FIVE-YEAR REVIEW REPORT

JOHN DEERE-DUBUQUE WORKS
DUBUQUE, IOWA

Conducted by:

U.S. Environmental Protection Agency
Region 7
Kansas City, Kansas

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1.0 INTRODUCTION

This report documents the five-year review of the John Deere Dubuque Works (JDDW) site in Dubuque, Iowa. This review was conducted by the U. S. Environmental Protection Agency (EPA) with the assistance of CDM Federal Programs Corporation (CDM Federal), a Contractor for the EPA, under Contract No. 68-W9-0021.

The purpose of the five-year review is to determine the continued adequacy of remedial response actions undertaken at the site to protect human health, welfare, and the environment. Section 121 (c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and Section 300.430 (f)(4)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) require that periodic (at least once every five years) reviews be conducted for sites where hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use or unrestricted exposure following the completion of all remedial actions for the site. The reviews are to be completed within five years of initiation of remedial actions. Remedial activities at the JDDW facility officially began in September 1990 when the Remedial Design was approved by the EPA.

The EPA has established three levels of review. Level III requires the most in-depth review and would be appropriate for sites where there is the greatest likelihood that the remedial actions are no longer protective of human health, welfare, and the environment. Level II is a less intensive review, and Level I is appropriate for sites where the remedial actions are anticipated to have been adequately protective of human health, welfare, and the environment during the first five years of implementation (EPA 1991a).

A Level I review was conducted of the JDDW site because the remedial actions appear to be adequate and fully implemented. This five-year review report summarizes remedial actions undertaken at the site to date, and will determine if the remedial actions are achieving the remedy selected in the Record of Decision (ROD), September 29, 1988, and the Performance Standards set forth in the Remedial Action Consent Decree, October 1989.

The five-year review included a site visit conducted on December 14 and 15, 1994, to observe the current site conditions and the current remedial actions. The Site Visit Trip Report is included as Appendix A of this report. The five-year review also included a review of the following documents:

- ROD for John Deere Dubuque Works Company Superfund Site, Dubuque, Iowa, September 29, 1988.
- Consent Decree between the EPA and Deere and Company, Inc., August 29, 1989.
- Performance Standards for Key Elements of the Selected Remedy for the JDDW Site, August 29, 1989.
- Quarterly Long-Term Monitoring Reports for the JDDW site prepared by Geraghty and Miller, Inc., First Quarter 1990 - 3rd Quarter 1994.
- Iowa Department of Natural Resources NPDES Permit for the JDDW site, September 3, 1992; November 25, 1992 Amendment; January 21, 1994 Amendment.
- Monthly Wastewater Monitoring Reports for the JDDW site prepared by JDDW, June 1992 - August 1994.

2.0 SITE BACKGROUND

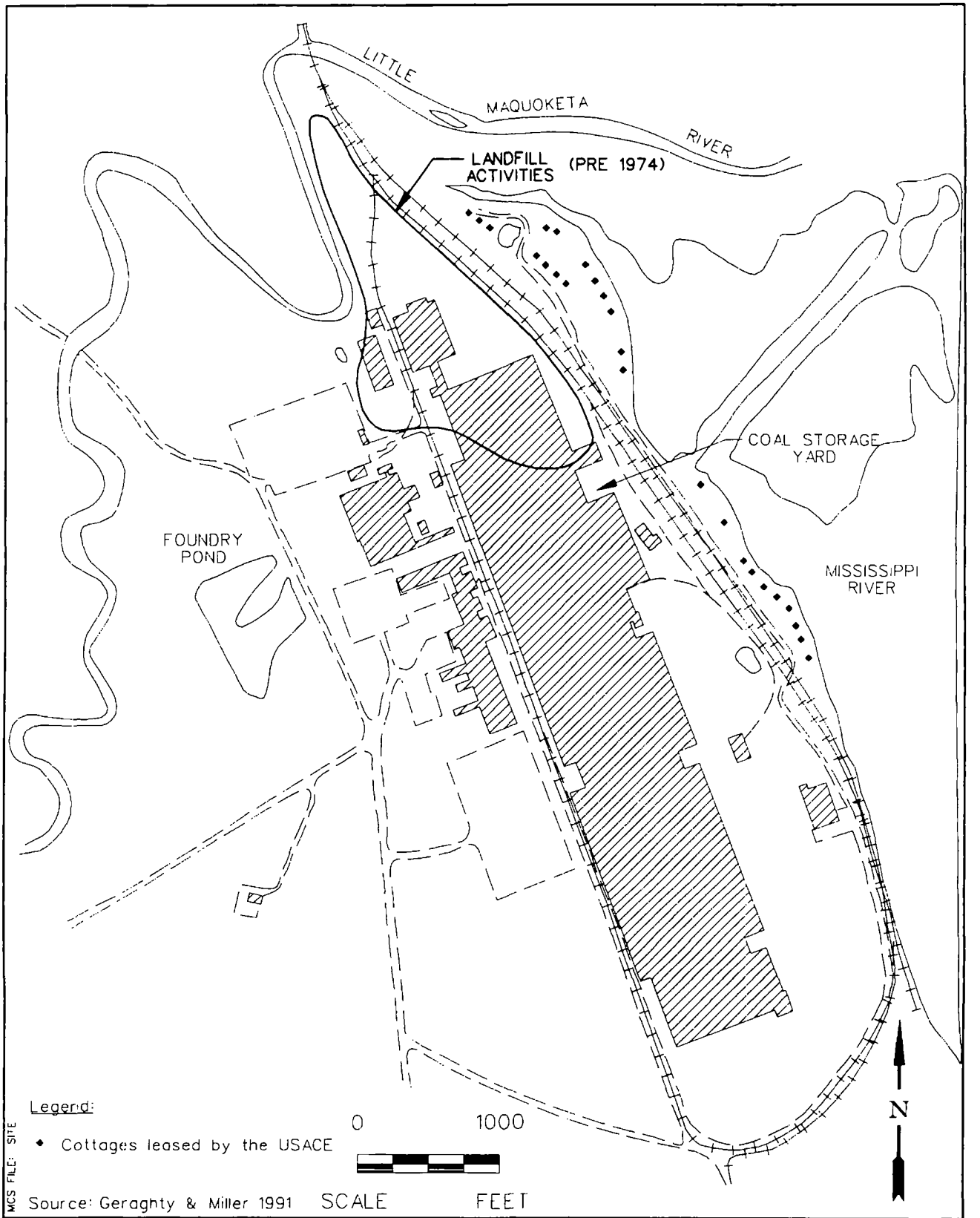
2.1 SITE LOCATION

The JDDW facility is located 2.5 miles north of the City of Dubuque, Iowa, and covers 1,447 acres near the confluence of the Mississippi and Little Maquoketa Rivers. The Mississippi River comprises the eastern border of the site, and the Maquoketa River runs west of the site entering the Mississippi River at the northwest facility boundary. A site map is included as Figure 2-1. The portion of the Mississippi River adjacent to the site is part of the Upper Mississippi River Wildlife and Fish Refuge established in 1924. A CMSP & Pacific Railroad track lies between the plant and the Mississippi River, and approximately 20 cottages, leased from the United States Army Corps of Engineers (USACE) to private residents, are located between the JDDW facility and the river on the Mississippi River flood plain (Geraghty & Miller 1990).

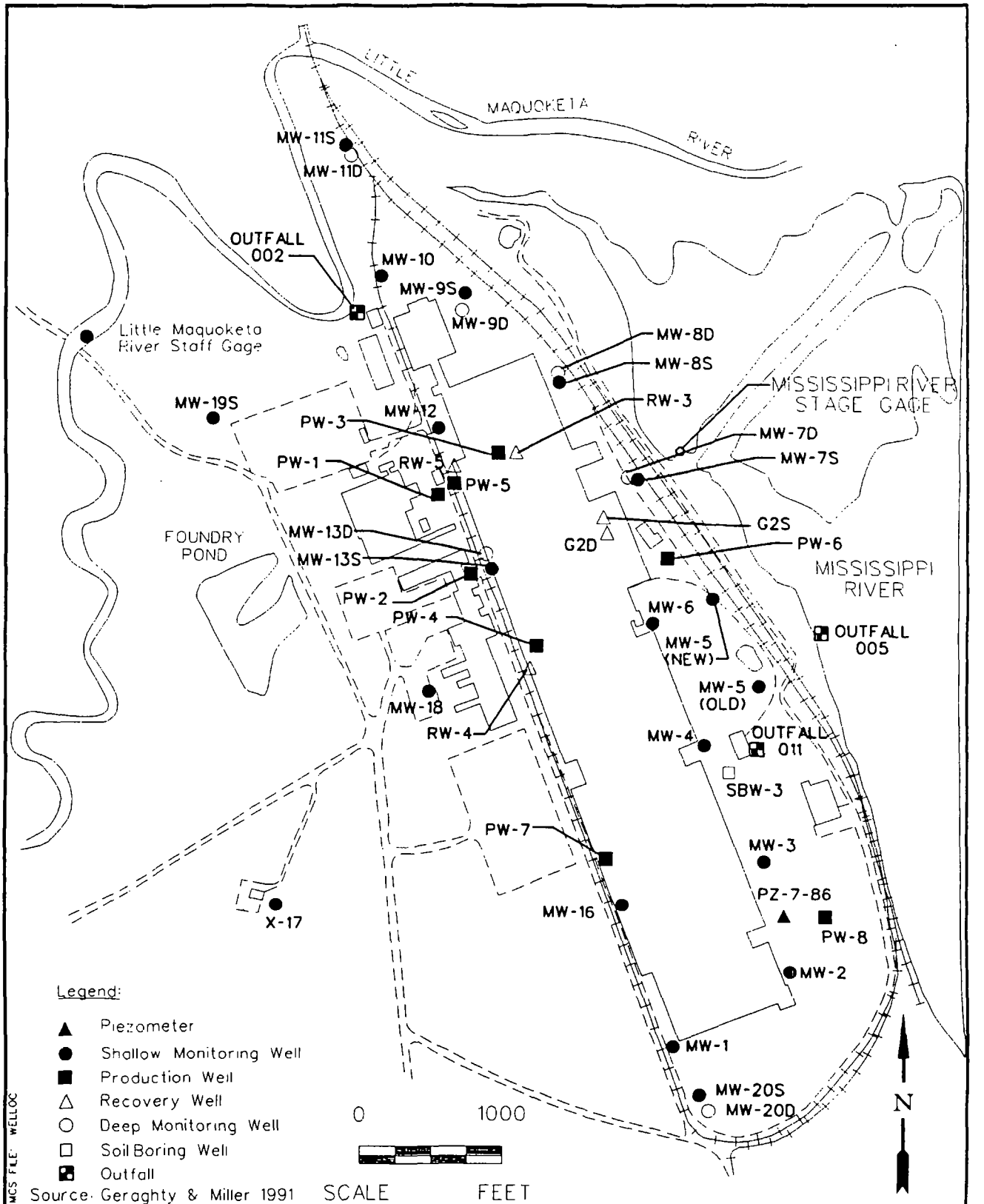
2.2 SITE HISTORY

The JDDW facility was originally constructed in 1946. The plant covered 600,000 ft^2 and was used to house the manufacturing operations. Prior to 1976, several major additions to the plant were completed, predominantly to the south of the original building. The total area of the facility is currently 5,000,000 ft^2 and includes the original plant building, storage areas, waste disposal areas, and parking lots. JDDW has employed over 8,000 workers in the manufacture of heavy construction equipment including backhoes, bulldozers, and forestry equipment. Currently, 2,800 workers are employed at the plant.

