term monitoring phase of the remedial action. The Long-Term Monitoring Plan will also present the method used to determine exceedence or projected exceedence, when and what action(s) (contingencies) will be taken to protect human health and the environment if exceedences are reported above specified action levels.

XII. STATUTORY DETERMINATIONS

The selected final remedy for the PWP Site is consistent with CERCLA and is in compliance with the NCP to the extent practicable. The selected remedy is protective of human health and the environment, attains ARARs, and is cost effective. The selected remedy also satisfies the statutory preference for treatment that permanently and significantly reduces the toxicity, mobility, or volume of hazardous substances as a principal element. The following describes how the selected remedy meets these requirements.

A. THE SELECTED REMEDY IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy will provide adequate protection of human health and the environment through consolidation and soil cover of direct contact soils, institutional controls to prevent exposures to ground-water and through the treatment technologies to be employed. The potential risks associated with access to/use of the site will decrease over time because natural attenuation, LNAPL removal, and bioventing will reduce the concentration of contaminants to the ground-water quality standards listed in Table 2. Environmental monitoring will be used to determine if the selected final remedy will achieve the remediation objectives within 30-40 years. If monitoring data demonstrates that the remediation objectives will not be met within this restoration time frame, more aggressive remedial action will be considered.

B. THE SELECTED REMEDY ATTAINS ARARs

The selected remedy will comply with identified federal and state ARARs. Potential chemical-, location-, and action-specific ARARs were identified, defined, and summarized in Appendix A of the FS report. Table 8 presents an overview of the ARARs for the selected remedy. Activities associated with the selected remedy will be conducted consistent with OSHA and other applicable regulations. No unacceptable short term risk will occur as a result of remedy implementation.

A brief narrative of significant ARARs, and other criteria, follows.

1. Ground-Water Regulations

Chemical-specific ARARs for site ground-water include regulations and criteria promulgated under the Safe Drinking Water Act (SDWA), Clean Water Act, and State of Wisconsin statutes. In addition, certain other numerical goals will be attained. The federal National Drinking Water Regulations consist of contaminant-specific standards known as MCLs and Maximum Contaminant Level Goals (MCLGs). MCLs are enforceable standards that are the maximum permissible level for specific contaminants in public water supplies. MCLGs are non-enforceable health-based goals that establish levels at which no known or anticipated adverse health effects occur. The NCP, at 40 C.F.R. section 300.430(e)(2)(i)(B) and (C), requires that MCLGs above zero, and MCLs where the MCLG for a contaminant has been set at zero, be attained for ground-water sources that are current or potential sources of drinking water.

Under the Wisconsin Ground-Water Quality Rules, found in ch. NR 140, Wisconsin Administrative Code, the state has adopted PALs that are more stringent than federal MCLs, that must be met at every point where groundwater is monitored on the site. Groundwater cleanup levels for the site were set at PALs. The selected remedy will be complete when PALs have been achieved in the ground-water plume. Use of the groundwater at the PWP Site will be restricted by implementing a groundwater use restriction until PALs are reached.

2. <u>Effluent Limits</u>

The substantive elements of the Wisconsin Pollutant Discharge Elimination System (WPDES) permit process will be used to establish the effluent limits for discharge of treated ground-water to surface water or ground-water (NR 102, NR 103, NR 104, NR 105, NR 106, NR 200, NR 207, and NR 220 and ch. 283, Wis. Stats.). Discharge limits for treated ground-water to surface water will need to meet Wisconsin surface water quality standards. Infiltration or reinjection of effluent (treated ground-water) to ground-water must meet the substantive requirements of WPDES an NR 140.28(5).

3. <u>Soil Residual Concentrations</u>

The chemical-specific ARARs for residual soils are the Wisconsin soil cleanup standards in NR 720. Chapter NR 720 provides generic RCLs and the procedures and risk assumptions for determining site specific soil cleanup standards that are protective of public health, safety, welfare and the environment. The generic RCL or site-specific RCL must be protective of the NR 140 ground-water standards for all contaminants of concern. The risk-based RCLs developed under NR 720 will be the basis for acceptance of any variances or exemptions under other regulatory authorities. The soil cleanup standards developed pursuant to NR 720 procedures are considered substantive requirements that are consistent with the NCP.

4. <u>Classification of Wastes</u>

The most significant ARARs that affect the alternatives involving excavation and treatment of soil are the requirements developed pursuant to Subtitle C of the Resource Conservation and Recovery Act (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984. RCRA Subtitle C requirements are ARARs if the wastes to be managed are listed or characteristic wastes under RCRA and the wastes were treated, stored, or disposed after the effective date of the RCRA requirements under consideration or the activity at the CERCLA site constitutes treatment, storage, or disposal as defined by RCRA. The waste at this site is RCRA hazardous waste F032 and F035, wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that currently use or have previously used chlorophenolic formulations, or generated at plants that use inorganic preservatives containing arsenic or chromium. The listings for F032 and F035 wastes were promulgated on Dec 6, 1990. PWP did not cease disposing of this waste until 1992, after the effective date of the listing, and therefore, RCRA ARARs are applicable. The RCRA requirements, as established in the WDNR NR 600 rule series, are applicable if the activity being considered as part of the remedial alternative constitutes treatment, storage, or disposal as defined by RCRA. The RCRA requirements are considered an ARAR, and the excavation and disposal activities will require compliance with RCRA waste management standards including accumulation, storage, transportation, and land disposal restrictions, consistent with the preamble to the NCP (55 Fed. Reg. 8758-8760, March 8, 1990).

Alternatives for soil reconsolidation or redisposal units on-site must meet the ch. NR 600 land disposal minimum technology requirements (MTRs) for hazardous waste landfills, including a liner and a leachate collection system unless:

- Appropriate LDRs or NR 720 RCLs, whichever is more stringent are met prior to redisposal
- An exemption is granted under NR 680.04
- A Corrective Action Management Unit (CAMU) is established and justified under NR 636
- A CERCLA waiver is issued by U.S. EPA

CAMU. The CAMU rule within RCRA (40 CFR 264 Subpart S [264.552]) allows movement of contaminated material within an area of contamination without triggering the requirements for "generated" hazardous waste. In essence, it allows consolidation of contaminated soils and sediments containing listed or characteristic waste, without triggering the LDR requirements. This concept is needed for alternatives involving consolidation followed by containment under a cover or otherwise the alternative would not comply with RCRA ARARs.

Wisconsin has adopted the CAMU rule in NR 636. If a CAMU is established under NR 636, the LDRs do not apply. Remedial Design details will address criteria in NR 636.40(3)(b) to insure that the waste management activities associated with the CAMU will not create unacceptable risk to humans and environment from exposure to the hazardous waste or hazardous constituents.

The arsenic containing soils will be consolidated and separated from organic contaminants to the extent practicable in the CAMU. The total area will be biovented to promote bioremediation of the PCP/fuel oil.

RCRA requires that the arsenic-and PCP-contaminated soils be capped with a cover which is in compliance with RCRA design standards. However, a RCRA cover will decrease the efficacy of the bioventing of the PCP-contaminated soils by severely reducing the soil moisture that is crucial for biological activity. Although the bioventing will not address co-mingled arsenic, the RCRA cover, while meeting ARARs, would not significantly reduce the migration potential of the arsenic or provide more protection. Since a RCRA cover would render the bioventing of the PCP less effective, without reducing the mobility of the arsenic, the proposed soil cover will provide adequate protection at this site.

Region 5 Office of RCRA has reviewed the selected remedy and agrees with a CAMU.

The Arsenic/metals contaminated soil will be tested with a conservative leachability test such as TCLP for its potential to become mobile. Soils failing to meet an NR 720 RCL protective of groundwater in TCLP leachate will be solidified prior to placement in the CAMU. In addition, the CAMU will be designed to eliminate conditions which could result in transformation of metals to the mobile form.

The requirements under NR 636.40(5) that must be addressed for the PWP site will be part of the Operation and Maintenance Plan (O&M). This includes activities that pertain to sampling and analysis, inspection schedules and contingency plans. The need for a RCRA Cap will be reviewed at closure. If necessary, a RCRA cap will be constructed on the CAMU areas consistent with the site closure plan.

5. Wetlands

The most important location-specific ARARs for the PWP site are the requirements for protection of wetlands (Executive Order 11990 and ch. NR 103, Wisconsin Administrative Code). These ARARs require that actions at the site be conducted in ways that minimize the destruction, loss, or degradation of wetlands.

6. Air Regulations

The need for control or treatment of air emissions will be evaluated during the remedial design based on requirements of the NR 400 series regulations (NR 404, NR 415, NR 419, NR 431, NR 440, and NR 445) for particulate matter and fugitive dust emissions that may result during soil consolidation. Plans for controlling fugitive air emissions will be included in the Remedial Design. Any dust or emissions from treatment systems, grading or other earthwork must meet the ambient air standards for particulate in NR 404, fugitive dust standards in NR 415, control of organic compound emissions in NR 419, control of hazardous pollutant emissions in NR 445, and visible emissions standards in NR 431.

C. THE SELECTED REMEDY IS COST EFFECTIVE

The remedy provides overall effectiveness proportionate to its cost. The estimated costs associated with this remedy are:

- Capital Cost: $ 3.8 million
- Operation and Maintenance Costs (net present worth): $ 4.4 million
- Total Cost (net present worth) $ 8.2 million

Alternative 3 is considered cost-effective because it takes advantage of the site stratigraphy to dewater the unconfined aquifer, remove the free phase LNAPL, and expose the residual LNAPL smear zone to air. Alternative 3 also takes advantage of natural attenuation processes occurring in the ground-water plume to remediate the less contaminated ground-water. The remedy provides protection against the potential for future human health risks associated with exposure to site ground-water, and prevents human and ecological exposure to soil contaminants by placing them under a cover. Natural degradation processes in the soil are enhanced with the addition of air to the subsurface. Major capital costs associated with the selected remedy include installation of the bioventing system and ground-water/LNAPL extraction system, constructing a lagoon support wall, grading the slopes and revegetating the site, excavating and consolidating soils, removing the biopad, and construction and engineering support associated with implementing the work. Major operation and maintenance costs include the bioventing system operation (electrical costs) and the ground-water /LNAPL recovery system operation (part-time operator and carbon exchange), subsurface soil sampling at five-year site reviews, and semi-annual or annual monitoring and inspection.

The No-Action alternative is less costly, but it would not provide protection from the current and potential future risks associated with soil and ground-water exposure. Alternative 2 (Soil Cover and Ground-water/LNAPL Extraction) is less costly than the selected remedy. However Alternative 2 does not enhance the degradation of PCP in the soils or smear zone, appreciably extending the time to meet remedial objectives within a reasonable time frame.

The selected remedy affords overall effectiveness when measured against CERCLA Section 121 criteria and the NCP's nine evaluation criteria, and costs are proportionate to the protection that will be achieved.

D. THE SELECTED REMEDY UTILIZES PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost-effective manner at the PWP Site. The remedy permanently removes the contaminants from the natural environment in the following manner:

- Free-phase LNAPL is extracted from the water table and incinerated off site.
- Extracted ground-water is treated with carbon and reinjected on site.
- Bioventing of the exposed smear zone will enhance natural degradation of residual LNAPL, and bioventing of the vadose soils will enhance biodegradation of PCP/oil contamination. It is estimated that 80 to 90 percent of the estimated 120,000 pounds of PCP will be reduced in 10 years of bioventing system operation.
- Natural attenuation is also occurring in the ground-water plume, reducing PCP to chloride, carbon dioxide, and water.
- Highly contaminated arsenic soils will be solidified to prevent migration, and placed under a cover to prevent direct contact. Less contaminated arsenic soils will be consolidated under the soil cover to remove the direct contact exposure route, and eliminate the ecological concerns.

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate, and is cost effective.

LNAPL and highly contaminated ground-water source removal combined with bioventing of the PCP/fuel oil contaminated soils, and monitored natural attenuation of the plume perimeter; consolidation of sediments and soils under a cover; erosion control measures; environmental monitoring; and restrictions to prohibit access to contaminated soils and ground-water through institutional controls, will provide the most permanent solution practicable, proportionate to cost.