The JDDW potable water supply is currently obtained from two bedrock wells, PW-1 and PW-2. Process and cooling water for the plant are provided by alluvial wells PW-3, PW-4, PW-5, and PW-7. Prior to 1988, potable water and process water were obtained from both the bedrock wells and alluvial wells in a blended supply. The two systems were separated in 1988. Currently, alluvial wells PW-6 and PW-8 are reserved for fire protection, and the Mississippi River supplies non-contact powerhouse cooling water. A well location map illustrating the location of the production wells is included as Figure 2-2 (Geraghty & Miller 1990).



Project No.: 7760-043	John Deere Dubuque Works Dubuque, Iowa	Site Map	Figure No.: 2-1
	CDM FEDERAL PROGRAMS CORPORATION a subsidiary of Camp Dresser & McKee Inc.		5/95



Project No.: 7760-043	John Deere Dubuque Works Dubuque, Iowa	Well Location Map	Figure No.: 2-2
	CDM FEDERAL PROGRAMS CORPORATION a subsidiary of Camp Dresser & McKee Inc.		8/95

Potential sources of environmental contamination were identified in a Remedial Investigation (RI) conducted at the JDDW site in 1988 which included air, soil, surface water, and groundwater sampling. Identified sources included a former landfill, a foundry, a chrome basin at the industrial wastewater treatment plant, a coal storage yard, and a diesel fuel line leak located under the plant which occurred in 1980 and released an estimated 200,000 gallons of diesel fuel.

A diesel fuel recovery system was implemented at the site on November 10, 1980, and groundwater was separated from the fuel using an oil/water separator. The recovered fuel was retained for onsite reclamation, and the water from the oil/water separator was discharged to the Mississippi River. Eighteen monitoring wells were installed February through June, 1981, to monitor groundwater quality related to the fuel spill. Locations of the monitoring wells and the recovery wells are located on Figure 2-2.

Throughout its history, the JDDW facility has used two separate landfills for waste disposal. The older landfill, identified as a potential source of environmental contamination in the RI report, was placed in a natural depression in the Little Maquoketa floodplain, near the northern end of the facility. Prior to 1974, JDDW placed wastes up to the banks of the river. In 1974, the Iowa Department of Natural Resources (IDNR) required the wastes to be moved to at least 140 feet from the riverbanks. The wastes were bulldozed back and fences were placed around the perimeter of the landfill. No known flooding of the landfill has occurred since 1965 (Geraghty & Miller 1991). The newer landfill is not included in the Remedial Action.

Wastes disposed in the older landfill included caustics (sodium or potassium hydroxide), acids (hydrochloric or sulfuric), petroleum distillates (solvents, grinding oils, etc.), heavy metals (chromium, lead, and zinc used in electroplating), cyanide, paint sludges, and foundry sand containing 1% oil-based resin. The quantities of materials disposed in the old landfill are not known (Geraghty & Miller 1991).

2.3 REGULATORY HISTORY

The JDDW facility was identified as a potential hazardous waste site on June 5, 1981. A Preliminary Assessment Report was submitted in July 1983, which cited an initial Hazard Ranking System (HRS) score of 34.95. In 1984, a Site Investigation was performed, and in 1985, JDDW contracted Geraghty & Miller to perform site studies related to the former landfill.

In September 1985, the EPA proposed the JDDW site for inclusion on the National Priorities List (NPL). An HRS score of 28.5 is sufficient to place a site on the NPL. However, the site was never placed on the final NPL. On June 24, 1988, the EPA announced its new national policy in the Federal Register (53 FR 23978) whereby RCRA treatment, storage, or disposal facilities would not be placed on the NPL. As a result of this policy, the EPA announced its intention to remove several sites, including the JDDW site, from the list of sites proposed for the NPL. One of the main purposes of this policy was to avoid spending Superfund money at RCRA sites that are subject to the corrective action authorities of RCRA. The policy does not prohibit site cleanup from proceeding under a CERCLA consent decree pursuant to which the potentially responsible party (PRP) funds the work. Region VII decided to continue to treat the facility as a Superfund site. Deere and Company, Incorporated has been the sole owner and operator at the site, is the only Potentially Responsible Party (PRP) for onsite contamination, and has funded the remedial work at the site to date.

Primary CERCLA activities have included completion of a Remedial Investigation and a Feasibility Study (RI/FS), Record of Decision (ROD), Consent Decree, Remedial Design (RD) report, and implementation of the approved remedial action. A chronology of CERCLA activities is presented in Table 2-1. A summary of the RI and FS (submitted separately), ROD/Consent Decree, and RD are presented in the following subsections.

TABLE 2-1
Chronology of CERCLA Activities
John Deere Dubuque Works
Dubuque, Iowa

Date	*Activity*
September 18, 1985	The EPA proposed the JDDW site for inclusion on the National Priorities List (NPL) pursuant to Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).
September 30, 1986	The EPA and JDDW enter into an Administrative Order on Consent requiring the development of a Remedial Investigation and Feasibility Study (RI/FS) for the site.
June 24, 1988	The EPA proposed removing the JDDW site as a candidate for inclusion on the NPL; however, the EPA determined that JDDW should continue with remedial activities as required by the EPA for compliance with CERCLA.
August 3, 1988	JDDW submitted the RI/FS Report to the EPA.
August 5, 1988	The EPA published a notice of completion of the RI/FS and the proposed plan for remediation. A public comment period was established and public comments were documented in the administrative record.
September 29, 1988	A Record of Decision (ROD) was signed by the EPA summarizing the EPA's decision for site remediation.
October 1989	The EPA and JDDW enter into a Consent Decree requiring the development of a Remedial Design (RD) Report and Remedial Action (RA).
January 1990	JDDW initiated groundwater monitoring activities according to the Consent Decree. Quarterly RA reports were prepared and submitted to the EPA.
September 1990	The Final RD Report was submitted to and approved by the EPA. This date marks the start of RA activities.
Currently (September 1995)	RA activities continue in accordance with the Consent Decree and Remedial Design Report.

2.3.1 REMEDIAL INVESTIGATION

The RI report was submitted to the EPA in August 1988. The purpose of the RI was to collect data to characterize the site and to assess the potential release of hazardous materials from waste management units, waste disposal, or product leakage and/or spillage.

RI activities included collection of data to characterize air, surface water, sediments, surface soils, subsurface soils, and groundwater quality. Low concentrations of volatile organic compounds (VOCs) were detected in the alluvial aquifer underlying the JDDW site; however, specific sources of the VOCs were not identified. Low concentrations of benzene, ethylbenzene, toluene, and xylenes (BETX) were associated with the diesel fuel spill. As a result of field activities, several constituents of concern, listed in Table 2-2, were identified.

Suspected constituent sources included the former landfill, the foundry, the chrome basin at the industrial wastewater treatment plant, waste oil coolant spills, the coal storage yard, and the 200,000-gallon diesel fuel line leak which occurred in 1980.

RI analytical results were used in a risk assessment to evaluate potential threats to human health and the environment. The risk assessment concluded that the primary risk associated with the site was the potential future exposure of residents located east of the JDDW facility to groundwater containing organic contaminants. Based on the evaluated risks, three remedial action objectives were developed which included:

- Improve the quality of the plant potable water supply.
- Prevent offsite migration of potentially contaminated groundwater.
- Restore groundwater quality in the alluvial aquifer.

2.3.2 FEASIBILITY STUDY

The FS report was submitted to the EPA concurrently with the RI report in August 1988. The purpose of the FS was to identify and evaluate a range of remedial alternatives based on the data

TABLE 2-2
Constituents of Concern
John Deere Dubuque Works
Dubuque, Iowa

Benzene
Carbon Tetrachloride
Chloroform
Hexavalent Chromium
Copper
1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethene
Ethylbenzene
Lead
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
Xylenes

collected and the remedial action objectives developed during the RI. The alternatives addressed potential threats to public health, welfare, and the environment. The EPA-approved alternatives included the following:

- Installation of an alternative potable water supply for the JDDW facility.
- Continued pumping of plant production wells for onsite containment of potentially impacted groundwater.
- Non-aqueous phase liquid (NAPL) recovery primarily associated with the diesel fuel line leak.
- Continued groundwater monitoring.

2.3.3 RECORD OF DECISION/CONSENT DECREE

Following the EPA review of the RI and FS reports, the EPA signed a Record of Decision (ROD) summarizing the decision for site remediation. The ROD is included as Appendix B of this report. The EPA and JDDW entered into a Consent Decree requiring the development of a Remedial Design and implementation of Remedial Action. The Performance Standards, an attachment to the Consent Decree, established the guidelines for Remedial Action and the Remedial Action end point. The Consent Decree is included as Appendix C, and the Performance Standards are included as Appendix C with this report.

The primary items addressed in the Performance Standards include: providing an alternative potable water supply for the facility; extraction of water from the aquifer at rates which maintain an inward gradient adequate to contain contaminants and prevent offsite migration; groundwater monitoring of the alluvial aquifer; NAPL recovery from the groundwater; and development of a remedial action contingency plan if the approved alternative is not completely effective.

Pursuant to Section IV of the Consent Decree, Deere & Company lodged the required deed restriction and a copy of the Consent Decree with the Dubuque County Recorders Office on January 19, 1990.

2.3.4 REMEDIAL DESIGN

The RD report was approved by the EPA in September 1990. The report addressed implementation of the requirements set in the ROD and Consent Decree.

Alternative Potable Water Supply

Modifications made to the potable water system in 1988 were documented in the RD report. Prior to 1988, the potable water and plant process water source for the plant included groundwater from the alluvial aquifer. In 1988, JDDW separated the potable water piping from other plant process water piping and connected it solely to bedrock wells installed into the lower limestone aquifer. The bedrock aquifer provides higher quality water without the potential for contamination from surficial sources.

Groundwater Management Plan

The RD report included a Groundwater Management Plan which addressed groundwater containment, monitoring, and NAPL management. The Plan included three components: a Well Management Plan, a Groundwater Monitoring Plan, and a NAPL Management Plan.

The Well Management Plan addressed the containment and recovery of impacted surficial groundwater. The Plan included alluvial production well system operating guidelines to maintain a minimum total pumping rate necessary to create an inward hydraulic gradient to prevent offsite migration of VOCs and to recover the impacted surficial groundwater. The Performance Standards in the Consent Decree set a minimum total pumping rate from Production Wells PW-3, PW-4, PW-5, and PW-7 at 1.2 MGD.

The Groundwater Monitoring Plan identified groundwater quality sampling and hydraulic monitoring to be completed for the duration of the Remedial Action and reporting requirements. The monitoring program provided assurance that the Remedial Action would be effective and

would prevent offsite migration of potentially contaminated groundwater and restore groundwater quality in the alluvial aquifer.

The NAPL Management Plan presented existing and future NAPL recovery operations and reporting requirements. A fuel layer on the shallow water table resulted from an underground diesel fuel line leak in 1980 near Well G-2. An estimated 200,000 gallons of diesel fuel leaked from the tank. Over time, the diesel fuel layer became contaminated with other organic compounds of unknown origin. Because of these compounds in the diesel fuel, the floating layer was renamed NAPL. JDDW initiated NAPL recovery operations soon after the leak was detected. The NAPL plume migrated from the area near Well G-2 toward Production Well PW-3. Recovery Well RW-3 was installed near PW-3, and a NAPL recovery system was installed in November 1980. The RD report (1990) documented that approximately 138,000 gallons of NAPL was recovered.

Contingency Plan

The RD report included a Contingency Plan if the plant shutdown or if operational modifications resulting in decreased process water pumping rates or changes in water quality would affect NPDES permit compliance. Contingency plans were developed for each possible scenario.

3.0 SUMMARY OF REMEDIAL ACTION

The Remedial Action consisted of the following components:

- Maintaining an inward hydraulic gradient.
- Monitoring groundwater quality.
- NAPL recovery.

Each of these components is described below.

3.1 INWARD HYDRAULIC GRADIENT

Several monitoring requirements were included in the Consent Decree to ensure that an inward hydraulic gradient is maintained in the alluvial aquifer beneath the JDDW facility to prevent contaminants from migrating to offsite residential wells or into the Mississippi or Little Maquoketa Rivers. The monitoring requirements are listed below.

- Maintain a minimum total pumpage rate for the production wells of 1.2 MGD.

- Record water level measurements at monitoring well pairs 1 and 20, 5 and 6, and 10 and 11 at least once every four hours. The groundwater elevation measured at the outer well of the piezometric pair should be higher than the groundwater elevation at the inner well of the pair. The water level differences should be at least 0.15 feet for wells 5 and 6, and 10 and 11. The water level differences should be at least 0.10 feet for wells 1 and 20. The difference in water levels at each piezometric pair is calculated on a rolling annual average basis. (JDDW received approval in September 1994 to relocate Well MW-5 due to construction activities. This well was relocated in the fourth quarter of 1994. All discussions in this report refer to the "old" MW-5. This well has been abandoned.)

- Measure the Mississippi River stage adjacent to the site on each day of operation at the facility to within 0.1 feet.

- Measure water levels and prepare contour maps on a monthly basis for shallow monitoring wells 1, 5, 6, 7, 8, 9, 10, 11, 13, 18, 19, 20, PZ-7-86, and X-17. After one year if water levels in the three perimeter piezometer pairs indicate a consistent inward gradient, contour maps are thereafter prepared on a quarterly basis for the next two years.

3.2 GROUNDWATER QUALITY

The Consent Decree required alluvial production wells PW-3, PW-4, PW-5, PW-7, and monitoring wells 6, 7S, 8S, 9, 11, 12, 13, 16, 20, and SBW-3 to be sampled quarterly for the first year and annually thereafter for the constituents of concern listed in Table 2-2.

As specified in the Performance Standards of the Consent Decree, alluvial groundwater is required to be extracted and sampled until the constituents of concern are reduced to below the federal Maximum Contaminant Levels (MCLs) or applicable Iowa state groundwater remediation regulations, whichever are more stringent. The State of Iowa has defined the groundwater action level to be the Lifetime Health Advisory Level (HAL) if one exists. If there is no HAL, the action level is the Negligible Risk Level (NRL). If there is no HAL or NRL, then the action level is equal to the MCL. For constituents for which there is no MCL or State requirement, the following regulatory sources shall be used in descending order in accordance with the Consent Decree and associated Performance Standards.

- Proposed MCL
- The EPA Office of Drinking Water Lifetime Health Advisory Levels
- IRIS verified reference dose or 10 E-6 cancer potency factor and ingestion of 2 liters of water per day by a 70 kg adult
- The EPA Office of Research and Development Health Effects Assessment criteria

The Consent Decree stated the Performance Standards for groundwater extraction in terms of an elaborate hierarchy of requirements or other sources of standards rather than freezing whatever specific numerical concentrations happened to have been in effect at the time the Consent Decree was written. The exact numbers specified by the federal Maximum Contaminant Levels and the Iowa groundwater remediation regulations have changed from time to time and may continue to change in the future. The groundwater extraction will continue until four consecutive quarters of monitoring indicate that the alluvial water quality beneath the Site has been at or below the specific numerical concentration levels stated in or calculated from the pertinent Performance Standards such as the MCLs or Iowa groundwater remediation regulations in effect at that time. The current groundwater Performance Standards identified as of May 1995 for the constituents of concern are listed in Table 3-1.

TABLE 3-1
Current Performance Standards for Contaminants in Groundwater
John Deere Dubuque Works
Dubuque, Iowa

Analytes	*Federal MCL (µg/L)*	*State Action Levels*		*IRIS (µg/L)*	*HEAST (µg/L)*
		HAL (µg/L)	*NRL (µg/L)*		
Benzene	5	-	**1**		
Carbon Tetrachloride	5	-	**0.3**		
Chloroform	100	-	**6**		
Hexavalent Chromium	-	-	-	**182 (a)**	
Copper	**1,300 ***	-	-		
1,1-Dichloroethane	-	-	-	-	**990 (b)**
1,1-Dichloroethene	7	**7**			
1,2-Dichloroethene (total)	**70**	70	-		
Ethylbenzene	**700**	700	-		
Lead	**15 ***	-	-		
1,1,2,2-Tetrachloroethane	-	-	-	**0.089 (c)**	
Tetrachloroethene	5	-	**0.7**		
Toluene	**1,000**	1,000	-		
1,1,1-Trichloroethane	**200**	200	-		
1,1,2-Trichloroethane	5	**3**			
Trichloroethene	5	-	**3**		
Xylenes	**10,000**	10,000	-		

The bold value is the Performance Standard for the John Deere site using criteria established in the Consent Decree in May 1995.

- = Indicates that no level has been established.
* = The criteria for lead and copper are action levels, not MCLs.
(a) = The Performance Standard Calculations for Chromium (VI) are found in Appendix F.
(b) = The Performance Standard Calculations for 1,1-dichloroethane are found in Appendix F.
(c) = The Performance Standard Calculations for 1,1,2,2-tetrachlorethane are found in Appendix F.
MCL = Maximum Contaminant Level (May 1995).
HAL = Lifetime Health Advisory Level. Established by the EPA to represent the concentration of a single contaminant in drinking water which is not expected to cause adverse health effects over lifetime exposure.
NRL = Negligible Risk Level. Established for carcinogens by the EPA which is an estimate of one per million cancer risk over lifetime exposure to the contaminant.
IRIS = Integrated Risk Information System, 1994.
HEAST = Health Effects Assessment Summary Tables, March 1994.

Sources: U. S. EPA Office of Water 1995
U. S. EPA 1991b, 1994a, 1994b
IDNR 1994

The groundwater extraction requirement will be considered complete when the constituents of concern in groundwater have been at or below the Consent Decree Performance Standards for four consecutive quarters or if the contaminant concentrations are shown to be below background levels.

3.3 NAPL RECOVERY

NAPL has been separated from the extracted groundwater at the JDDW facility using an oil/water separator. The groundwater effluent is required to be discharged through NPDES-permitted outflows, and the remaining material disposed as a RCRA hazardous waste. The volume of NAPL and the volume of contaminated groundwater withdrawn from each recovery well is required to be recorded on each normally scheduled working week for the JDDW facility.

NAPL thicknesses at recovery wells RW-3, RW-4, RW-5, and G-S, and monitoring wells 4, 6, 7S, 8S, 12, and 13S are to be recorded on a weekly basis. The Consent Decree stated that when ¼-inch or less of NAPL is recorded at RW-3, and ⅛-inch or less of NAPL is recorded at the remaining wells, the well in question shall be purged of three well volumes and allowed to stabilize for 24 hours before a verification thickness measurement is taken. The above wells are then required to be sampled and analyzed for BETX, TCE, and total petroleum hydrocarbons. If levels of these analytes are below Performance Standards for four consecutive quarters, the NAPL extraction and treatment requirements are considered complete.

NAPL recovery operations were discontinued in July 1991. Less than ¼-inch of NAPL has been measured at RW-3 since recovery operations ceased, and only traces of NAPL have been observed at any of the other wells. Concentrations of benzene are still above action levels, therefore, JDDW continues to monitor the groundwater. No further activities have been performed to complete the NAPL recovery requirements.

3.4 SURFACE WATER DISCHARGE

The Consent Decree required JDDW to obtain a revised NPDES permit with the groundwater monitoring constituents included for sampling at Outfalls 002, 005, and 011. Outfall 002 discharges noncontact cooling water, drinking fountain water, and storm water through the north sedimentation pond which is equipped with an oil skimmer. Outfall 005 discharges noncontact cooling water, drinking fountain water, and storm water through the south sedimentation pond which is equipped with an oil skimmer. Outfall 011 discharges wastewater from a physical, chemical, and biological treatment plant which treats all process wastewater from the facility (IDNR 1992).