E. THE SELECTED REMEDY SATISFIES THE PREFERENCE FOR TREATMENT THAT PERMANENTLY AND SIGNIFICANTLY REDUCES THE TOXICITY, MOBILITY, OR VOLUME OF THE HAZARDOUS SUBSTANCES AS A PRINCIPAL ELEMENT

The principal elements of the selected remedy are LNAPL removal, treatment of the grossly contaminated ground-water with carbon, and enhancing natural biodegradation of the principal hazard at the site, PCP. Biodegradation of PCP produces benign substances, reducing the toxicity and volume of the principal site threat. Fuel components, such as benzene and naphthalene, will also biodegrade with the PCP. Arsenic, copper, and to a lessor extent, zinc, are rendered immobile by solidification, or consolidated in the CAMU, covered with soil, and fenced. This remedy addresses the potential threat to human health and the environment by the restoration of the ground-water resource by the permanent destruction of organic hazardous substances, and immobilizing the metals. This will significantly reduce the toxicity, mobility, and volume of the hazardous substances.

XIII. DOCUMENTATION OF SIGNIFICANT CHANGES

There are no significant changes from the recommended alternative described in the proposed plan.

TABLE 1
PRELIMINARY REMEDIAL GOALS AND CLEAN UP GOALS FOR CONSTITUENTS OF POTENTIAL CONCERN IN SOIL

RECORD OF DECISION
PENTA WOOD PRODUCTS SITE
TOWN OF DANIELS, WISCONSIN

	Clean up Goals			Parameters Considered in Setting Preliminary Remedial Goals for Soil												
	Shallow Soil		Subsurface Soil	Indus...l Site Worker[a]			Industrial Excavation Worker[a]		Residential Adult[a]			Wisconsin ARAR NR 720.11 RCL for Direct Contact[b]		Ecological PRGs		
Compound	Onsite PRG (mg/kg)	Offsite PRG (mg/kg)	Soil Concentration Protective of Groundwater (mg/kg)	Cancer Risks 10^{-6} (mg/kg)	Cancer Risks 10^{-4} (mg/kg)	Noncancer Risks HI=1 (mg/kg)	Cancer Risks 10^{-6} (mg/kg)	Noncancer Risks HI=1 (mg/kg)	Cancer Risks 10^{-6} (mg/kg)	Cancer Risks 10^{-4} (mg/kg)	Noncancer Risks HI=1 (mg/kg)	Nonresidential RCL (mg/kg)	Residential RCL (mg/kg)	Onsite (mg/kg)	Offsite (mg/kg)	Background[c] (mg/kg)
Arsenic	5.2[d]	5.2[d]	NA	1.1	108	171	14	87	0.414	41	80	1.9	0.426	0.26–17.4	0.26–52.2	5.2
Benzene	0.0055[e]	0.0055[e]	0.0055[f]	1.3	129	25	53	43	0.75	75	17.5	90.7	22	--	--	--
Copper	100	100	347	--	--	40,880	--	12,562	--	--	17,086	37,814	2,804	26–118	26–347	17
Ethylbenzene	2.9[e]	2.9[e]	2.9[f]	--	--	4,787	--	6,917	--	--	3,126	102,166	7,821	--	--	--
Fluorene	100[e]	100[e]	100[g]	--	--	8,517	--	7,799	--	--	4,204	40,880	3,129	--	--	--
Isophorone	626	264	--	626	62,754	42,583	14,367	38,986	264	26,367	21,471	3,012	672	--	--	--
Methylnaphthalene	--	--	--	--	--	--	--	--	--		--	--	--	--	--	--
Naphthalene	0.4[e]	0.4[e]	0.4[g]	--	--	8,517	--	7,799	--	--	4,204	40,880	3,129	--	--	--
Pentachlorophenol	2.1	0.9	4.8[h]	2.1	212	2,725	67	3,423	0.92	92	1,413	23.8	5.3	0.037 15.1	0.037–45.5	--
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	1.5[e]	1.5[e]	1.5[f]	--	--	2,866	--	4,367	--	--	1,849	204,346	15,643	--	--	--
Zinc	320	320	8,882	--	--	329,677	--	101,777	--	--	136,808	--	156,429	15–2,907	11–8,882	46
Xylene, Mixture	4.1[e]	4.1[e]	4.1[f]	--	--	425,833	--	388,867	--	--	214,706	306,800	23,464	--	--	--

NA = Not Applicable

[a] PRGs for industrial workers, excavation workers and residential exposures are based on Region IX PRG approach assuming ingestion, inhalation and dermal exposure routes See Appendix E, Tables E-1 to E-3

[b] Wisconsin direct contact PRGs based on EPA RAGS Part B multiple pathway approach for soil ingestion and inhalation and default exposure assumptions presented in NR 720 19
RCLs for PAHs based on WDNR Guidance Soil Cleanup Levels for PAHs Interim Guidance

[c] Background not determined for site Background value is based on the mean of concentrations in soils of the United States.
(Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S.G.S. Professional Paper 1270, Shacklette and Boerngen, 1984). Background to be determined during pre-design investigations

[d] Arsenic PRG is background because residential and industrial PRGs are below background Site specific arsenic background will be determined as part of pre-design studies.

[e] Soil concentration protective of groundwater is the lowest of all the parameters considered

[f] Soil concentrations protective of groundwater are Wisconsin NR 720 09 Table 1 values for the BTEXs.

[g] Soil concentrations protective of groundwater are based on Wisconsin DNR guidance *Soil Cleanup Levels for PAHs Interim Guidance, April 1997*.

[h] Based on Sommers Model methodology, as presented in the *Draft Report Preliminary Hydrogeologic Investigation Penta Wood Products Site, Roy F. Weston, December 1994*
Value to be revised based on additional site investigation and treatability study data.

TABLE 2
PRELIMINARY REMEDIAL GOALS AND CLEAN UP GOALS FOR CONSTITUENTS OF POTENTIAL CONCERN IN GROUNDWATER

RECORD OF DECISION
PENTA WOOD PRODUCTS SITE
TOWN OF DANIELS, WISCONSIN

Compound	Clean Up Goals (µg/L)	Parameters Considered in Setting PRGs for Groundwater						
		Federal MCLs		Residential Adult[a]			Wisconsin Groundwater Quality Standards	
		Primary MCL (µg/L)	Secondary MCL[b] (µg/L)	Cancer Risks 10^{-6} (µg/L)	Cancer Risks 10^{-4} (µg/L)	Noncancer Risks HI=1 (µg/L)	Enforcement Standard (µg/L)	Preventive Action Limit (µg/L)
Arsenic	5	50	--	0.045	4	11	50	5
Benzene	0.5	5	--	0.30	30	12.5	5	0.5
Chloride	125,000[b]	--	250,000	--	--	--	250,000[b]	125,000[b]
Copper	130	--	1,000	--	--	1,351	1,300	130
Ethylbenzene	140	700	--	--	--	1,327	700	140
Iron	150[b]	--	300	--	--	--	300[b]	150[b]
Manganese	25[b]	--	50	--	--	5,110	50[b]	25[b]
Naphthalene	8	--	--	--	--	1,460	40	8
Pentachlorophenol	0.1	1.0	--	0.56	56	1,095	1.0	0.1
Toluene	69	1,000	--	--	--	749	343	68.6
Xylene, mixture	124	10,000	--	--	--	73,000	620	124
Zinc	2,500[b]	--	5,000	--	--	10,950	5,000[b]	2,500[b]

" -- " = No criteria.

[a] PRGs for residential exposures are based on ingestion and inhaltion using U.S. EPA Region IX approach for tap water.

[b] Criteria is for public welfare concerns (taste or odor aesthetics).

TABLE 3
SUMMARY OF SITE RISK TO HUMAN HEALTH
POTENTIAL FUTURE SCENARIOS

RECORD OF DECISION
PENTA WOOD PRODUCTS SITE
TOWN OF DANIELS, WISCONSIN

Exposure Scenario	Exposure Route	Medium	Cancer Risks – Sitewide RME	Cancer Risks – Sitewide Average	Cancer Risks – Treatment Area RME	Cancer Risks – Treatment Area Average	Hazard Indices – Sitewide RME	Hazard Indices – Sitewide Average	Hazard Indices – Treatment Area RME	Hazard Indices – Treatment Area Average
Residential (unconfined wells)	Incidential ingestion	Soil	**1.7E-04**	**1.6E-06**	**1.3E-02**	**1.3E-02**	0.80	0.23	**65**	**19**
	Dermal contact	Soil	**1.1E-04**	**4.9E-06**	**3.0E-03**	**1.4E-04**	0.07	0.01	**2**	0.3
	Ingestion	Homegrown produce	**5.5E-06**	1.0E-06	**3.0E-03**	**5.6E-04**	0.19	0.12	**13**	**8.3**
	Inhalation	Outdoor air	5.4E-08	1.3E-08	**4.4E-06**	1.0E-06	--	--	--	--
	Ingestion	Groundwater (MW-10s)[a]	**1.4E-01**	**2.5E-02**	**1.4E-01**	**2.5E-02**	**100**	**56**	**100**	**56**
	Dermal contact	Groundwater (MW-10s)[a]	**9.1E-01**	**4.1E-01**	**9.1E-01**	**4.1E-01**	**1,700**	**1,100**	**1,700**	**1,100**
TOTAL			**1.1E+00**	**4.4E-01**	**1.1E+00**	**4.5E-01**	**1,800**	**1,200**	**1,900**	**1,200**
Residential (semiconfined wells)	Incidental ingestion	Soil	**1.7E-04**	**1.6E-06**	**1.3E-02**	**1.3E-02**	0.8	0.23	**65**	**19**
	Dermal contact	Soil	**1.1E-04**	**4.9E-06**	**3.0E-03**	**1.4E-04**	0.07	0.01	**2**	0.3
	Ingestion	Homegrown produce	**5.5E-06**	1.0E-06	**3.0E-03**	**5.6E-04**	0.19	0.12	**13**	**8.3**
	Inhalation	Outdoor air	5.4E-08	1.3E-08	**4.4E-06**	1.0E-06	--	--	--	--
	Ingestion	Groundwater (MW-10s)[a]	**2.4E-02**	**4.0E-03**	**2.4E-02**	**4.0E-03**	**16**	**8.8**	**16**	**8.8**
	Dermal contact	Groundwater (MW-10s)[a]	**3.4E-01**	**4.8E-02**	**3.4E-01**	**4.8E-02**	**270**	**170**	**270**	**170**
TOTAL			**3.6E-01**	**5.2E-02**	**3.8E-01**	**6.6E-02**	**290**	**180**	**370**	**210**
Typical Worker	Incidental ingestion	Soil	**1.9E-05**	--	**1.5E-03**	--	0.11	--	**8.8**	--
	Dermal contact	Soil	**3.4E-05**	--	**9.8E-04**	--	0.03	--	0.76	
	Inhalation	Outdoor Air	3.2E-08	--	**2.6E-06**	--	--	--	--	--
TOTAL			**5.3E-05**	--	**2.5E-03**	--	0.14	--	**9.6**	--
Construction/Excavation Worker	Incidental ingestion	Soil	**3.8E-06**	--	--	--	0.56	--	--	--
	Dermal contact	Soil	3.6E-07	--	--	--	0.01	--	--	--
	Inhalation	Outdoor Air	**4.2E-06**	--	--	--	--	--	--	--
TOTAL			**8.4E-06**	--	--	--	0.57	--	--	--

Key:
[a]Exposure to groundwater assumes that domestic water is derived from a maximally contaminated well.
-- = Not evaluated.
RME = Reasonable maximum exposure.
BOLD = Indicates calculated risk exceeds 1E-6 or HI exceeds 1.

TABLE 4
SUMMARY OF SITE RISK TO ECOLOGICAL RECEPTORS

RECORD OF DECISION
PENTA WOOD PRODUCTS SITE
TOWN OF DANIELS, WISCONSIN

Receptor	General Location	Contaminant of Concern			
		Pentachlorophenol	Arsenic	Copper	Zinc
Deer Mouse	Onsite Treatment Area	9,750	1,055	1,139	50
	Onsite Nontreatment Area	25	266	0.06	0.34
	Offsite Wooded Area	163	219	6.8	0.34
	Offsite Wetland Area	2.0	47.5	0.8	0.08
Short-tailed Shrew	Onsite Treatment Area	319,100	2,712	2,932	126
	Onsite Nontreatment Area	824	680	1.5	0.09
	Offsite Wooded Area	5,318	561	17.5	0.09
	Offsite Wetland Area	66.5	118.6	2.0	0.20
Raccoon	Onsite Treatment Area	5,238	249	3,993	83
	Onsite Nontreatment Area	13.5	63	2.05	0.06
	Offsite Wooded Area	87.3	52	24	0.06
	Offsite Wetland Area	33.3	11.5	2.79	0.14
American Robin	Onsite Treatment Area	47,409	462	2,597	4,341
	Onsite Nontreatment Area	122	116	1.3	3.3
	Offsite Wooded Area	790	95	16	3.3
	Offsite Wetland Area	10.0	19.8	1.8	7.5

TABLE 5
PRELIMINARY REMEDIAL GOALS FOR CONSTITUENTS OF POTENTIAL CONCERN IN SEDIMENT

RECORD OF DECISION
PENTA WOOD PRODUCTS SITE
TOWN OF DANIELS, WISCONSIN

Compound	Preliminary Remediation Goal (mg/kg)	Parameters Considered in Setting PRGs for Sediment					
		Summary of Concentrations Related to Effects to Benthic Organisms From Four Guidelines[a]		Ecological PRGs Based on Toxicity Reference Values[b]	Washington Sediment Quality Value[c] (mg/kg)	Site-Specific Background (mg/kg)	95% of the Mean Regional Background[d] (mg/kg)
		Lowest Effect Level Median Value (mg/kg)	Severe Effects Level Median Value (mg/kg)				
Arsenic	9.6	9.6	40.5	0.25–52.1	--	1.8	1.77
Pentachlorophenol	0.4	--	--	0.037–1.6	0.36	--	--
Copper	31	31	154	25–347	--	9.6	15.5
Zinc	120	120	428	11.5–8,692	--	31	65

" -- " = No criteria.

[a] Sediment Quality Objectives provided by Tom Janisch/WDNR for Penta Wood Site (WDNR 1998). Guideline sources are Ontario Sediment Quality Guidelines, NOAA Potential for Biological Effects (Long and Morgan), Ingersoll et al. Calculation of Sediment Effect Concentrations, and Smith et al. Sediment Quality Assessment Values.

[b] Ecological PRGs prepared by CH2M HILL, see Appendix E of the FS.

[c] State of Washington criteria.

[d] "Statistical Summary for Stream Sediments of the Rice Lake Quadrangle," USDOE, 1978, National Uranium Resource Evaluation Program.

TABLE 6
PRELIMINARY REMEDIAL GOALS FOR CONSTITUENTS OF POTENTIAL CONCERN IN SURFACE WATER

RECORD OF DECISION
PENTA WOOD PRODUCTS SITE
TOWN OF DANIELS, WISCONSIN

Compound	Preliminary Remediation Goal (µg/L)	Parameters Considered in Setting PRGs for Surface Water: Federal Water Quality Criteria		Wisconsin Water Quality Criteria				Great Lakes Water Quality Initiative
		Acute Criteria (µg/L)	Chronic Criteria (µg/L)	Threshold Concentration for Taste and Odor (µg/L)	Acute Toxicity Criteria (µg/L)	Chronic Toxicity Criteria (µg/L)	Human Cancer Criteria[a] (µg/L)	Chronic Criteria (µg/L)
Arsenic	50	360	190	--	340	152	50	1,800
Iron	1,000	--	1,000	--	--	--	--	--
Manganese	--	--	--	--	--	--	--	--
Copper	43[b]	105[b]	57[b]	--	105[b]	57[b]	--	43[b]
Zinc	524[b]	579[b]	524[b]	--	579[b]	524[b]	--	580
Chloride	230,000	860,000	230,000	--	--	--	--	--
Pentachlorophenol	1.8[c]	--	1.8[c]	30	2.1[d]	2.1[e]	--	1.8[c]
Ammonia	--	--	--	--	f	--	--	--

" -- " = No criteria.
[a] Human threshold cancer criteria for nonpublic water supply.
[b] Hardness dependent, criterion based on 660 mg/L hardness.
[c] pH dependent, pH 5.68 assumed.
[d] PCP acute toxicity criteria = e (1.0054(pH)-4.877); at pH = 5.68, ATC= 2.1 µg/L (NR 105).
[e] PCP chronic toxicity criteria = e (1.0054(pH)-4.9617); at pH = 5.68, CTC= 2.1 µg/L (NR 105).
[f] Ammonia surface water quality criteria are set for specific discharges based on temperature and pH of the receiving water. NR 104.20 requires ammonia to be less than 3 mg/L in surface water.

TABLE 7
COMPONENTS OF THE REMEDIAL ALTERNATIVES

RECORD OF DECISION
PENTA WOOD PRODUCTS SITE
TOWN OF DANIELS, WISCONSIN

Key Components	1 No Further Action	2 Soil Consolidation and Cover, Ground Water, and LNAPL Collection and Treatment, and Natural Attenuation	3 Soil Consolidation and Cover, Bioventing, Ground Water and LNAPL Collection and Treatment, and Natural Attenuation	4 Soil Consolidation and Cover, Bioventing, Ground Water and LNAPL Collection and Treatment Throughout Plume	5 Soil Consolidation and Cover, Bioventing, and Steam Injection with Soil Vapor Extraction
No Further Action	X				
Land Use Restrictions		X	X	X	X
Building Demolition		X	X	X	X
Dismantle Biopad and Backfill Onsite		X	X	X	X
Grading, Lagoon Buttress, Revegetation		X	X	X	X
Excavation of Hot Spots, Washout Gully Soils and Sediments and Consolidation		X	X	X	X
Fixation / Stabilization—Arsenic Contaminated Soil and Consolidation		X	X	X	X
Soil Cover over Consolidated Soils and Sediments		X	X	X	X
Natural Attenuation—Vadose Soils		X			
In Situ Bioventing of Vadose Soils			X	X	X
In Situ Bioventing of Dewatered Smear Zone			X	X	
LNAPL Collection and Offsite Disposal		X	X	X	X

TABLE 7
COMPONENTS OF THE REMEDIAL ALTERNATIVES

RECORD OF DECISION
PENTA WOOD PRODUCTS SITE
TOWN OF DANIELS, WISCONSIN

Key Components	1 No Further Action	2 Soil Consolidation and Cover, Ground Water, and LNAPL Collection and Treatment, and Natural Attenuation	3 Soil Consolidation and Cover, Bioventing, Ground Water and LNAPL Collection and Treatment, and Natural Attenuation	4 Soil Consolidation and Cover, Bioventing, Ground Water and LNAPL Collection and Treatment Throughout Plume	5 Soil Consolidation and Cover, Bioventing, and Steam Injection with Soil Vapor Extraction
Ground Water Collection in LNAPL Area		X	X	X	X
Ground Water Collection Throughout Plume				X	
Monitored Natural Attenuation—Ground Water		X	X		X
Steam Injection with SVE Collection					X
GAC Adsorption		X	X	X	X
Precipitation and Filtration		a	a	a	a
Discharge Via Infiltration Trenches (or)		X	X	X	X
Discharge to Doctor Lake		b	b	b	b
Environmental Monitoring		X	X	X	X
Maintenance of Cover and Erosion Control		X	X	X	X
Alternative Water Supply		X	X	X	X
Five-year Site Reviews	X	X	X	X	X

[a]Precipitation of iron and manganese may be necessary for discharge to Doctor Lake.
[b]Discharge to Doctor Lake will be considered if discharge limits result in more cost-effective treatment processes.

TABLE 8
ARARs CRITERIA AND GUIDANCE FOR THE SELECTED REMEDY

RECORD OF DECISION
PENTA WOOD PRODUCTS SITE
TOWN OF DANIELS, WISCONSIN

Chemical-Specific ARARs

- Wisconsin NR 140 - Ground Water Quality
- Wisconsin NR 102 and 103 - Water Quality Standards for Surface Water and Wetlands
- Wisconsin NR 720 - Soil Cleanup Standards
- Wisconsin NR 404, 415, and 419 - Air Quality Standards
- Safe Drinking Water Act (SDWA) - MCLs
- SDWA - MCLGs
- Clean Water Act (CWA) - Ambient Water Quality Criteria
- Clean Air Act - National Primary and Secondary Ambient Air Quality Standards

The following chemical-specific criteria were also considered:

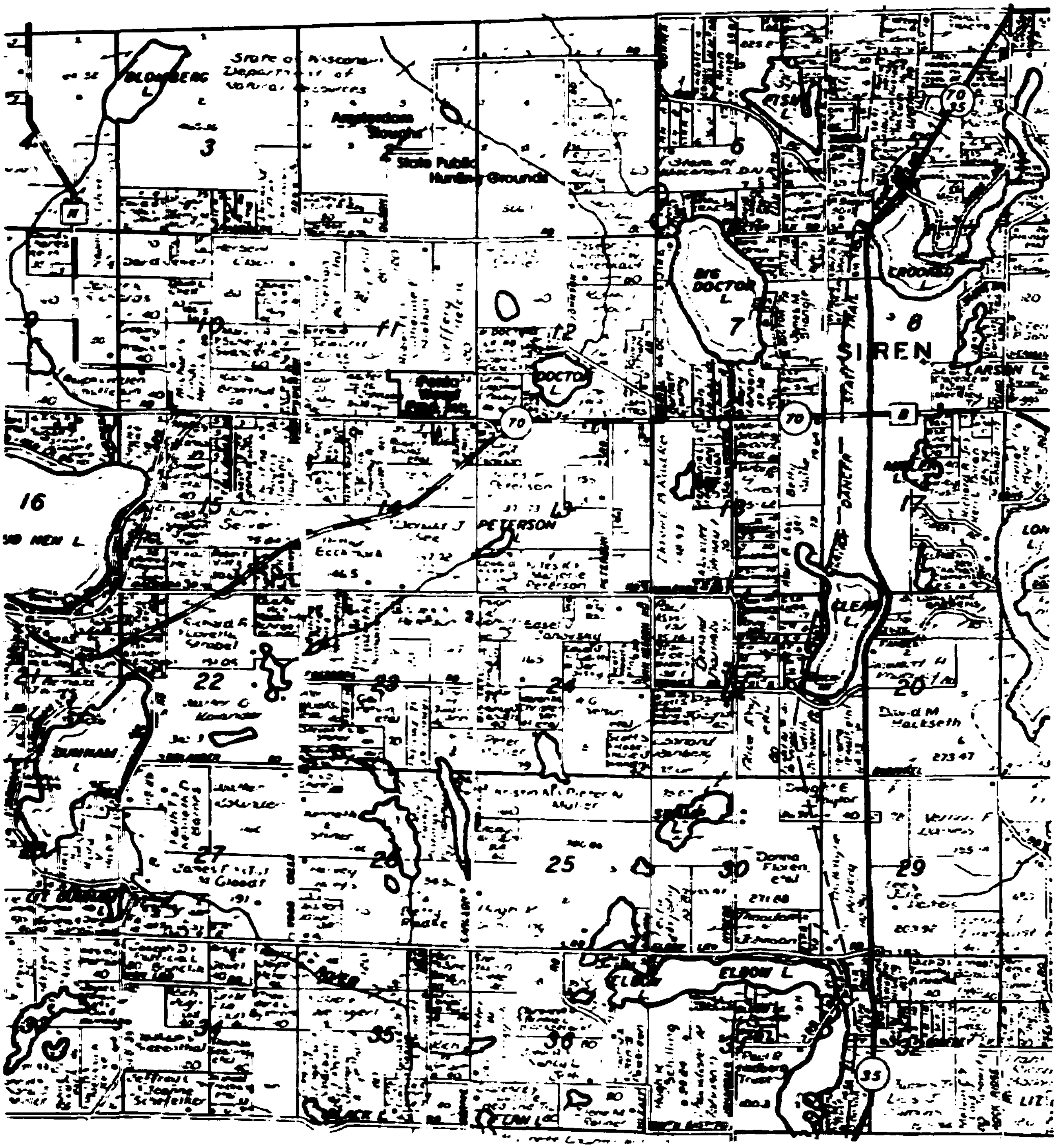
- EPA Risk Reference Doses
- EPA Carcinogen Assessment Group Cancer Slope Factors
- EPA Health Advisories
- EPA Region IX PRG approach
- EPA approach for addressing dioxin in soil memorandum
- WDNR Soil Cleanup Levels for PAHs Interim Guidance
- WDNR Sediment Quality Objectives

Action-Specific ARARs

- Resource Conservation and Recovery Act
- Wisconsin NR 500 Series - Solid Waste Management
- Wisconsin NR 600 Series - Hazardous Waste Management, particularily NR 636, CAMU provisions
- Wisconsin NR 812 - injection of treated ground water; point-of-use water treatment devices
- EPA and Department of Transportation regulations on transport of hazardous waste
- Wisconsin NR 700 (Investigation and Remediation of Environmental Contamination)