A revised NPDES permit was issued by IDNR for the JDDW facility on September 3, 1992. The revised permit addresses the constituents of concern discharged through Outfall 011. Effluent limitations were not established for the constituents of concern in Outfalls 002 or 005.

Outfall sampling events which have occurred after September 3, 1992, are subject to the requirements of the revised NPDES permit. These surface water sampling results will be discussed in this report. The revised NPDES permit is included as Appendix D, and the NPDES effluent limitations for the constituents of concern are listed in Table 3-2.

TABLE 3-2
NPDES Effluent Limitations for the Constituents of Concern in Outfall 011
John Deere Dubuque Works
Dubuque, Iowa

Constituent	*Monitoring Frequency*	*Effluent Limitation*			
		Daily Maximum		*30 Day Average*	
		mg/L	*lbs/day*	*mg/L*	*lbs/day*
Lead	2/week	0.69	2.00	0.43	1.26
Copper	2/week	0.94	2.73	0.63	1.83
Chromium (VI)	2/week	0.41	1.20	0.27	0.82
Total Toxic Organics*	1/6 months	2.13	6.00	--	--

* Total Toxic Organics include benzene, carbon tetrachloride, chloroform, 1,1-dichloroethane, 1,1-dichloroethene, trans,1,2-dichloroethene, ethylbenzene, 1,1,2,2-tetrachloroethane, tetrachloroethene, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene, xylenes.

3.5 PAST EVALUATIONS OF REMEDIAL ACTION

On September 5, 1991, a site visit to the JDDW facility was conducted by personnel from the EPA Region VII and CDM Federal Programs Corporation. At that time, the EPA granted permission for JDDW to cease NAPL recovery operations at RW-3 because NAPL had not been recovered in the first two quarters on 1991. The thickness of the NAPL layer would still continue to be monitored at the designated monitoring wells, and NAPL recovery would commence if necessary.

The site visit concluded that JDDW had met the operation, maintenance, data collection, and reporting requirements of the Consent Decree and Final Remedial Design Report during the first year of remedial action at the JDDW facility (Geraghty & Miller 1991).

4.0 REMEDIAL ACTION IMPACTS

This section presents a review of the data collected from the first quarter of 1990 through the third quarter of 1994 and presents trends in contaminant concentrations since remedial activities were initiated at the site. The data were reported in quarterly reports prepared by Geraghty & Miller and submitted to the EPA (Geraghty and Miller 1990-1994).

4.1 GROUNDWATER

The volume of groundwater pumped out of the production wells has consistently exceeded the 1.2 MGD requirement set in the Performance Standards. Table 4-1 presents a summary of the well pumping rates. Water levels in the three piezometer pairs at the perimeter of the site have consistently exhibited rolling annual average head differences greater than the minimum requirements established in the performance standards. A summary of the annual average head differences at each of the three piezometer pairs is provided in Table 4-2.

JDDW encountered some problems with the transducers and cables during the five years of monitoring which caused some of the water level data from the piezometer pairs to be lost. Minor problems occurred throughout the five-year period of monitoring. JDDW began downloading the data loggers on a weekly basis beginning in 1993 to recover as much of the data as possible. The weekly downloading minimized the occurrence of large data gaps. Although some data gaps occurred, all data reported indicated that the requirements for the rolling annual average head differences were met.

Water level data obtained from fourteen monitoring wells during each day of operation at the site and corresponding contour maps indicate that an inward hydraulic gradient has been maintained at the facility during the first five years of remediation.

Groundwater samples were collected from the required onsite wells (production wells PW-3, PW-4, PW-5, and PW-7, and monitoring wells 6, 7S, 8S, 9, 11, 12, 13, 16, 20, and SBW-3) during all four quarters of 1990 and annually thereafter. A summary of the analytical data is

TABLE 4-1
Alluvial Production Well Pumping Summary
John Deere Dubuque Works
Dubuque, Iowa

Period		*Alluvial Aquifer Pumping (MGD)*		
Year	*Quarter*	*Minimum*	*Maximum*	*Average*
1990	1	N/R	N/R	N/R
	2	2.43	3.51	2.80
	3	2.30	4.31	3.39
	4	1.30	3.05	2.18
1991	1	1.54	2.60	2.15
	2	2.46	4.35	3.11
	3	2.22	3.98	3.18
	4	1.72	2.51	2.01
1992	1	1.67	2.14	1.90
	2	1.78	3.38	2.52
	3	2.38	3.85	3.22
	4	2.03	3.22	2.32
1993	1	1.91	2.61	2.40
	2	2.41	3.61	2.89
	3	2.51	3.95	3.29
	4	2.44	2.88	2.73
1994	1	2.10	3.00	2.73
	2	2.44	4.18	3.18
	3	2.60	3.80	3.32

N/R = Not Recorded.
MGD = Million Gallons per day.
Alluvial wells include production Wells PW-3, PW-4, PW-5, and PW-7.

TABLE 4-2
Paired Wellhead Difference Summary
John Deere Dubuque Works
Dubuque, Iowa

Year	*Annual Average Head Difference (feet)**					
	Wells 10 & 11S		*Wells 5 & 6****		*Wells 1 & 20S*	
	Actual	*Required*	*Actual*	*Required*	*Actual*	*Required*
1990	1.34	0.15	0.91	0.15	0.36	0.10
1991	1.17	0.15	0.84	0.15	0.55	0.10
1992	0.83	0.15	0.57	0.15	0.20	0.10
1993	0.66	0.15	0.61	0.15	0.44	0.10
1994**	0.77	0.15	0.48	0.15	0.38	0.10

Notes

* Numbers represent the annual average of the difference between the outer and inner well pair. A positive value indicates that the groundwater table slopes toward the main facility.

** Includes January through September.

*** This is "old" MW-5. See Section 3.1.

Source: Geraghty and Miller, 1994.

found in Appendix E. Wells which have contaminants of concern that were detected above the Performance Standards are listed in Table 4-3. Contaminants which have been present above Performance Standards throughout the first five years of monitoring are trichloroethylene (TCE), benzene, and tetrachloroethylene (PCE).

Figures 4-1, 4-2, and 4-3 illustrate the trends in concentrations of PCE, TCE, and benzene in the alluvial aquifer from 1990 to 1994. PCE and TCE show a general decline in concentrations over the monitoring period but elevated concentrations in 1993. The higher concentrations in 1993 may be related to a higher water level in the alluvial aquifer in that year due to the increased rainfall. The water level was approximately 3.5 to 5 feet higher in 1993 than in 1992 and was 1.5 to 3 feet higher in 1993 than in 1994. Because PCE and TCE have a tendency to adsorb to soils, all of the contaminants may not have leached directly to groundwater. The higher water level in 1993 would have captured contaminants remaining in the soils causing higher concentrations to be seen in groundwater that year.

Benzene concentrations are illustrated in Figure 4-3 and appear to have remained fairly constant except in 1991 when there was a sharp peak. Benzene has most often been detected in PW-3 at levels ranging between 6.4 and 14 μg/L. Benzene was reported once in Well 13S at 48 μg/L in 1992. Benzene has not been detected above 5 μg/L in this well in any of the other sampling events.

The most recent groundwater sampling event for which we have data occurred in July 1994. PCE, TCE, and benzene were detected above the Performance Standards. TCE was present in monitoring well 16 at 3.5 μg/L; the Performance Standard is 3.0 μg/L. Benzene was present in PW-3 at 6.4 μg/L; the Performance Standard is 1.0 μg/L. PCE was present at 1.2 μg/L in monitoring well 9S and 1.3 μg/L in monitoring well 13S; the Performance Standard is 0.7 μg/L.

In several instances for the organic constituents of concern, detection limits were higher than the Performance Standards. For the VOC analyses performed between 1990 and 1993, detection limits were either 5 μg/L or 10 μg/L. Benzene, carbon tetrachloride, PCE, 1,1,2-trichloroethane, and TCE have Performance Standards less than 5 μg/L, and chloroform and 1,1-dichloroethane have

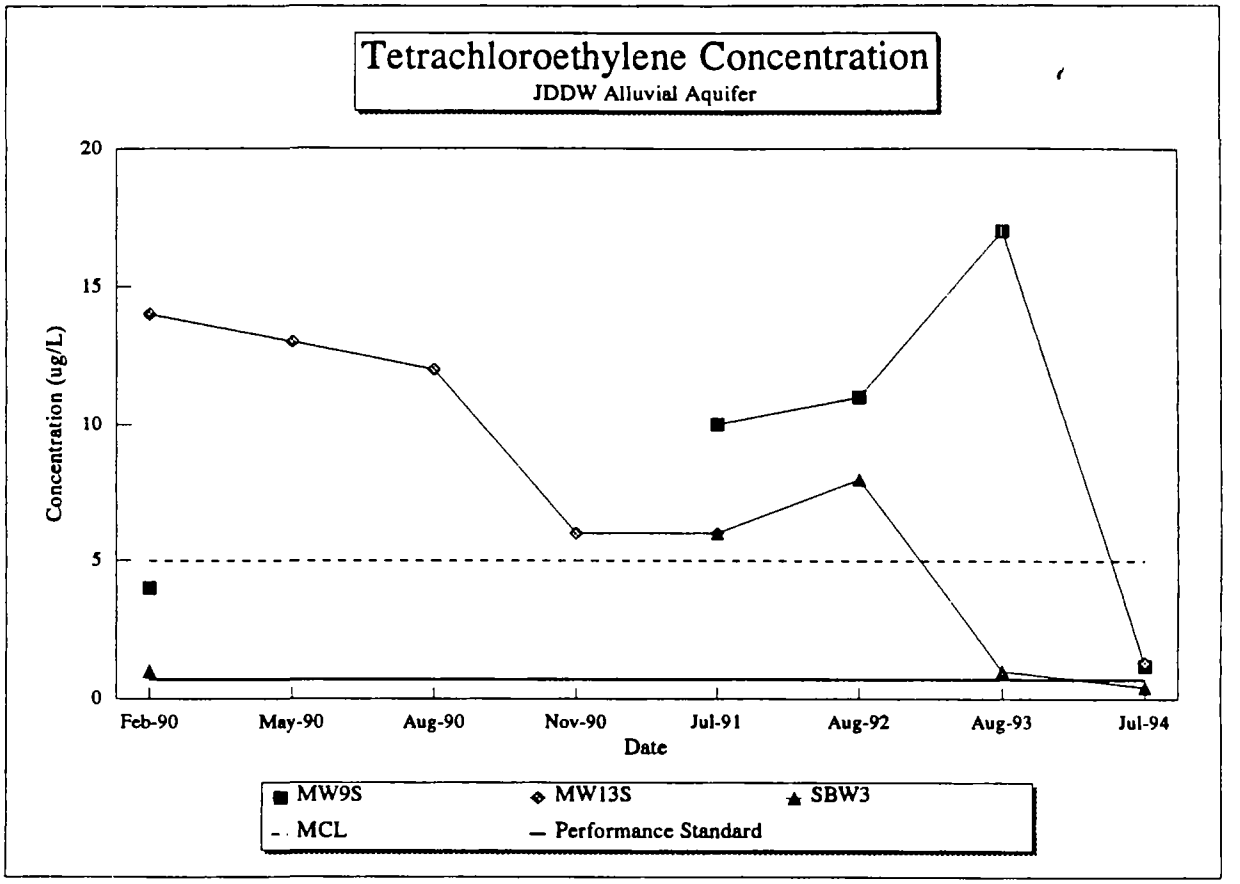
TABLE 4-3
Chemical Groundwater Analyses Summary[1]
John Deere Dubuque Works
Dubuque, Iowa
(μg/L)