Location-Specific ARARs

- Executive Orders 11988 and 11990 - avoid adversely affecting wetlands



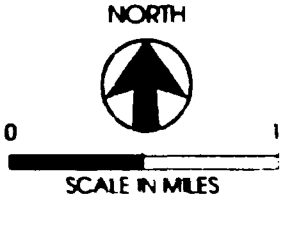


FIGURE
Site Location Map
Record of Decision
Penta Wood Products Site
Town of Daniels, Wisconsin

CH2M HILL

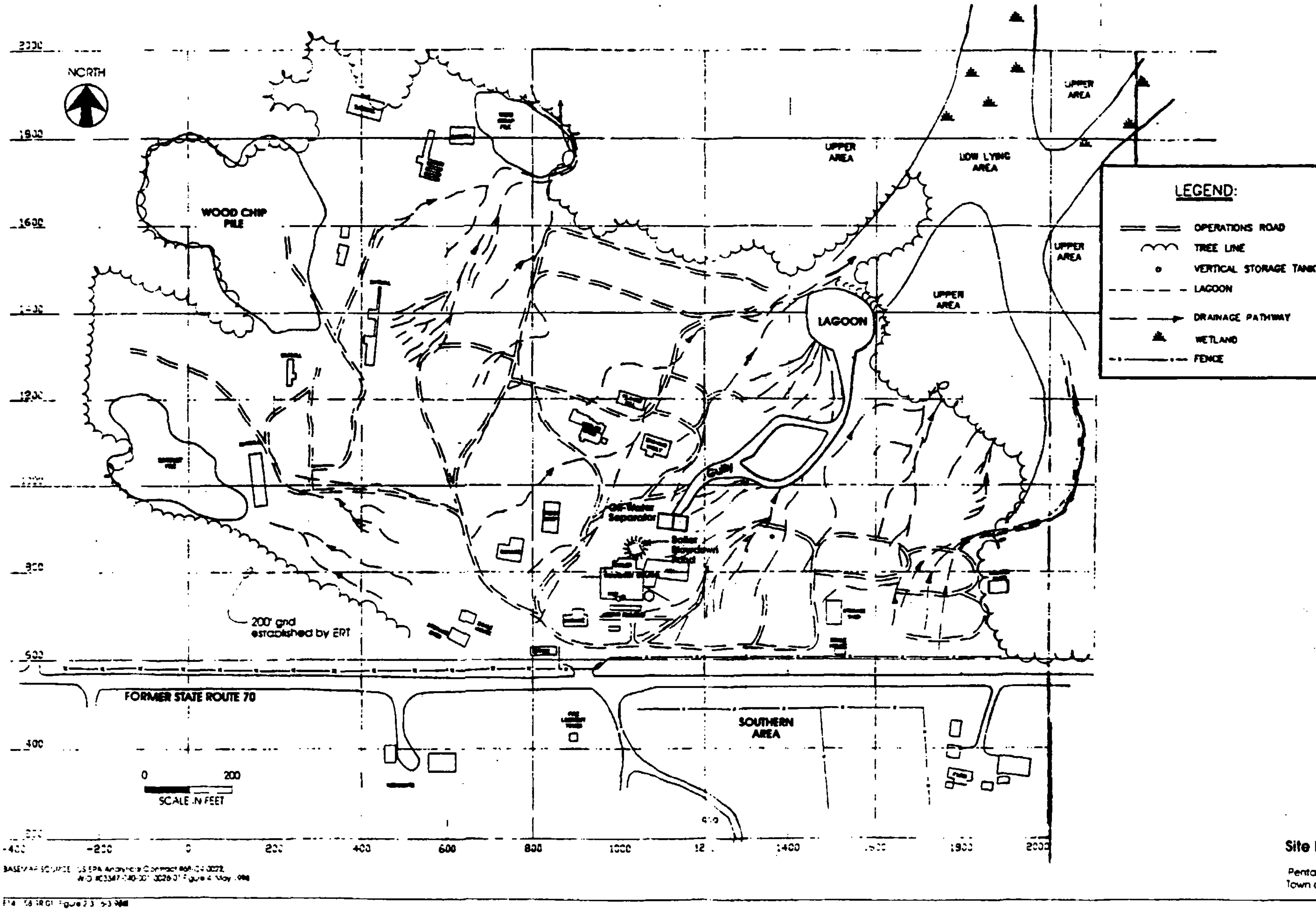


FIGURE 2
Site Features Map
Record of Decision
Penta Wood Products Site
Town of Daniels, Wisconsin

CH2MHILL

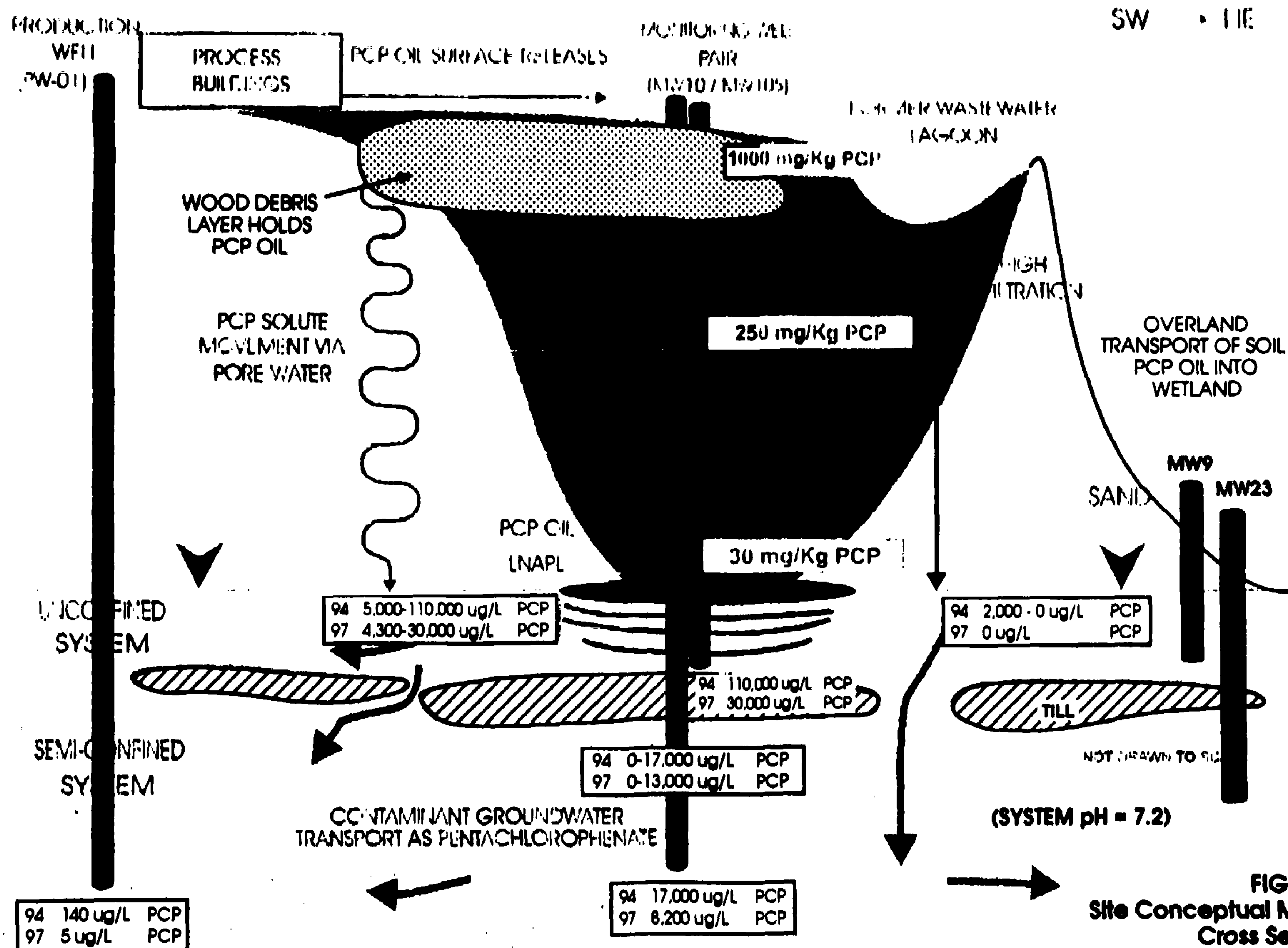


FIGURE 3
Site Conceptual Model
Cross Section
Record of Decision
Penta Wood Products Site
Town of Da[illegible] Wisconsin

SOURCE: US EPA Analytical Contract #C4-68-0022,
W.O.#03347-040-001-0026-01 Figure 4.4-1, December 1994.

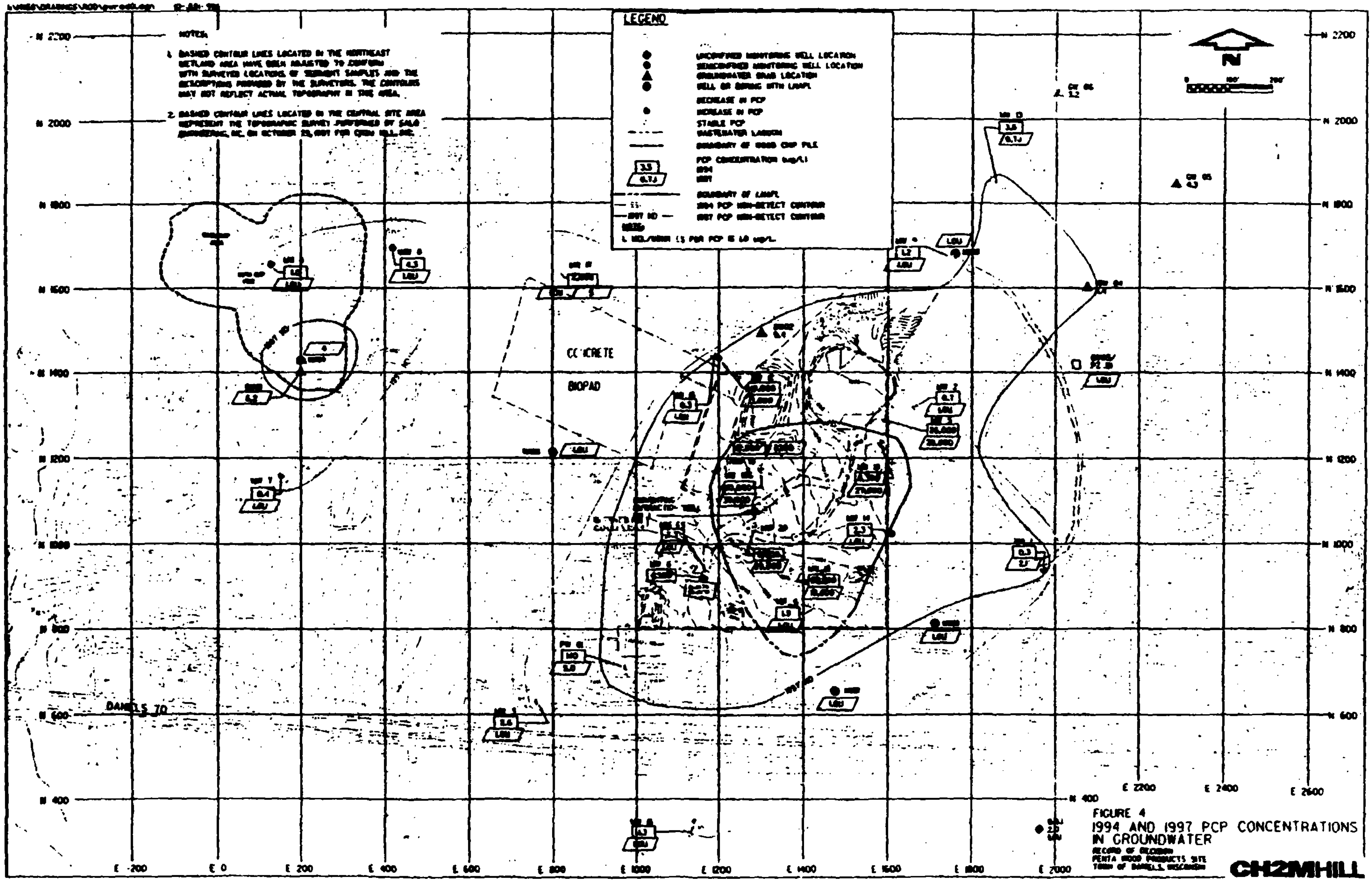


FIGURE 4
1994 AND 1997 PCP CONCENTRATIONS IN GROUNDWATER
RECORD OF DECISION
PENTA WOOD PRODUCTS SITE
TOWN OF DANIELS, WISCONSIN
CH2MHILL

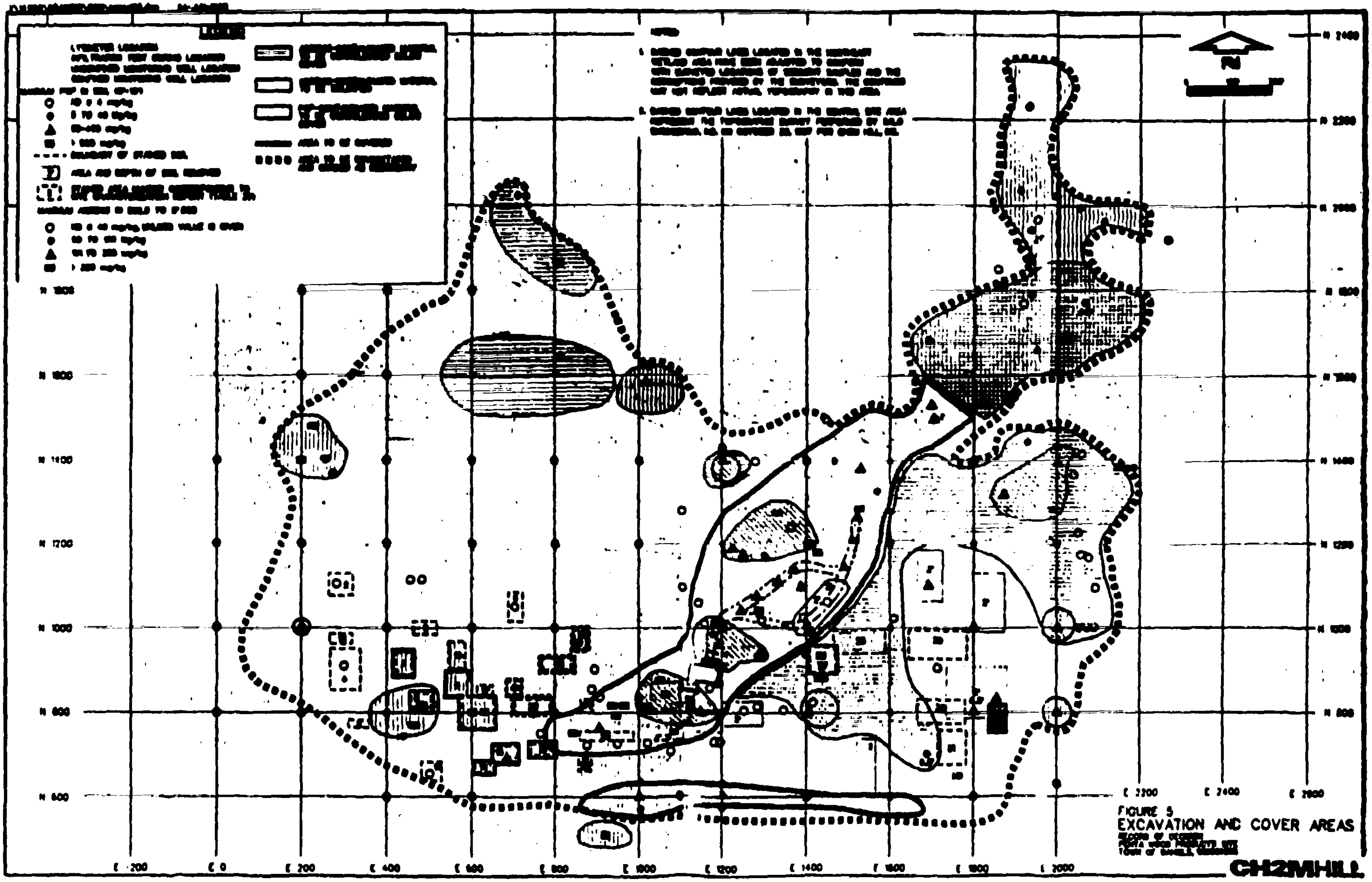


FIGURE 5
EXCAVATION AND COVER AREAS

APPENDIX A

WDNR LETTER OF CONCURRENCE

WISCONSIN DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary

Box 7921
101 South Webster Street
Madison, Wisconsin 53707-7921
TELEPHONE 608-266-2621
FAX 608-267-3579
TDD 608-267-6897

October 15, 1998

Mr. William E. Muno, Director, Superfund Division
U.S. EPA Region 5
77 W. Jackson Blvd.
Chicago, IL 60604

SUBJECT: **Concurrence on the Selected Remedy (Alternative 3) for the Penta Wood Products Superfund Site, Town of Daniels, Burnett County, Wisconsin.**

Dear Mr. Muno:

The Wisconsin Department of Natural Resources ("the Department") is providing you with this letter to document our concurrence with the remedy selected for the Penta Wood Products Superfund site. The final remedy, as outlined in the July 1998 Proposed Plan and the September 1998 Record of Decision, will address the impacted soil and groundwater and is considered a final remedy for the site. The selected remedy, identified as Alternative 3 in the Proposed Plan and Record of Decision, includes:

- Building Demolition
- Segregation, solidification, and placement of all arsenic soils in a CAMU
- Consolidation of PCP/Fuel Oil soils, sediments and wood chips under a soil cover
- Bioventing PCP/Fuel Oil contaminated material
- Biopad removal and backfill on site
- Erosion control measures
- Revegetation
- LNAPL Removal
- Grossly contaminated groundwater collection, treatment and discharge
- Monitored natural attenuation
- Institutional controls
- Environmental monitoring and maintenance
- Contingency measures to assure groundwater is restored within the specified restoration time frame
- Point of use carbon treatment or well replacement, if necessary
- Five year site reviews

The costs and time frames for the selected remedy are estimated to be as follow:

- Estimated Time to Design and Construct = 2 Years
- Estimated Remedial Time Frame for soils above the water table = 10 years
- Estimated Remedial Time Frame to meet NR 140 PALs in groundwater = 30-40 years

- Total Capital Costs = $3.8 million
- Total Operation and Maintenance Costs (net present worth) = $4.4 million
- Total Costs (net present worth) = $8.2 million

We understand that the potentially responsible parties (PRPs) have agreed to a contribution but are not able to fund the remedy and that the site remediation will be Fund Financed. It is understood that it will be necessary for the state of Wisconsin to contribute 10% of the remedial action costs associated with the proposed remediation (erosion control, soil consolidation and treatment, LNAPL removal, Bioventing, grossly contaminated groundwater treatment and monitored natural attenuation).

It is also understood that an evaluation will be done during the Five Year Reviews as to whether or not the remedy is performing as expected to restore groundwater to NR 140 standards within the estimated restoration time frame of 30-40 years and to meet other remedial goals. In accordance with Sections IX.B.11 and 13, and IX.C.3 of the Record of Decision (ROD), it is understood that U.S. EPA will evaluate and, if necessary, implement additional technologies, such as steam extraction, direct oxidation, pump and treat, etc., to achieve the NR 140 groundwater standards within this estimated restoration time frame in accordance with a contingency plan approved by both of our agencies. If a Five Year Review determines that it is necessary and feasible to implement more aggressive measures, as provided in the ROD, it is understood that it will be necessary for the State of Wisconsin to contribute 10% of any capital and O&M costs for the first ten years of the additional remedial action in accordance with the cost allocation provisions of CERCLA and the National Contingency Plan.

We maintain that NR 140 standards are technically and economically achievable for this site and it is not likely that a CERCLA Technical Impracticability Waiver from those standards will be necessary.

It is further understood that 10% of the O&M costs for the first ten years of active groundwater remediation and any contingencies and 100% of all O&M costs after the first ten years will be the State of Wisconsin's responsibility, unless changes are made to CERCLA or the National Contingency Plan that would require an alternative cost allocation.

Until the final remedy is funded, designed and implemented, it may be necessary to implement erosion control measures, to contain residual contamination and ensure the safety of the site. U.S. EPA staff and DNR staff have agreed that if the Department chooses to implement and fund such erosion control measures, subject to the prior approval of U.S.EPA, the cost of such approved remedial erosion control activities will be credited to the state's cost share for remedial action at the site. We expect that this agreement will be formalized in the Superfund State Contract for the site, and we condition our concurrence with the selected remedy for the site on reaching an agreement in the Superfund State Contract on this issue.

We provide assurance of the State's willingness to provide the required State cost share on the assumption that U.S. EPA will assure that the PRPs will comply with their stipulated agreements and all feasible enforcement actions against the PRPs will be pursued .

Nearly all contamination and remedial treatment residuals at Penta Wood Products have been determined to be F032 or F035 listed hazardous waste. We understand that if the Fund is expended to conduct the remedy and if hazardous waste needing disposal is required to be managed off-site as part of the remedy, that the State of Wisconsin will be required to provide the assurances for hazardous waste management in 40 CFR 300.510 (d) and (e) of the National Contingency Plan. The assurances are that a compliant hazardous waste facility is available, and that facility's use is consistent with our approved Capacity Assurance Plan.

According to the September 1998 ROD for Penta Wood Products, a cornerstone of the final plan for this site is the designation and acceptance of a Corrective Action Management Unit (CAMU). Chapter NR 636 Wisconsin Administrative Code describes Wisconsin's requirements for our acceptance of the design and performance of CAMUs and is an ARAR. Our acceptance of this final selected remedy is contingent upon our acceptance of the CAMU design, construction and performance and consistency with Wisconsin's hazardous waste program rules.

Our staff will continue to work in close consultation with your staff during the pre-design, design and construction phases of the remedy. Thank you for your support and cooperation in addressing the contamination problem at the site. Should you have any questions regarding this matter, please contact Mark Giesfeldt at (608) 267-7562 or Tom Kendzierski at (715) 635-4057.

Sincerely,

George E. Meyer

George E. Meyer
Secretary

cc: Tom Kendzierski NOR/Spooner
Gary Kulibert NOR/Rhinelander
Linda Meyer LS/5
Mark Giesfeldt RR/3
Mark Gordon RR/3
Gary Edelstein RR/3
Ken Glatz U.S. EPA Region V, 77 West Jackson (SR-6J), Chicago, IL 60604

APPENDIX B

ADMINISTRATIVE RECORD INDEX

AND

ADMINISTRATIVE RECORD LOCATIONS:

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CHICAGO, ILLINOIS

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMOVAL ACTION

ADMINISTRATIVE RECORD
FOR
PENTA WOOD PRODUCTS INC.
SIREN, DANIELS TOWNSHIP, WISCONSIN

ORIGINAL
MAY 11, 1993

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	04/01/86	Vulcan Chemicals		Material Safety Data Sheet, Pentachlorophenol	3
2	08/00/90	Aqua-Tech, Inc.	WDNR	Environmental Assessment Report, Phase III	88
3	01/22/91	Mockenhaupt, S., CRA	Kafura, D., WDNR	Groundwater Analytical Results	12
4	02/13/91	Kafura, D., WDNR	Mockenhaupt, S., CRA	Correspondence re: 1/22/91 Analytical Results	2
5	01/16/92	Mockenhaupt, S., CRA	Kafura, D., WDNR	Analytical Summary of Groundwater Data	6
6	03/00/92	Conestoga-Rovers & Associates	WDNR	Remedial Investigation and Corrective Action Plan	259
7	08/19/92	Hanson, R., Inter-County Leader	Public	Newspaper Article, "Alleged Pollution Shuts Down Penta Wood Products	2
8	09/28/92	Ramsey, W., WDNR	U.S. EPA	Preliminary Assessment	122
9	04/12/93	Pastor, S., U.S. EPA	Lesser, T., U.S. EPA	SACM Team Trip Report	1
10	06/18/93	E & E	U.S. EPA	Site Assessment	26
11	11/18/93	Steadman, P., U.S. EPA	Muno, W., U.S. EPA	Action Memorandum	25