Tetrachloroethylene (Performance Standard = 0.7 μg/L)								
Well	*1990 (1)*	*1990 (2)*	*1990 (3)*	*1990 (4)*	*1991 (3)*	*1992 (3)*	*1993 (3)*	*1994 (3)*
MW-9S	4 J	<5	<5	<5	10	11 J*	17	1.2
MW-13S	14	13	12	6	6 J	<10	<5	1.3
PW-4	<5	<5	<5	<5	<10	<5	1 J	0.62
SBW-3	1 J	<5	<5	<5	6 J	8 J*	1 J	0.43 J
Trichloroethylene (Performance Standard = 3 μg/L)								
Well	*1990 (1)*	*1990 (2)*	*1990 (3)*	*1990 (4)*	*1991 (3)*	*1992 (3)*	*1993 (3)*	*1994 (3)*
MW-6	<5	<5	<5	<5	10	<5	7 J	1.2
MW-9S	1 J	<5	<5	<5	4 J	5.4 J*	6 J	<0.5
MW-16	8	9	9	9	7 J	2.3	2	3.5
PW-3	4 J	<25	<10	<5	<25	<12	<10	<0.5
PW-4	3 J	<5	6	5	3 J	<5	5 J	2.7
SBW-3	3 J	5	<5	<5	3 J	2	1	0.49 J
Benzene (Performance Standard = 1 μg/L)								
Well	*1990 (1)*	*1990 (2)*	*1990 (3)*	*1990 (4)*	*1991 (3)*	*1992 (3)*	*1993 (3)*	*1994 (3)*
MW-13S	<5	<5	<5	<5	<10	48	<10	<0.5
PW-3	11	<25	10	<5	14 J	<12	13	6.4
PW-4	<5	<5	<5	<5	3 J	<5	3 J	0.54

Sources for the groundwater data are the quarterly reports submitted by JDDW to EPA.

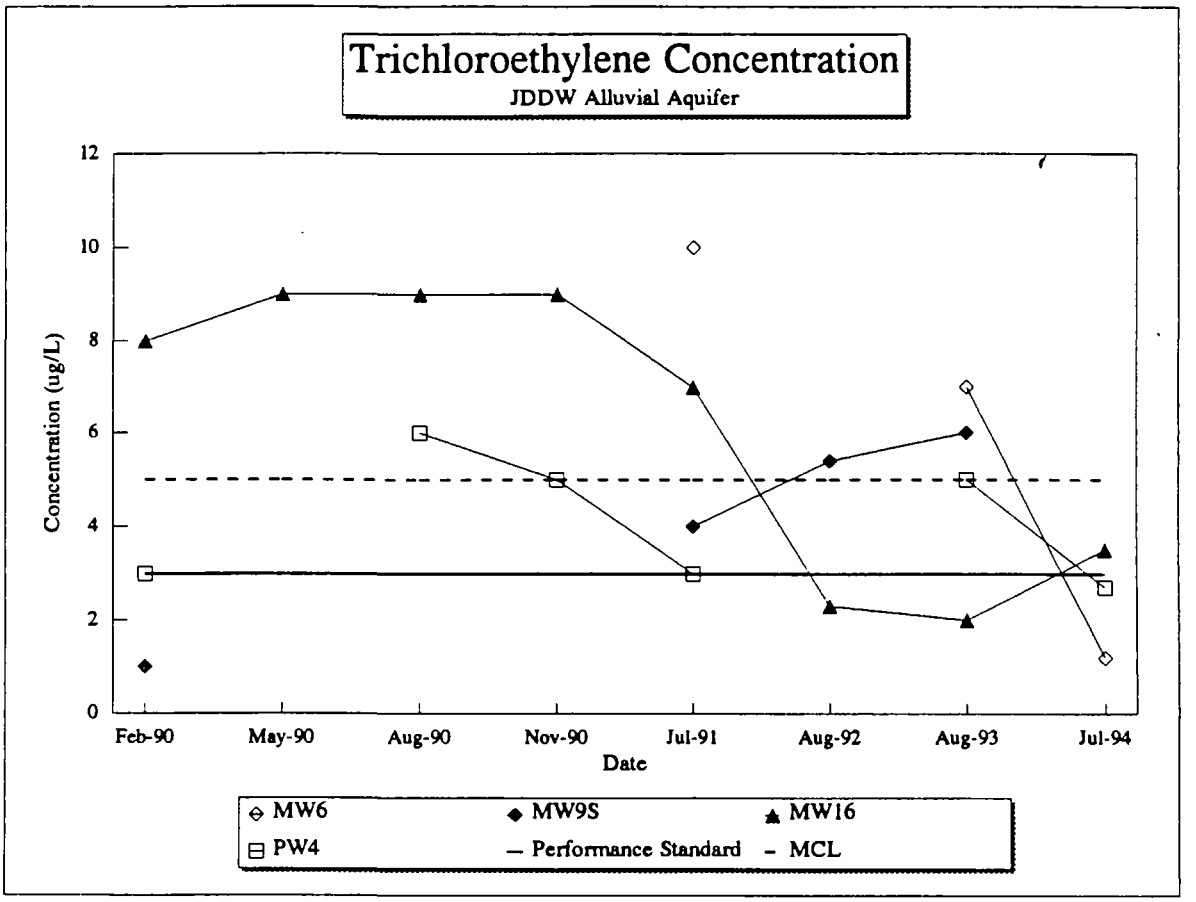
(x) = Quarter in which data was collected.
J = The value is estimated.
J* = Temperature of the coolers were 13.5 and 15 degrees C. Therefore, the data are estimated.
[1] = Only those wells which have contaminants detected above Performance Standards have been included in this table.

NOTE: All data is listed for a well location if at least one sample contained concentrations above Performance Standards.



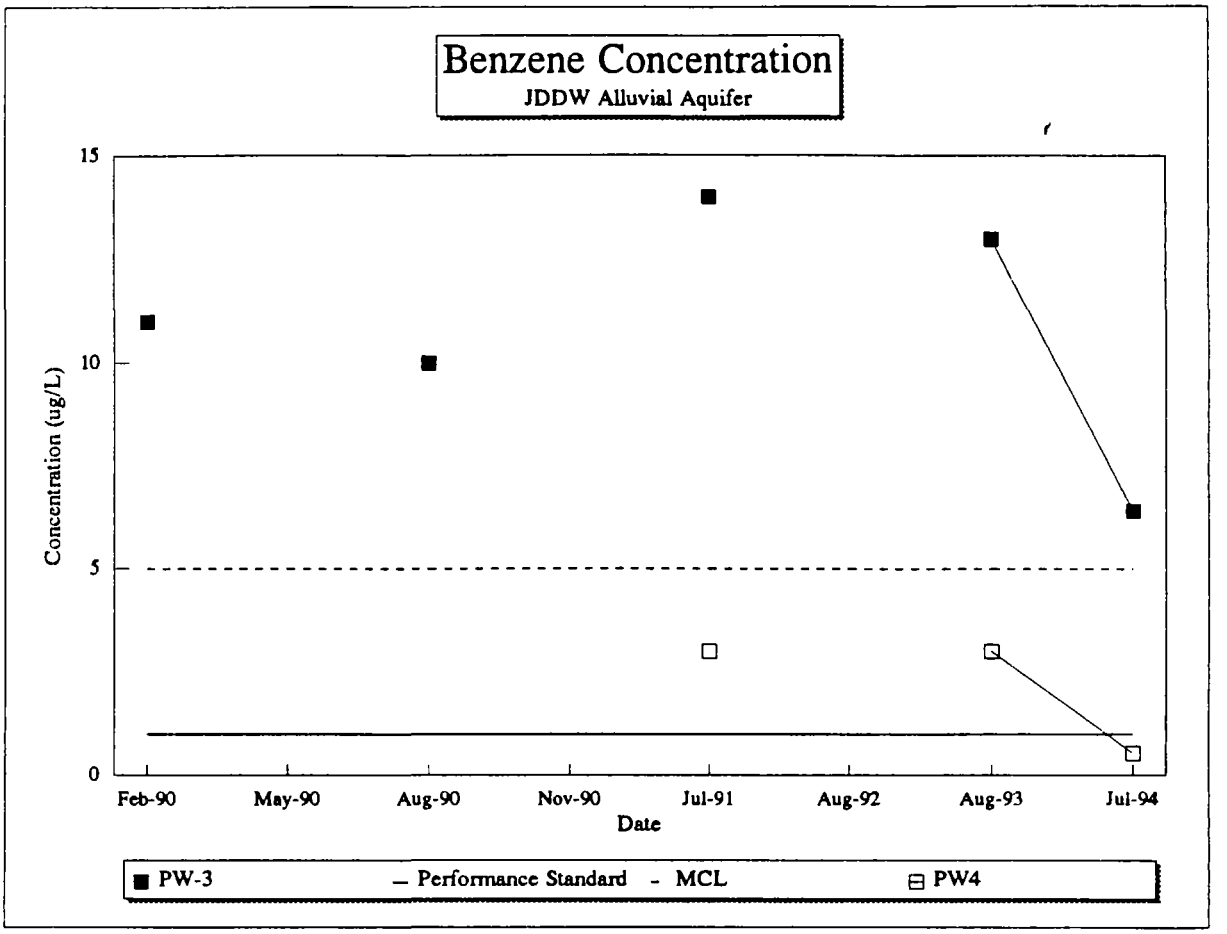
The absence of a data point indicates that the compound was not detected above the quantification limit. See Appendix F for the quantification limits.