UPDATE #1
OCTOBER 15, 1993

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	03/19/93	Parkinson, A., WDNR	Recipients	Memo re: 3/19/93 Conference Call	2
2	03/23/93	Dunn, J., WDNR	Kafura, D., Michaelsen, M., WDNR	WDNR's Review of the RI and Corrective Action Plan (Draft)	4
3	04/23/93	Parkinson, A., WDNR	Recipients	Agenda for 4/29/93 Conference Call	4
4	05/03/93	Parkinson, A.,	Recipients	Memo re: 4/29/93	3

		WDNR		Conference Call	

NO	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
5	05/14/94	Parkinson, A., WDNR	Steadman, P., U.S. EPA	Letter re: Pathway Sampling	1
6	05/20/93	Parkinson, A., WDNR	Recipients	Memo re: Site Strategy	1
7	06/14/93	Parkinson, A., WDNR	Recipients	Agenda for 6/15/93 Meeting, with Attachments	6
8	06/25/93	Steadman, P., U.S. EPA	Williams, R., U.S. EPA	Letter re: Request for ATSDR's Hazard/ Risk Evaluation of PCP, Arsenic and Copper in Soils	1
9	07/14/93	Williams, R., U.S. EPA	U.S. EPA	ATSDR's Record of	2
10	08/20/93	Johnson, D., WDNR	Parkinson, A., WDNR	Memo re: Geologic and Well Data	9

UPDATE #2
MARCH 8, 1995

NO	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	03/08/95	Steadman, P., U.S. EPA	Adamkus, V., U.S. EPA	Action Memorandum: Ceiling Increase	35

U.S. EPA ADMINISTRATIVE RECORD
REMOVAL ACTION
PENTA WOOD PRODUCTS SITE
SIREN, BURNETT COUNTY, WISCONSIN
UPDATE #3
12/04/96

DOC#	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	00/00/00	Penta Wood Products, Inc.		Brochure: "Chemonite Pressure Treatment Protects Wood Products"	4
2	00/00/00	U.S. EPA	File	Excerpts from "Field Applications of Bioremediation"	31
3	00/00/00	U.S. EPA	File	Site Securing List	1
4	00/00/00	U.S. EPA	File	Table: List of Typical Contaminants Identified Within the Penta Wood Site and the Range of Calculations	1
5	04/01/86	Vulcan Chemicals	File	Material Data Safety Sheet for Pentachlorophenol	3
6	01/22/91	Mockenhaupt, S., Conestoga-Rovers & Associates	Kafura, D., WDNR	Letter re: Groundwater Analytical Results	12
7	02/13/91	Kafura, D., WDNR	Mockenhaupt, S., Conestoga-Rovers & Associates	Letter re: Sampling Parameters at the Penta Wood Site	2
8	03/00/92	Conestoga-Rovers & Associates	U.S. EPA	Remedial Investigation and Corrective Action Plan	259
9	08/19/92	Hanson, R., Inter-County Leader	Public	Newspaper Article: "Alleged Pollution Shuts Down Penta Wood Products"	2
10	09/28/92	Ramsey, W., WDNR	WDNR/U.S. EPA	Preliminary Assessment Narrative for the Penta Wood Products Site w/Attachments	211
11	03/04/93	Glatz, K., U.S. EPA	Steadman, P., U.S. EPA	Memorandum re: Analytical Methods for the Penta Wood Site	1
12	03/19/93	Helmer, E., U.S. EPA/TSS	Steadman, P., et al; U.S. EPA	Memorandum re: Potential Ecological Risks	3
13	04/12/93	Pastor, S., U.S. EPA/CRC	Lesser, T., U.S. EPA	Trip Report: April 2, 1993 Penta Wood Site Visit with SACM Team	1
14	05/12/93	U.S. EPA	File	Site Sketch of the Penta Wood Products Site	1
15	06/25/93	Steadman, P., U.S. EPA	Williams, R., USDHHS/USPHS/ATSDR	Memorandum re: U.S. EPA Request for Hazard/Risk Evaluation of Pentachlorophenol, Arsenic and Copper in Soils at the Penta Wood Products Site w/Attached July 13, 1993 ATSDR Record of Activity	3

ITEM	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
16	08/23/93	Fayne, J., Popham Haik	Steadman, P., U.S. EPA	Letter re: Penta Wood's Response to the August 11, 1993 Section 106 Order	4
17	09/14/93	U.S. EPA/OSWER	U.S. EPA	Superfund Accelerated Cleanup Model (SACM): Coordination Strategy (OSWER Directive 9203.1-11)	4
18	10/19/93	Parkinson, A., WDNR	Steadman, P., U.S. EPA	Letter re: Data Summary for Samples Collected During the June 1993 Screening Site Inspection	27
19	10/21/93	Steadman, P., U.S. EPA	Tafura, D. and A. Parkinson, WDNR	Letter re: U.S. EPA's Request for Identification of ARARs for the Penta Wood Products Site	2
20	11/02/93	Parkinson, A., WDNR	Addressees	Memorandum re: Points of Discussion for Regional Decision Team Presentation (PORTIONS OF THIS DOCUMENT HAVE BEEN REDACTED)	4
21	11/12/93	U.S. EPA/ORD	U.S. EPA	Report: Superfund Technical Assistance Response Team (START) Wood Preserving Site Workshop Summary	25
22	11/15/93	Allen, H. and G. Prince, U.S. EPA/ERT	Steadman, P., U.S. EPA	Memorandum re: ERT Proposal for Support of Region 5 at the Penta Wood Products Site	6
23	11/19/93	Steadman, P., U.S. EPA	Muno, W., U.S. EPA	Action Memorandum: Request for a Removal Action at the Penta Wood Products, Inc. Site (PORTIONS OF THIS DOCUMENT HAVE BEEN REDACTED)	25
24	11/18/93	Steadman, P., U.S. EPA; et al.	U.S. EPA RDT	Memorandum re: Executive Summary for the Penta Wood Products SACM Site	3
25	11/19/93	Steadman, P., U.S. EPA; et al.	U.S. EPA/RDT	Memorandum re: Briefing Memo for the Penta Wood Products SACM Site	39
26	12/15/93	Traub, J., U.S. EPA	File	Memorandum re: Regional Decision Team Strategy Approval for the Penta Wood Products SACM Site	2
27	12/17/93	Steadman, P., U.S. EPA	Tafura, D., WDNR	Cover Letter Forwarding the Action Memorandum for the Removal Action	1
28	01/04/94	Peterson, L., U.S. EPA	Chapman Chemical Corporation	Letter re: 104(e) Information Request	7
29	01/06/94	Slatz, ?., U.S. EPA	Steadman, P., U.S. EPA	Memorandum re: Application of White Rot Fungus at the Penta Wood Site w/Attached December 27, 1993 EarthFax Letter	2

DOC#	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
30	01/24/94	Parkinson, A., WDNR	Addressees	Memorandum re: Minutes of January 19, 1993 Site Assessment Team Conference Call Meeting	4
31	01/28/94	U.S. EPA/OSWER	U.S. EPA	Memorandum re: Expectations for Full Implementation of SACM (OSWER Directive 9203.1-13)	5
32	01/31/94	Steadman, P., U.S. EPA	Leech, T., IRC Corporation	Cover Letter Forwarding June 18, 1993 Site Assessment Report	1
33	02/03/94	Steadman, P., U.S. EPA	Lee, R., Village of Siren	Letter re: Notice of U.S. EPA Actions in Siren under CERCLA	3
34	03/00/94	U.S. EPA/WDNR	Public	Fact Sheet: "Cleanup Begins at Penta Wood Products"	6
35	03/00/94	Roy F. Weston, Inc.	U.S. EPA	Quality Assurance Project Plan (Revision 2)	82
36	03/17/94	U.S. EPA/WDNR	Addressees	Agenda for the March 17, 1994 Site Assessment Team Conference Call Meeting	1
37	03/21/94	Rivera, R., U.S. EPA	U.S. EPA/SAT	Highlights from the March 17, 1994 Site Assessment Team Conference Call Meeting (PORTIONS OF THIS DOCUMENT HAVE BEEN REDACTED)	3
38	03/22/94	U.S. EPA/WDNR	Public	Draft Agenda for the March 29, 1994 Penta Wood Products Site Environmental Cleanup Public Meeting	1
39	04/00/94	U.S. EPA/OERR	U.S. EPA	Engineering Bulletin: "In Situ Biodegradation Treatment" (EPA/540S-94/502)	16
40	04/07/94	Parkinson, A., WDNR	U.S. EPA/SAT	Memorandum re: March 30, 1994 Penta Wood Site Assessment Team Conference Call Debriefing of Public Meeting	2
41	04/08/94	Nied, W., U.S. EPA	Addressees	POLREP #1 (Initial)	2
42	04/15/94	Allen, H., et al.; U.S. EPA/ERT	Nied, W., U.S. EPA	Memorandum re: ERT Activities at the Penta Wood Products Site for the Period April 11-16, 1994	2
43	04/15/94	Nied, W., U.S. EPA	Addressees	POLREP #2	1
44	04/22/94	Allen, H., et al.; U.S. EPA/ERT	Steadman, P., et al.; U.S. EPA	Memorandum re: ERT Activities at the Penta Wood Products Site for the Week of April 17-22, 1994	2

DOC#	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
45	04/2[illegible]/94	Nied, W., U.S. EPA	Addressees	POLREP #[illegible]	1
46	04/25/94	Glatz, K., U.S. EPA	U.S. EPA/SAT	Memorandum re: April 21, 1994 Site Assessment Team Conference Call Meeting	2
47	04/2[illegible]/94	Kremer, F., U.S. EPA	Steadman, P., U.S EPA	Letter re: U.S. EPA's Bioremediation Field Initiative w/Attached Bioremediation in the Field Questionnaire	1[illegible]
48	04/28/94	Allen, H., U.S. EPA/ERT	Steadman, P., et al.; U.S. EPA	Memorandum re: Activities at the Penta Wood Products Site for the Period April 2[illegible]-28, 1994	2
49	04/29/94	Kiee, N., U.S. EPA	Addressees	POLREP #4	2
50	05/00/94	U.S. EPA	Public	Fact Sheet: "Cleanup Progresses at Penta Wood Products Site"	4
51	05/00/94	U.S. EPA/ERT	U.S. EPA	Technical Memorandum: Remedial Technology Evaluation	247
52	05/03/94	U.S. EPA/ERC	U.S. EPA	ERD Weekly Report for the Week Ending April 29, 1994	4
53	05/05/94	U.S. EPA/ERT	U.S. EPA	Soil Isoconcentration Maps	4
54	05/06/94	Prince, G., et al.; U.S. EPA/ERT	Steadman, P., et al; U.S. EPA	Memorandum re: ERT Activities at the Penta Wood Products Site for the Period May 1- May 6, 1994	2
55	05/09/94	Parkinson, A., WDNR	U.S. EPA/SAT	Memorandum re: May 5, 1994 Penta Wood Site Assessment Team Conference Call Meeting	2
56	05/11/94	Glatz, K., U.S. EPA	Faryan, S., U.S. EPA	Memorandum re: Recommended Changes to the Biotrol Unit	1
57	05/11/94	Breslin, J., U.S. EPA	Steadman, P., et al.; U.S. EPA	Memorandum re: Removal of Equipment and Other Assets from the Penta Wood Products Site	2
58	05/18/94	Steadman, P., U.S. EPA	Lafura, D., WDNR	Letter re: U.S. EPA/ORC's Instructions Concerning Disposal of Assets and Fixtures at the Penta Wood Products Site w/Attachments	4
59	05/19/94	Parkinson, A., WDNR	Addressees	Memorandum re: Agenda for the May 19, 1994 Penta Wood Conference Call	1
60	05/19/94	U.S. EPA	File	Memorandum re: Summary of May 19, 1994 Penta Wood Conference Call (PORTIONS OF THIS DOCUMENT HAVE BEEN REDACTED)	2

DOC#	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
61	06/09/94	Prince, G., U.S. EPA/ERT	Steadman, P., et al.; U.S. EPA	Memorandum re: Draft Tables and Figures Generated from the Extent of Contamination and Engineering Studies (April-May, 1994) and Presentation of a Conceptual Design for a Pilot Study w/Attachments	127
62	06/13/94	Parkinson, A., WDNR	U.S. EPA/SAT	Memorandum re: Summary of June 3, 1994 Penta Wood Site Assessment Team Conference Call Meeting (PORTIONS OF THIS DOCUMENT HAVE BEEN REDACTED)	2
63	06/23/94	Allen, H., U.S. EPA/ERT	Steadman, P., U.S. EPA	FAX Transmission Forwarding U.S. EPA Memorandum re: Dioxin Toxicity Equivalent Calculations	1
64	06/27/94	Parkinson, A., WDNR	U.S. EPA/SAT	Memorandum re: June 16, 1994 Penta Wood Site Assessment Team Conference Call Meeting	3
65	07/01/94	Prince, G. and H. Allen; U.S. EPA	Steadman, P., et al.; U.S. EPA	Memorandum re: Multi Purpose Field Test at the Penta Wood Site	11
66	07/09/94	Nied, W. and S. Faryan; U.S. EPA	Addressees	FAX Transmission Forwarding Attached POLREP #14	3
67	07/12/94	Lemcke, J., WDNR	Steadman, P., U.S. EPA	Letter re: Identification of ARARs for the Penta Wood Products Site	19
68	07/19/94	Penta Wood Site Assessment Team	U.S. EPA/Penta Wood Regional Decision Team	Memorandum re: Update of Site Activities, Sampling Results, and Site Action Strategy	3
69	07/20/94	Brown, B., National Environmental Testing, Inc.	Walls, J., Environmental Quality Management, Inc.	Analytical Reports for Water Treatment Samples	3
70	07/22/94	Nied, W. and S. Faryan, U.S. EPA	Addressees	POLREP #15	1
71	08/24/94	Briggs, S., Burnett County Sentinel	Public	Newspaper Article: "EPA Builds Cleanup Pad at Penta Wood"	1
72	08/24/94	Hanson, R., Inter County Leader	Public	Newspaper Article: "Gigantic 'Bio Pad' Part of Penta Cleanup"	3
73	09/00/94	U.S. EPA/ERL	U.S. EPA	Quick Reference Fact Sheet: "DNAPL Site Characterization" (Publication 9355.4 16FS; EPA/540/F-94/049; PB94-963317)	12

DOC#	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
74	09/16/94	Vendl, M., U.S. EPA/TSU	Weis, A., U.S. EPA	Memorandum re: EPR Survey Report	2
75	09/16/94	Vendl, M., U.S. EPA/TSU	U.S. EPA	Report: A EPR Survey at Penta Wood Products	12
76	09/21/94	Faryan, S., U.S. EPA	Steadman, P., U.S. EPA	FAX Transmittal re: Pilot Scale DARAMEND Bioremediation Demonstration - An Unsolicited Proposal	5
77	09/30/94	U.S. EPA	File	Chart: Remaining Waste Material at the Penta Wood Site as of September 30, 1994	2
78	11/09/94	U.S. EPA	Public	Fact Sheet: "Cleanup Progress at Penta Wood Products Site"	4
79	11/30/94	U.S. EPA	Public	Announcement of November 30, 1994 Penta Wood Products Update Meeting	1
80	12/22/94	Rusin, J., et al.; National Environmental Testing, Inc.	Walls, J., Environmental Quality Management, Inc.	Quality Control Data for Water Treatment Samples	106
81	01/05/95	MDNR	U.S. EPA	Press Release: "MDNR Recommends Superfund Status for the Penta Wood Products Site Due to Environmental Contamination"	2
82	02/07/95	Leggett, A., CMC/EARTHTEC	Faryan, S., U.S. EPA	Report: Pilot Study Utilizing White Rot Fungus the Penta Wood Treating Site	14
83	03/06/95	Steadman, P., U.S. EPA	Adamkus, V., U.S. EPA	Action Memorandum: Request for Ceiling Increase and for an Exemption to the $2 Million and 12 Month Statutory Limit for the Time-Critical Removal Action at the Penta Wood Products Site	9
84	05/00/95	Roy F. Weston, Inc.	U.S. EPA/ERT	Site Characterization Final Report: Extent of On- and Off-Site Contamination Surficial and Near Surface Soil at the Penta Wood Products Site (Volume 1 of 3: Text, Tables and Figures	151
85	05/00/95	Roy F. Weston, Inc.	U.S. EPA/ERT	Site Characterization Final Report: Extent of On- and Off-Site Contamination Surficial and Near Surface Soil at the Penta Wood Products Site (Volume 2 of 3: Appendices A-C)	710

DOC#	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
86	05/00/95	Roy F. Weston, Inc.	U.S. EPA/ERT	Site Characterization Final Report: Extent of On and Off Site Contamination—Surficial and Near Surface Soil at the Penta Wood Products Site (Volume 3 of 3: Appendices D-F)	380
87	05/31/95	Roy F. Weston, Inc.	U.S. EPA	Technical Memorandum: Bioremediation Activity Summary for the Penta Wood Products Site	559
88	06/00/95	Ecology and Environment, Inc.	U.S. EPA	Final Community Involvement Plan	36
89	06/00/95	Roy F. Weston, Inc.	U.S. EPA	Phase II Amended Quality Assurance Work Plan (UNSIGNED)	63
90	06/06/95	Walls, J., Environmental Quality Management, Inc.	Nied, W., U.S. EPA	Letter Forwarding Attached Original Reports for Samples Collected July 7, 1994	110
91	06/09/95	Steadman, P., U.S. EPA	Graeber, J., Environmental Quality Management, Inc.	Letter Forwarding Attached Invoice for Additional Laboratory Analytical Services	3
92	07/00/95	U.S. EPA	Public	Fact Sheet: "Questions & Answers Concerning the Penta Wood Products Site"	4
93	08/16/95	Jergens, E., Environmental Quality Management, Inc.	Steadman, P., U.S. EPA	FAX Transmission re: Transportation and Disposal Summary for the Penta Wood Site	4
94	08/28/95	Jergens, E., Environmental Quality Management, Inc.	Steadman, P., U.S. EPA	FAX Transmission re: Updated Transport and Disposal Summary	5
95	08/30/95	Greber, J., Environmental Quality Management, Inc.	Steadman, P., U.S. EPA	Memorandum re: Remobilization of the Penta Wood Site for Transport and Disposal Purposes	1
96	10/19/95	Environmental Quality Management, Inc.	U.S. EPA	Analytical Report for Penta Wood RFW Lot 95096400	327
97	12/04/95	Doan, J., Environmental Quality Management, Inc.	Steadman, P., U.S. EPA	Letter re: Preliminary Review of Sampling Data	1

DOC#	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
98	12/06/95	Steadman, P., U.S. EPA	Greber, J., Environmental Quality Management, Inc.	Letter re: Transportation and Disposal of Hazardous Contaminants from the Penta Wood Site	2
99	12/12/95	Greber, J., Environmental Quality Management, Inc.	Steadman, P., U.S. EPA	Letter re: Current Status of Waste Transportation and Disposal at the Penta Wood Site	1
100	12/12/95	Jergens, E., Environmental Quality Management, Inc.	Steadman, P., U.S. EPA	Letter re: Status Report of the Transportation and Disposal Activities at the Penta Wood Site	1
101	12/14/95	Greber, J., Environmental Quality Management, Inc.	Steadman, P., U.S. EPA	Letter re: Status Report of Transportation and Disposal at the Penta Wood Site	1
102	12/15/95	Roy F. Weston, Inc.	U.S. EPA	Technical Memorandum: Bioremediation Activity Summary for the Penta Wood Products Site	256
103	12/22/95	Doan, J., Environmental Quality Management, Inc.	Steadman, P., U.S. EPA	Letter Forwarding Attached Weston Corrective Action Report	4
104	01/02/96	Tafura, D., WDNR	Wied, W., U.S. EPA	FAX Transmission re: Peroxidation System for Possible Use at the Penta Wood Site	10
105	01/09/96	Doan, J., Environmental Quality Management, Inc.	Steadman, P., U.S. EPA	Letter Forwarding Attached Weston Letters re: the Corrective Action Report and Chain of Custody	2
106	02/12/96	Doan, J., Environmental Quality Management, Inc.	Steadman, P., U.S. EPA	Analytical Report for Penta Wood RFW Lot 96015458	234
107	02/16/96	Pastor, S. and P. Steadman, U.S. EPA	Public	Letter re: Update on Cleanup Activities at the Penta Wood Site	2
108	04/24/96	Burnett County Sentinel	Public	Newspaper Article: "Penta Lawsuit Settled"	1
109	05/19/96	Steadman, P., U.S. EPA	Addressees	POLREP #2E	2
110	06/06/96	Jergens, E., Roy F. Weston, Inc.	Steadman, P., U.S. EPA	Preliminary Inorganics Data Summary Report	9

DOC#	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
111	06/10/96	Sabin, D., WRR Environmental Services Company	U.S. EPA	Bill of Lading: Waste Oil Non Hazardous Non Regulated	1
112	06/10/96	IDEM	U.S. EPA	Uniform Hazardous Waste Manifests for the Period May 20—June 10, 1996	95
113	06/12/96	Slater, S., Burnett County Sentinel	Public	Newspaper Article: "Penta Cleanup Continues: EPA Official Sees Light at the End of the Tunnel"	2
114	06/12/96	Hanson, R., Inter-County Leader	Public	Newspaper Article: "Superfund Cleanup at Penta Wood Entering New Phase"	2
115	06/12/96	WDNR	U.S. EPA	Uniform Hazardous Waste Manifests for the Period January 29--June 12, 1996	6
116	06/17/96	Steadman, P., U.S. EPA	File	Government Property Disposition Document	1
117	06/19/96	Doan, J., Environ mental Quality Management, Inc.	Steadman, P., U.S. EPA	Analytical Report for Penta Wood RFW Lot 96066508	695
118	06/21/96	U.S. EPA	Public	Environmental News Release: "EPA Names New Superfund Sites in Midwest"	2
119	06/28/96	Greber, J., et al.; Environmental Quality Management, Inc.	Steadman, P., U.S. EPA	FAX Transmission re: Disposal of Contaminated Soils from the Penta Wood Products Site	7

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMOVAL ACTION

ADMINISTRATIVE RECORD
FOR
PENTA WOOD PRODUCTS SITE
SIREN, BURNETT COUNTY, WISCONSIN

UPDATE #4
JULY 7, 1998

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	01/08/93	U.S. EPA	File	Record Book: OSC's Log Containing Information on Penta Wood Site from January 8, 1993 - June 10, 1996 w/Attachments (Receipts, Business Cards)	54
2	04/00/93	U.S. EPA	File	*Seminars: Bioremediation of Hazardous Waste Sites: Practical Approaches to Implementation* (EPA/600/K-93/002)	288
3	08/22/94	Steadman, P., U.S. EPA	Rollins, F., U.S. EPA	Soil Volume Estimates for PCP and Arsenic for the Penta Wood Products Site	4
4	08/30/95	Karl, R., U.S. EPA	Dietrich, D., U.S. EPA	On-Scene Coordinator's Report: Removal Action at the Penta Wood Products Site (DRAFT)	25
5	12/00/95	U.S. EPA/ OSWER	U.S. EPA	Report: *Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites* (OSWER Directive 9200. 5-162)	59
6	03/04/96	Hemming, B., Microbe Inotech Laboratories, Inc.	Steadman, P., U.S. EPA	Pamphlet: *Bioremediation Testing Information* w/Cover Letter	17
7	04/11/96	U.S. District Court/Western District of Wisconsin	File	Consent Decree re: Penta Wood Products Site	36
8	05/00/96	*Soil and Groundwater Cleanup*		Publication: *Bioremediation* Issue (May 1996)	74
9	06/03/96	Lundequam, V., Penta Wood Products, Inc.	U.S. EPA	Handwritten Log of Activities for the Period May 9-June 3, 1996	11