Project No. 7760-043	John Deere Dubuque Works Dubuque, Iowa CDM FEDERAL PROGRAMS CORPORATION a subsidiary of Camp Dresser & McKee Inc.	Tetrachloroethylene Concentration	Figure No.: 4-1 5/95



The absence of a data point indicates that the compound was not detected above the quantification limit. See Appendix F for the quantification limits.

Project No.: 7760-043	John Deere Dubuque Works Dubuque, Iowa CDM FEDERAL PROGRAMS CORPORATION a subsidiary of Camp Dresser & McKee Inc.	Trichloroethylene Concentration	Figure No.: 4-2 5/95



The absence of a data point indicates that the compound was not detected above the quantification limit. See Appendix F for the quantification limits.

Project No. 7760-043	John Deere Dubuque Works Dubuque, Iowa CDM FEDERAL PROGRAMS CORPORATION a subsidiary of Camp Dresser & McKee Inc.	Benzene Concentration	Figure No.: 4-3 5/95

Performance Standards less than 10 μg/L (Table 3-1). If a contaminant was detected below the detection limit, the result was reported but was qualified with a "J" indicating the result was estimated.

The detection limits were per the Quality Assurance Project Plan (QAPP). In the QAPP, Deere was allowed to use the higher detection limits until the concentrations approached the Performance Standards in all wells.

For the 1994 sampling event, the EPA remedial project manager, requested that analytical methods SW846 8010/8020 be used for the VOC analysis to achieve a lower detection limit. The detection limit for the 1994 VOC analysis was 0.5 μg/L. This level is lower than all Performance Standards except 0.3 μg/L for carbon tetrachloride. A summary of the detection limits for the contaminants of concern is included as Table 4-4.

4.2 NAPL RECOVERY

NAPL recovery occurred from Wells G-S, RW-4, and RW-3 from November 1980 to July 1991. During this time 138,163 gallons of NAPL were recovered. No measurable amounts of NAPL were recovered from January 1991 through July 1991, although 3.67 million gallons of groundwater were pumped from RW-3 during this time. Table 4-5 lists the volume of NAPL recovered from 1980 through 1991 (Geraghty & Miller 1994).

NAPL recovery operations were discontinued July 21, 1991; however, recovery Wells RW-3, RW-4, RW-5, and G-S, and monitoring wells 4, 6, 7S, 8S, 12, and 13S have continuously been monitored for NAPL thickness. Thickness measurements are summarized in Table 4-6. Since recovery operations have ceased, NAPL has been measured up to 0.02 feet (approximately ¼-inch) in recovery well RW-3. This thickness is below thicknesses specified in the Consent Decree which governs NAPL recovery operations.

TABLE 4-4
Detection Limits for Groundwater Analyses
John Deere Dubuque Works
Dubuque, Iowa

Sampling Period	*Detection Limits (µg/L)*			
	Chromium (VI)	*Copper*	*Lead*	*Organics*
1990, 1st Quarter	10	5.0	1.6	5
1990, 2nd Quarter	10	4.0	2.0	**5***
1990, 3rd Quarter	10	4	1	5
1990, 4th Quarter	10	5.0	1.0	5
1991, 3rd Quarter	10	25	1	**10**
1992, 3rd Quarter	10	25	3	5
1993, 3rd Quarter	10	3	1	**10**
1993, 3rd Quarter	10	25	3	**0.5****
Performance Standards	182	1,300	15	0.3 - 10,000

* = Samples from PW-3 and PW-5 were diluted and analyzed with detection limits of 25 µg/L and 50 µg/L, respectively.

** = The detection limits for 1,1,2-trichloroethane and 1,1,2,2-tetrachloroethane were 1.0 µg/L.

Bolded detection limits are higher than the Performance Standards. The 0.5 detection limit for organics is lower than all Performance Standards except 0.3 µg/L for carbon tetrachloride.

TABLE 4-5
NAPL Recovery Data
John Deere Dubuque Works
Dubuque, Iowa

Date	*Amount of NAPL Recovered (Gallons)*				
	G-2	*RW-4*	*RW-3*	*Total per Period*	*Cumulative Total*
October 30, 1980	(A)				
May 1, 1981	(B)				
June 30, 1981	20,400			20,400	20,400
April 15, 1982	210 (C)		(F)	0	20,400
May 17, 1982			28,500	28,500	48,900
June 30, 1982		(D)	1,500	1,500	50,400
September 8, 1982		5	3,800	3,805	54,205
October 4, 1982		15	205	220	54,425
December 10, 1982			6,470	6,470	60,895
March 14, 1983			25	25	60,920
June 10, 1983			0	0	60,920
September 14, 1983			1,200	1,200	62,120
December 7, 1983		(E)	6,200	6,200	68,320
March 20, 1984			8,547	8,547	76,867
June 21, 1984			2,555	2,555	79,422
December 5, 1984			3,041	3,041	82,463
March 19, 1985			1,266	1,266	83,729
June 12, 1985			1,466	1,466	85,195
October 24, 1985			72	72	85,267
December 6, 1985			353	353	85,620
March 20, 1986			0	0	85,620
June 6, 1986			0	0	85,620
October 1, 1986			0	0	85,620
September 17, 1987			0	0	85,620
December 10, 1987			1,800	1,800	87,420
March 14, 1988			225	225	87,645
June 7, 1988			5,024	5,024	92,669
August 15, 1988			5,349	5,349	98,018
September 7, 1988			6,029	6,029	104,047
February 27, 1989			23,496	23,496	127,543
June 23, 1989			1,268	1,268	128,811
September 29, 1989			3,698	3,698	132,509
November 30, 1989			2,841	2,841	135,350
February 28, 1990			1,867	1,867	137,217
March 31, 1990			71	71	137,288
April 30, 1990			594	594	137,882
June 30, 1990			77	77	137,959
September 29, 1990			0	0	137,959
December 29, 1990			204	204	138,163
March 30, 1991			0	0	138,163
June 29, 1991			0	0	138,163
July 30, 1991			(G)		
Total Recovery	20,400	20	117,743		**138,163**

(A) G-2 (shallow) recovery operations begin.
(B) G-2 (deep) recovery operations begin.
(C) G-2 (shallow) and G-2 (deep) recovery discontinued.
(D) RW-4 recovery operations begin.
(E) RW-4 recovery discontinued.
(F) RW-3 recovery operations begin.
(G) RW-3 recovery operations discontinued.

Source: Geraghty and Miller, 1994.

TABLE 4-6
NAPL Thickness Measurement Summary
John Deere Dubuque Works
Dubuque, Iowa

Year	*Quarter*	*Date Measured*	*Well*	*NAPL Thickness Measurement (feet)*
1990	1	2-26-90	RW-3	2.00
			RW-5	0.14
			G-2S	Emulsified Layer
	2	5-8-90	RW-5	0.02
			G-2S	Trace
	3	8-30-90	RW-3	0.30
			RW-4	Trace
			G-2S	Trace
	4	11-10-90	RW-3	Trace
			RW-5	0.20
			G-2S	Trace
1991	1	4-1-91	No NAPL Detected	
	2	7-1-91	No NAPL Detected	
	3	7-1-91	No NAPL Detected	
	4	10-3-91	RW-3	Trace
1992	1	1-20-92	RW-5	Trace
	2	4-7-92	RW-5	Trace
	3	7-17-92	No NAPL Detected	
	4	11-17-92	No NAPL Detected	
1993	1	1-26-93	RW-3	0.01
	2	4-6-93	RW-3	0.02
	3	8-24-93	No NAPL Detected	
	4	11-1-93	RW-3	0.01
1994	1	1-10-94	No NAPL Detected	
	2	4-15-94	No NAPL Detected	
	3	7-18-94	No NAPL Detected	
	4	10-4-94	No NAPL Detected	

NAPL = Nonaqueous phase liquid

For each quarter listed above, NAPL thickness was measured at the following wells: Monitoring Wells MW-4, MW-6, MW-7S, MW-8S, MW-12, and Recovery Wells RW-3, RW-4, and G-2S.

Source: Geraghty and Miller, 1994.

4.3 SURFACE WATER

The JDDW facility has 18 NPDES-permitted outfalls with various monitoring requirements and discharge limits which are listed on the NPDES permit (Appendix D).

Surface water discharge through the NPDES-permitted outfalls to the Mississippi River and the Little Maquoketa River has been monitored and reported in monthly wastewater monitoring reports to IDNR in accordance with the NPDES permit for the JDDW facility (JDDW 1992-1994). Only Outfalls 002, 005, and 011 were targeted by the Consent Decree for monitoring the discharge for the constituents of concern.

Outfalls 002 and 005 are regularly monitored for flow rate, oil and grease, pH, and temperature. Effluent limitations and monitoring requirements for these parameters are set in the NPDES permit; none of the parameters monitored in Outfall 002 or 005 have exceeded the effluent limitations. Beginning in February 1994, Outfall 002 was also monitored for total residual chorine in accordance with a January 21, 1994, amendment to the NPDES permit. The amendment took effect August 1, 1994, and no residual chlorine has been detected in Outfall 002 since this date.

Outfalls 002 and 005 were analyzed for copper and total toxic organics (TTO) in July 1992. Total toxic organics (TTO) include 1,1-dichloroethene, 1,1-dichloroethane, trans 1,2-dichloroethene, chloroform, 1,1,1-trichloroethane, carbon tetrachloride, trichloroethylene, 1,1,2-trichloroethane, benzene, tetrochloroethene, 1,1,2,2-tetrachloroethane, toluene, ethylbenzene, and xylene. These results are summarized in Table 4-7.

Copper levels identified in Outfalls 002 and 005 in July 1992 did not exceed established effluent limitations.

The TTO constituents identified in Outfalls 002 and 005 were all BETX compounds. No effluent limitations were set for TTO for Outfalls 002 and 005 in the NPDES permit. These outfalls are monitored for oil and grease; oil and grease concentrations have never exceeded the effluent limitations set in the NPDES permit.