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
10	06/12/96	U.S. EPA	File	Federal On-Scene Coordinator's Report (DRAFT)	23
11	06/14/96	WDNR		State of Wisconsin Uniform Hazardous Waste Manifests for U.S. EPA Penta Wood Products	2
12	07/01/96	Steadman, P., U.S. EPA	Distribution List	Final Pollution Report (POLREP #32) for the Penta Wood Products Site	6
13	08/15/96	State of Wisconsin Department of Health and Social Services	Steadman, P., U.S. EPA	Information Mailing re: Role of Health Assessors and Educators from the Environmental Agency Perspective	6
14	08/21/96	Dumelle, R., U.S. EPA	Greber, J., Environmental Quality Management, Inc.	Letter re: Financial Monitoring Review Finding No. 4 - Over Billed Costs for a Fixed Rate Equipment Item	3
15	08/21/96	Dumelle, R., U.S. EPA	Greber, J., Environmental Quality Management, Inc.	Letter re: Financial Monitoring Review Finding No. 6 - Non-Compliance with Other Direct Cost Allocation Policy	4
16	08/26/96	Pastor, S., & P. Steadman, U.S. EPA	Public	Letter re: Update on Cleanup Activities at the Penta Wood Products Site (UNSIGNED)	1
17	08/29/96	Ramaly, T., Ecology and Environment, Inc.	Nabasny, G., U.S. EPA	TDD Amendment Request for the Penta Wood Products Site	4
18	08/30/96	Ramaly, T., Ecology and Environment, Inc.	Steadman, P., U.S. EPA	Letter re: Draft OSC Report for the Penta Wood Site	1
19	08/30/96	Lundequam, V., Penta Wood Products, Inc.	U.S. EPA	Handwritten Log of Activities for the Period July 9-August 30, 1996	1
20	09/12/96	Ecology & Environment, Inc.	U.S. EPA	Technical Direction Document (TDD) for Removal Support at the Penta Wood Products Site	1

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
21	09/18/96	Liszewski, C., U.S. EPA	Lundequam, V.	Letter re: Change in Office of Regional Counsel Contact for the Penta Wood Products Site	1
22	09/26/96	Ramaly, T., Ecology and Environment, Inc.	Nabasny, G., U.S. EPA	TDD Amendment Request re: the Penta Wood Products Site	1
23	09/30/96	Nordine, J. & T. Kouris; Ecology & Environment, Inc.	Nabasny, G., U.S. EPA	Letter re: Extent of Contamination Survey for the Penta Wood Products Site (DRAFT)	9
24	10/08/96	Steadman, P., U.S. EPA	Young, M., Wisconsin Division of Health	Letter re: Residual Contaminant Level Information Request for the Penta Wood Site	1
25	10/08/96	U.S. EPA	Reidel Environmental Services	Amendment of Solicitation/Modification of Contract for the Penta Wood Products Site	4
26	10/22/96	Nabasny, G., U.S. EPA	File	Technical Direction Document (TDD) re: Removal Support at the Penta Wood Products Site	2
27	10/22/96	Liszewski, C., U.S. EPA	Lundequam, V.	Letter re: Treating Cylinders at the Penta Wood Products Site	2
28	10/24/96	McCarrin, M., Clayton Environmental Consultants	Steadman, P., U.S. EPA	Statement of Qualifications Package w/Cover Letter	72
29	11/15/96	Nordine, J. & T. Kouris, Ecology & Environment, Inc.	Nabasny, G., U.S. EPA	Letter Forwarding Penta Wood Products Site Extent of Contamination Survey	8
30	11/15/96	Ecology & Environment, Inc.	U.S. EPA	Draft OSC-Report Outline for the Penta Wood Products Site	23
31	02/17/97	Jergens, E., Environmental Quality Management, Inc.	Steadman, P., U.S. EPA	CERCLA Offsite Disposal Report for the Penta Wood Products Site w/ Cover Letter	40

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
32	03/21/97	Greber, J., Environmental Quality Management, Inc.	Steadman, P., U.S. EPA	Letter Forwarding Contractor's FINAL Site Report for the Penta Wood Products Site w/Cover Letter	107

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMOVAL ACTION

ADMINISTRATIVE RECORD
FOR
PENTA WOOD PRODUCTS SITE
SIREN, BURNETT COUNTY, WISCONSIN

UPDATE #5
JULY 7, 1998

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	06/00/95	Ecology and Environment, Inc.	U.S. EPA	*Final Community Involvement Plan* for the Penta Wood Products Site	37
2	08/00/97	Ecology and Environment, Inc.	U.S. EPA	Report: *Focused Human Health Risk Assessment* for the Penta Wood Products Site	115
3	06/00/98	CH2M Hill	U.S. EPA	Report: *Screening Level Ecological Risk Assessment* for the Penta Wood Products Site (FINAL)	70
4	06/00/98	CH2M Hill	U.S. EPA	*Remedial Investigation Report* for the Penta Wood Products Site (FINAL)	497
5	06/00/98	CH2M Hill	U.S. EPA	*Feasibility Study Report* for the Penta Wood Products Site (FINAL)	320
6	06/29/98	Kendzierski, T., WDNR	Glatz, K., U.S. EPA	Memorandum re: WDNR's Comments on the June 1998 *Draft Remedial Investigation Report* for the Penta Wood Products Site	2

GUIDANCE ADDENDUM

THE FOLLOWING DOCUMENTS ARE INCORPORATED INTO
THE ADMINISTRATIVE BY REFERENCE

DOCUMENTS HAVE NOT BEEN COPIED FOR PHYSICAL INCLUSION
INTO THE ADMINISTRATIVE RECORD

DOCUMENTS MAY BE VIEWED AT:
U.S. EPA REGION 5
77 W. JACKSON BLVD.
CHICAGO, IL 60604-3590

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
7	00/00/82	U.S. Geological Survey		Siren West, Wisconsin Quadrangle Map (SW/4 Webster 15', N4545-W9222.5/7.5)	

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
8	10/00/88	U.S. EPA/ OERR	U.S. EPA	*Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (Interim Final)* [OSWER Directive 9355.3-01]	
9	00/00/89	U.S. EPA		*Risk Assessment Guidance for Superfund: Volume 1 (Human Health Evaluation)*	
10	03/00/89	U.S. EPA		*Risk Assessment Guidance for Superfund: Volume 2 (Environmental Evaluation Manual)*	
11	03/08/90	U.S. EPA		*National Oil and Hazardous Substances Pollution Contingency Plan (Final Rule)* [55FR8666]	
12	03/25/91	U.S. EPA		*Risk Assessment Guidance for Superfund: Volume 1 (Human Health Evaluation Manual: Supplemental Guidance, Standard Default Exposure Factors)*	
13	00/00/93	U.S. EPA		*Wildlife Exposure Factors Handbook: Volume 1 of 2* (EPA/600/R-93/187a)	
14	00/00/94	USDHHS/USPHS/ ATSDR		*Toxicological Profile for Pentachlorophenol*	
15	02/00/96	U.S. EPA		*Drinking Water Regulations and Health Advisories*	
16	06/00/97	U.S. EPA		*Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments*	
17	00/00/98	U.S. EPA		*Integrated Risk Information System (IRIS)*	
18	00/00/98	U.S. EPA		*Health Effects Assessment Summary Tables (HEAST)*	

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
19	01/00/98	U.S. EPA/ ORD/OSWER	U.S. EPA	*Steam Injection for Soil and Aquifer Remediation*	
20	04/13/98	U.S. EPA/ OSWER	U.S. EPA	Memorandum: *Approach for Addressing Dioxin in Soil at CERCLA and RCRA Sites* (OSWER Directive 9200.4-26)	

U.S. ENVIRONMENTAL PROTECTION AGENCY

ADMINISTRATIVE RECORD
FOR
PENTA WOOD PRODUCTS SITE
SIREN, BURNETT COUNTY, WISCONSIN

UPDATE #6
SEPTEMBER 10, 1998

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	06/29/98	Kendzierski, T., WDNR	Glatz, K., U.S. EPA	Letter: WDNR's Comments on the *Remedial Investigation Report* for the Penta Wood Products Site	2
2	07/28/98	Northwestern Court Reporters	U.S. EPA	*Transcript* of July 15, 1998 Public Meeting re: the *Proposed Plan* for the Penta Wood Products Site	43
3	07/30/98	Kendzierski, T., WDNR	Glatz, K., U.S. EPA	Letter: WDNR's Comments on the *Feasibility Study* for the Penta Wood Products Site w/ Attachment	9
4	08/05/98	Kendzierski, T., WDNR	Glatz, K., U.S. EPA	Letter: WDNR's Comments on the *Proposed Plan* for the Penta Wood Products Site	6

APPENDIX C

RESPONSIVENESS SUMMARY

OVERVIEW

The public participation requirements of CERCLA sections 113 (k) (2) (B)) (i-v) and 117 of CERCLA have been met during the remedy selection process. Section 113 (k) (2) (B) (iv) of CERCLA requires the U.S. EPA to respond "to each of the significant comments, criticisms, and new data submitted in written or oral presentations" on a proposed plan for a remedial action. The Responsiveness Summary addresses concerns expressed by the public and governmental bodies in written and oral comments received by U.S. EPA and WDNR regarding the proposed remedy for the PWP Superfund Site.

BACKGROUND OF COMMUNITY INVOLVEMENT

The following is a chronology of community relations activities to date:

Fact sheets were issued in March and May, 1994, to explain the start-up and progress made during the non-time critical removal. The March 1994 fact sheet was developed by the WDNR in cooperation with the U.S. EPA. WDNR hosted a public meeting on March 29, 1994, to explain the beginning stages of the cleanup.

U.S. EPA met with several local residents, representatives from various town boards, and a representative from the Burnett County Health Department on April 11-13, 1995, to identify community concerns and interests regarding the PWP Site.

Community Relations Plan (CRP) was prepared based on concerns and interests generated from community interviews in June 1995.

U.S. EPA published two public meeting notices in the *Burnett County Sentinel* and *Inter-County Leader* to discuss cleanup activities under the removal program, and to announce the meeting. Fact sheets were distributed to inform the community about the cleanup and provide background on the PWP site. A public meeting was held on November 30, 1994.

A press release was sent to area media announcing that the PWP site had been listed on the NPL (June 1996).

The RI, FS, and Proposed Plan for the PWP Site were released to the public on July 1, 1998.

Public Notices were placed in the *Burnett County Sentinel* and *Inter-County Leader* on July 1, 1998.

The public comment period was held from July 7 to August 8, 1998.

A public meeting was held on July 15, 1998, to discuss the FS and Proposed Plan. Representatives from U.S. EPA and WDNR answered questions about the PWP Site and the proposed remedial alternative. A transcript of this public meeting has been placed in the Administrative Record. Written comments were solicited at the meeting. Approximately six people attended, including local residents. No public comments were received during the public meeting.

RESPONSE TO COMMENTS

No public comments were received during the public comment period.

LIST OF ACRONYMS

ACZA	ammonia, copper II oxide, zinc, and arsenic
ARARs	Applicable or relevant and appropriate requirements
AWQC	ambient water quality criterion
bgs	below ground surface
CAMU	corrective action management unit
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	constituent of potential concern
CFS	cancer slope factor
cys	cubic yards
DO	dissolved oxygen
EPC	exposure point concentration
ERB	Emergency Removal Branch
ERT	Emergency Response Team
ES	Enforcement Standard
FHHRA	Focused Human Health Risk Assessment
FS	Feasibility Study
ft/day	feet per day
ft/ft	feet per feet
ft/yr	feet per year
FWS	U.S. /Fish and Wildlife Service
GAC	granular activated carbon
gpm	gallons per minute
HI	hazard index
HQ	hazard quotient
IRIS	Integrated Risk Information System
lb/hr	pounds per hour
L/kg	liters per kilogram

LDR	land disposal restriction
LNAPL	light non-aqueous phase liquid
LOAEL	lowest observed adverse effect level
MCLG	maximum contaminant level goal
MCLs	maximum contaminant levels
mg/kg	milligram per kilogram
µg/L	micrograms/liter
µg/kg	micrograms/kilogram
msl	mean sea level
MTRs	minimum technology requirements
NCP	National Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no observed adverse effect level
NPL	National Priorities List
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
PALs	Preventative Action Limits
PCP	Pentachlorophenol
ppb	parts per billion
pph	pounds per hour
PRGs	Preliminary Remediation Goals
PVC	polyvinyl chloride
PWP	Penta Wood Products
RCL	residual contaminant level
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI	remedial investigation
RME	reasonable maximum exposure
ROD	Record of Decision
S.U.	standard units
SACM	Superfund Accelerated Cleanup Model

SARA	Superfund Amendments and Reauthoriztion Act
SDWA	Safe Drinking Water Act
scfm	standard cubic feet per minute
STP	standard temperature and pressure
SVE	soil vapor extraction
TBC	to be considered
TCLP	toxicity characteristic leaching procedure
TMV	toxicity, mobility, and volume
TPH	total petroleum hydrocarbons
TSD	treatment, storage, or disposal
U.S. EPA	United States Environmental Protection Agency
UCL	upper confidence limit
VOCs	volatile organic compounds
WDNR	Wisconsin Department of Natural Resources
WPDES	Wisconsin Pollutant Discharge Elimination System

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