TABLE 4-7
July 1992 Results for Copper & Total Toxic Organics
for Outfalls 002 and 005
John Deere Dubuque Works
Dubuque, Iowa

Outfall	*Copper*		*Total Toxic Organics*	
	mg/L	*lbs/day*	*mg/L*	*lbs/day*
002	0.01	0.07	0.042 (BETX)	0.277
005	0.01	0.35	0.041 (BETX)	1.269
Revised permit effluent limitation-002	0.07	0.39	NA	NA
Revised permit effluent limitation-005	0.04	3.004	NA	NA

Effluent limitations for the constituents of concern discharged from Outfall 011 were incorporated into a revised permit which was issued on September 3, 1992. The final effluent from Outfall 011 was required to be analyzed once every six months for TTO which include the organic constituents of concern. The inorganic constituents of concern, lead, copper, and hexavalent chromium, were required to be analyzed two times per week. The effluent limitations set for these constituents in Outfall 011 are listed in Table 3-2.

In Outfall 011, concentrations of lead, copper, and hexavalent chromium were identified at levels below permitted discharge limits except for lead present in the effluent on July 17, 1994. The lead concentration on this date was 0.81 mg/L; the effluent limitation is 0.69 mg/L. All other lead concentrations were below the effluent limits. All concentrations of copper and hexavalent chromium identified in Outfall 011 were below the permitted discharge limits.

Outfall 011 was analyzed for TTO in July 1992, October 1992, April 1993, and October 1993. Wastewater monitoring reports have been received through August 1994.

None of the organic constituents of concern were detected in Outfall 011 during any of the sampling events. Table 4-8 summarizes TTO results from Outfall 011.

In addition to lead, copper, hexavalent chromium, and TTO, Outfall 011 is regularly monitored for flow rate, biochemical oxygen demand (BOD5), total suspended solids, pH, temperature, cadmium, total chromium, cyanide, nickel, oil and grease, silver, and zinc. Outfall 011 had two exceedences of the BOD5 effluent limitation in November 1992 and October 1993. The effluent limitation is 45.0 mg/L for the daily maximum and 30.0 mg/L for the monthly average. In November 1992, the highest daily maximum BOD5 level was 192.0 mg/L, and the monthly average was 79.3 mg/L. In October 1993, the highest daily maximum BOD5 level was 47.4 mg/L. All other constituents monitored in Outfall 011 did not exceed the effluent limitations set in the NPDES permit.

TABLE 4-8
Total Toxic Organics Concentrations for Outfall 11
John Deere Dubuque Works
Dubuque, Iowa

Sampling Date	*Total Toxic Organics*
July 15, 1992	< 0.010 mg/L
October 6, 1992	< 0.002 mg/L
April 6, 1993	< 0.025 mg/L
October 27, 1993	< 0.050 mg/L
Revised permit effluent limitations	2.13 mg/L and 6.00 lbs/day

5.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The five-year review includes a review of newly promulgated or modified requirements of Federal and State environmental laws. The NCP provides:

> "Requirements that are promulgated or modified after ROD signature must be attained (or waived) only when determined to be applicable or relevant and appropriate and necessary to ensure that the remedy is protective of human health and the environment." [NCP 40 CFR § 300.430(f)(1)(ii)(B)(1).]

After the Record of Decision (ROD) was signed on September 29, 1988, the U.S. EPA adopted a number of MCLs and the Iowa Environmental Protection Commission adopted rules establishing cleanup action levels. These newly promulgated levels are relevant to the groundwater extraction part of the remedy being implemented at the site. These levels could be used to determine whether the groundwater is clean enough to terminate the extraction of groundwater.

The ROD identified federal MCLs and Iowa's Groundwater Protection Policy as ARARs to be attained in the extraction of contaminated ground water.

> "The recovery of the NAPL and contaminated ground water should restore the alluvial aquifer to the chemical-specific ARARs for ground water. Ground water remediation would be specifically monitored and maintained until chemical-specific ARARs are met or constituent recovery is limited by the best available technologies." (ROD, p. 23.)

Also the SELECTED REMEDY section of the ROD provided:

> "Recovery operations will be continued until ground water quality meets the remedial action goals (e.g., Federal primary drinking water standards, USEPA Health Advisories), and until the maximum recoverable amount of NAPL is withdrawn." (ROD, p. 23.)

The Consent Decree entered by the Court on December 16, 1989, stated the Performance Standards for the groundwater extraction portion of the remedy as follows:

> "Deere shall continue to extract alluvial groundwater until such time as the constituents in the water listed in Table 1 hereto are reduced to or below all applicable MCLs established under Section 300g-1 of the Safe Drinking Water Act, 42 U.S.C. § 300g-1, and codified at 40 C.F.R. § Part 141, or all applicable Iowa State groundwater remediation regulations, whichever are more stringent. The extraction requirement shall terminate . . . when monitoring indicates that alluvial water quality beneath the Site has been at or below the relevant MCLs or Iowa groundwater remediation regulations for four consecutive quarters or if Deere demonstrates to the EPA that contaminant concentrations are below background levels." (Performance Standards, pp. 7 & 8.)

Since the date of the ROD, eleven additional MCLs have been promulgated for the constituents of concern at the JDDW site. Generally, MCLs are relevant and appropriate to groundwater cleanups. The promulgation of these new MCLs does not call into question the protectiveness of the required remedial actions so as to require a change in the remedy. The remedial actions required by the Consent Decree already includes the new MCLs. The Consent Decree defined a list of constituents of concern and anticipated that the number of MCLs promulgated and the specific concentration values established might change during the time period of groundwater extraction. The Consent Decree did not freeze the MCLs (nor the Iowa action levels) at the time of the Consent Decree. The Consent Decree Performance Standards set out an elaborate hierarchy of potential sources of cleanup levels in order to assure that some appropriate contemporary standard will be available in the future. The numeric concentration values will be determined by whatever of the identified standards are in effect at the time.

On August 16, 1989, the Iowa Environmental Protection Commission adopted Chapter 133, "Rules for Determining Cleanup Actions and Responsible Parties." Section 133.4(3)b.1. regarding required cleanup actions of ground water provides as follows:

> "Groundwater. The goal of groundwater cleanup is use of best available technology and best management practices as long as it is reasonable and practical to remove all contaminants, and in any event until water contamination remains below the action level for any contaminant, and the department determines that the contamination is not likely to increase and no longer presents a significant risk. Where site conditions and available technology are such that attainment of these goals would be impractical, the department may establish an alternative cleanup level or levels, including such other

conditions as will adequately protect the public health, safety, environment, and quality of life."

The term "Action Level" is defined by the Iowa Rules as follows:

> "'Action Level' means, for any contaminant, the HAL, if one exists; if there is no HAL, then the NRL, if one exists; if there is no HAL or NRL, then the MCL. If there is no HAL, NRL, or MCL, an action level may be established by the department based on current technical literature and recommended guidelines of the EPA and recognized experts, on a case-by-case basis." (Chapter 133.2, Definitions.)

The protectiveness of the current remedy stated in the JDDW ROD is not called into question by the subsequent enactment of the Chapter 133 Rules and does not need to be amended to expressly include those Chapter 133 Rules. The JDDW ROD had already identified the State of Iowa's Ground Water Protection Policy as an ARAR to be attained in the extraction of contaminated groundwater (ROD, p. 19). The Iowa Environmental Protection Commission adopted the Chapter 133 Rules for Determining Cleanup Actions and Responsible Parties pursuant to the Groundwater Protection Act, Chapter 455E, in order to implement and fulfill the Iowa Groundwater Protection Policies. The Iowa Rule set up a hierarchy of sources for establishing cleanup levels in the definition of "Action Level." The Iowa Rules would use a HAL or a NRL as a cleanup level before it would use an MCL. The HAL and the NRL may be concentrations that are lower than the MCL and consequently more protective. However, neither the CERCLA statute nor the National Contingency Plan require that the EPA in its five year review, adopt a subsequently enacted ARAR that is the "more protective" or "most protective" as long as the original remedy is itself protective. The EPA considers MCLs, by definition, to be protective of human health and the environment. Therefore, it is not necessary to amend the ROD to lower the cleanup levels.

Deere and Company, or its contractor, has suggested that it may be impractical to continue pumping in an attempt to attain HALs and NRLs and that it may be appropriate to ask the Iowa Department of Natural Resources to make a determination that some levels below MCLs but above HALs and NRLs would be the protective clean up goal for this site.

The Iowa rules do provide that where site conditions and available technology are such that attainment of these goals would be impractical, the department may establish an alternative cleanup level or levels. Pursuit of a cleanup level other than the HALs and NRLs in accordance with state law does not appear to be prohibited by either the ROD or the Consent Decree which included the more general policy or the Chapter 133 Rules as a whole rather than locking in the HAL or NRL part of the Iowa Rules as the particular cleanup standards.

Of course, the federal MCLs will be the minimum required standard to be attained for all constituents of concern for which there are MCLs. The state standards would not be used as the cleanup standards unless they are more stringent than the federal MCLs. The EPA considers MCLs protective of human health and the environment. So even if the cleanup levels for those constituents of concern for which there are MCLs are changed pursuant to the State regulatory procedure to some level lower than the MCLs but higher than the NRLs, it is not obligatory to amend or change the ROD to lower cleanup levels which were set at MCLs to lower State ARARs. Since the EPA considers the MCLs protective, this variation of the Iowa regulations would not call into question the protectiveness of the remedy as stated in the ROD. It should be noted, however, that the Consent Decree is less static than the ROD and requires that the groundwater be cleaned up to either the MCL, if an MCL exists, or the State standard, whichever is more stringent.

Also since the ROD, the EPA promulgated a National Primary Drinking Water Regulation for lead and copper which replaces the primary MCL of 50 ppb of lead and the secondary MCL of 1 ppm of copper which were in effect at the time of the ROD. The new regulation establishes a treatment technique requirement that includes corrosion control treatment, source water treatment, lead service line replacement and public education which is to be used when an action level of 15 ppb of lead or 1.3 ppm of copper is exceeded at 10 percent of the taps sampled. The new regulation recognizes that lead and copper differ from other drinking water contaminants because they generally do not occur in significant amounts in source water, but rather occur as the result of the corrosive action of the water in contact with plumbing materials containing lead and copper. The regulation does not include a requirement to attain a certain level in the source water. Consequently the action levels for

lead and copper are not cleanup ARARs for the extraction of groundwater which is not used in a public drinking water system. The regulation, however, does call into question the protectiveness of the 50 ppb of lead which had been established as a cleanup level in the ROD and Consent Decree. At any rate, the former MCLs for lead and copper have been repealed. Also, currently, neither a HAL nor a NRL has been established for lead in water. The Iowa rule definition of "action level" provides:

> "If there is no HAL, NRL or MCL, an action level may be established by the department based on current technical literature and recommended guidelines of EPA and recognized experts, on a case-by-case basis." [Iowa Rules 133.2(455B, 455E).]

To our knowledge the Iowa Department of Natural Resources has not established any site specific action level. In the absence of any MCL or State requirement, the Consent Decree Performance Standards provides a list of sources that shall be used to identify completion levels. The two remaining sources are the IRIS and the HEAST.

Although the National Primary Drinking Water Regulations action levels of 15 ppb of lead and 1.3 ppm of copper are not strictly speaking ARARs, they probably qualify as standards that should be considered in setting new cleanup levels for groundwater extraction at the site. Since those action levels are measured at the tap and allowance should be made for some measure of contamination being contributed by the water distribution system and the plumbing, it is anticipated that the cleanup completion level for groundwater extraction will be at least as low as 15 ppb and perhaps as low as 10 ppb. The exact number would need to be established as the time approaches to initiate the four-quarter verification sampling.

6.0 CONCLUSIONS

During the first five years of remedial action at the JDDW facility, the Remedial Design Report was completed and approved by the EPA, and the response actions were implemented and have been ongoing in accordance with the ROD and the Consent Decree.

The primary components of the ROD and the Consent Decree include maintaining an inward hydraulic gradient in the shallow aquifer beneath the site, groundwater monitoring, NAPL recovery, and surface water monitoring in accordance with the NPDES permit. These components are summarized below.

Hydraulic Gradient

More than 1.2 MGD of groundwater have been pumped from production wells PW-3, PW-4, PW-5, and PW-7 during remedial activities at the JDDW facility. The hydraulic gradient has been monitored by measuring water levels at three paired piezometers at the site perimeter and by performing monthly water level measurements in onsite monitoring wells. These activities indicate that an inward hydraulic gradient has been maintained in the alluvial aquifer beneath the site during the first five years of remedial action. The contour mapping outlined in Paragraph 2b of the Performance Standards is no longer required to demonstrate that JDDW is maintaining an inward gradient.

Groundwater Monitoring

Groundwater samples were collected during all four quarters of 1990, and were collected annually in 1991, 1992, 1993, and 1994. Data indicates that groundwater quality has been generally improving. In the final sampling event in 1994, PCE, TCE, and benzene were detected above Performance Standards. Of these, only benzene was also reported above the federal MCL.

NAPL Recovery

NAPL recovery was discontinued in July 1991 after 138,163 gallons had been recovered. For three years after recovery operations were halted, less than ¼-inch of NAPL has been observed at recovery well RW-3. Concentrations of benzene are still above Performance Standards, therefore, JDDW continues to monitor the groundwater and has not performed the final requirements as stated in the Consent Decree to determine whether NAPL recovery is complete.

Surface Water Monitoring

Monitoring of Outfalls 002, 005 and 011 has been performed as required in the revised NPDES permit for the JDDW facility. Of the constituents of concern, only one exceedence for lead was noted in Outfall 011 on July 17, 1992. Lead was reported at 0.81 mg/L which exceeded the daily maximum discharge set for lead of 0.69 mg/L. No other exceedences were reported. No TTO compounds have been detected in Outfall 011 in any of the four sampling events performed to date.

Statement of Protectiveness

The groundwater extraction system continues to be fully operational and functional. Operation of the system creates a hydraulic capture zone that contains and withdraws the contaminated groundwater. All monthly progress reports submitted to date indicate that the system is meeting the performance criteria for hydraulic capture of the groundwater. The response actions implemented by JDDW, together with the long-term monitoring, continue to protect the public health, welfare, and the environment at the JDDW site.

Next Five Year Review

The next five-year review will be conducted by the year 2000.

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APPENDIX A

Five-Year Review Trip Report

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc

December 20, 1994

Ms. Pamela G. Samek
U. S. Environmental Protection Agency
Region VII, Waste Management Division
726 Minnesota Avenue
Kansas City, KS 66101

Project: ARCS Region VI, VII, & VIII, Contract No. 68-W9-0021
Work Assignment No. 043-7HY3
DCN: 7760-043-EP-DGCT
Subject: Site Visit

Dear Ms. Samek:

Attached is my site visit summary for the site visit conducted at the John Deere Dubuque Works Facility, Dubuque, Iowa. The site visit was conducted on December 14 and 15, 1994. This information will be used to prepare the Five Year Review Report to be submitted next month.

If you have any questions regarding this summary, please contact me at (913) 492-8181.

Sincerely,

CDM FEDERAL PROGRAMS CORPORATION

Jacqueline M. Mosher

Jacqueline M. Mosher, P.E.
Work Assignment Manager

cc: W. Koski
DC
RF

JMM2A.D19

8215 Melrose Drive, Suite 102, Lenexa, KS 66214, 913 492-8181

SITE VISIT
JOHN DEERE DUBUQUE WORKS - DUBUQUE, IOWA
December 14 & 15, 1994

Attendees:

Pam Samek	USEPA, Regional Project Manager
Jackie Mosher	CDM Federal Programs Corporation, Work Assignment Manager
George Hellert	John Deere Dubuque Works, Supervisor, Environmental Engineering

The purpose of the site visit was to determine whether John Deere Dubuque Works (JDDW) was complying with the terms of the Consent Decree and the progress of the remedial action.

Samek and Mosher met with Hellert on the afternoon of December 14, 1994. Hellert provided a brief overview of the remedial activities at the site. He has received no complaints during the five year period from the citizens surrounding the site. Hellert indicated that they have maintained an inward gradient of the shallow groundwater table throughout the remedial action period. They continue to monitor the NPDES outfalls and the wells per the Consent Decree requirements. The Iowa Department of Natural Resources (IDNR) is the governing agency for the NPDES monitoring. Samek indicated that since the IDNR is the governing agency on the permits, USEPA does not require a copy of the NPDES monitoring results.

Hellert confirmed that the cottages on the east side of the JDDW facility are still leased to local citizens by the government. JDDW is still using Production Wells 1 and 2 for potable water. Production Wells 6 and 8 are used for fire protection. Production Wells 3, 4, 5, and 7 are used for process water. The NAPL recovery system at production Well 3 has been dismantled since NAPL has been detected at minimal levels in the associated recovery wells. If the NAPL thickness increases, the system can be connected for NAPL recovery.

On December 15, 1994, Hellert provided a tour of the facility. The group visited all of the well locations, outfalls and former recovery areas. All of the monitoring wells appeared to be in good condition. PW-4 was temporarily out of service. Gravel was plugging the pump. JDDW was currently trying to find the cause of the problem.

After the site tour, the group called Mr. Joe Darby from Geraghty & Miller. Samek told Hellert and Darby that the Five Year Review deadline was from five years from the date of Remedial Action implementation which was September 1990 not September 1989, as JDDW had indicated.

Mosher asked Darby to check the units for the metals analyses on the first 3 quarterly reports of 1990. The reports indicted mg/L; however, the concentrations appear to be μg/L. Darby indicated that he would check and forward a letter to Samek detailing his findings.

Darby indicated that he had talked to Mr. Bob Drustrup from IDNR who said that JDDW may want to ask the state to determine site-specific action levels. Mr. Drustrup indicated that if JDDW achieves federal Maximum Contaminant Levels (MCLs) that IDNR may agree that the Remedial Action is complete. JDDW will request IDNR to determine site-specific action levels.

Darby stated that based on the 1994 sampling of the wells, only one well appeared to have contaminants at concentrations greater than the MCLs. Darby asked whether EPA would consider averaging the groundwater results when determining if the Remedial Action is complete. Samek stated that she would check on EPA Region VII policy with respect to averaging groundwater results when determining Remedial Action completion.

Samek asked Hellert and Darby what they hoped would result from the Five Year Review. Hellert would like to see the requirement for the data loggers on the 6 wells be removed. Darby indicated that they believe they are near Remedial Action completion based on the sampling results from 1994, and therefore would like to see the monitoring ended. Samek noted the requests and said that they would be evaluated when preparing the Five Year Review Report.

The meeting concluded at 11:00 A.M.

APPENDIX B

Record of Decision

RECORD OF DECISION

John Deere Dubuque Works Company Superfund Site

Dubuque, Iowa

Prepared by:

U.S. Environmental Protection Agency

Region VII

Kansas City, Kansas

September 29, 1988

THE DECLARATION

Site Name and Location

John Deere Dubuque Works, Dubuque, Iowa.

Statement of Basis and Purpose

This decision document presents the selected remedial action for the John Deere Dubuque Works site in Dubuque, Iowa. It was developed in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Contingency Plan. This decision is based on the administrative record for this site. The attached index identifies the items that comprise the administrative record upon which the selection of the remedial action is based.

The Iowa Department of Natural Resources has concurred with the selected remedy.

Description of the Selected Remedy

This remedial action represents the final action for contaminated groundwater at the JDDW site. It addresses the principal threats both onsite and offsite by:

- Developing an alternate potable water supply for the plant.
- Extracting water from the contaminated alluvial aquifer using the existing production wells. This action will maintain drawdown around the plant and landfill areas, thus protecting nearby wells and controlling contaminant releases. The production wells and other monitoring wells would be periodically checked for contamination.
- Continuing to extract and treat non-aqueous phase liquid (NAPL) from the alluvium near production well-3 (PW-3). The source of this material is probably diesel fuel spills and waste oil leaks.
- Using deed restrictions to prevent inappropriate use of the plant property in the future.
- Developing a contingency plan which would assure that contaminants do not migrate off-site in the event of a plant shutdown.

Declaration

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate for this remedial action, and is cost effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. Because treatment of the principal threats of the site was not found to be practicable, however, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy.

DECLARATION

Because this remedy will leave hazardous substances on-site above health-based levels, a review will be conducted within five years after commencement of remedial action to assure that the remedy continues to provide adequate protection of human health and the environment.

Morris Kay
Regional Administrator
Region VII

9-29-88
Date

DECISION SUMMARY

This document was prepared using EPA Guidance for Developing Superfund Records of Decision (July 1988). Source material for site description, history, and characteristics was primarily the Remedial Investigation (RI) Report. The Feasibility Study Report was the main source for the description of alternatives and comparative analysis.

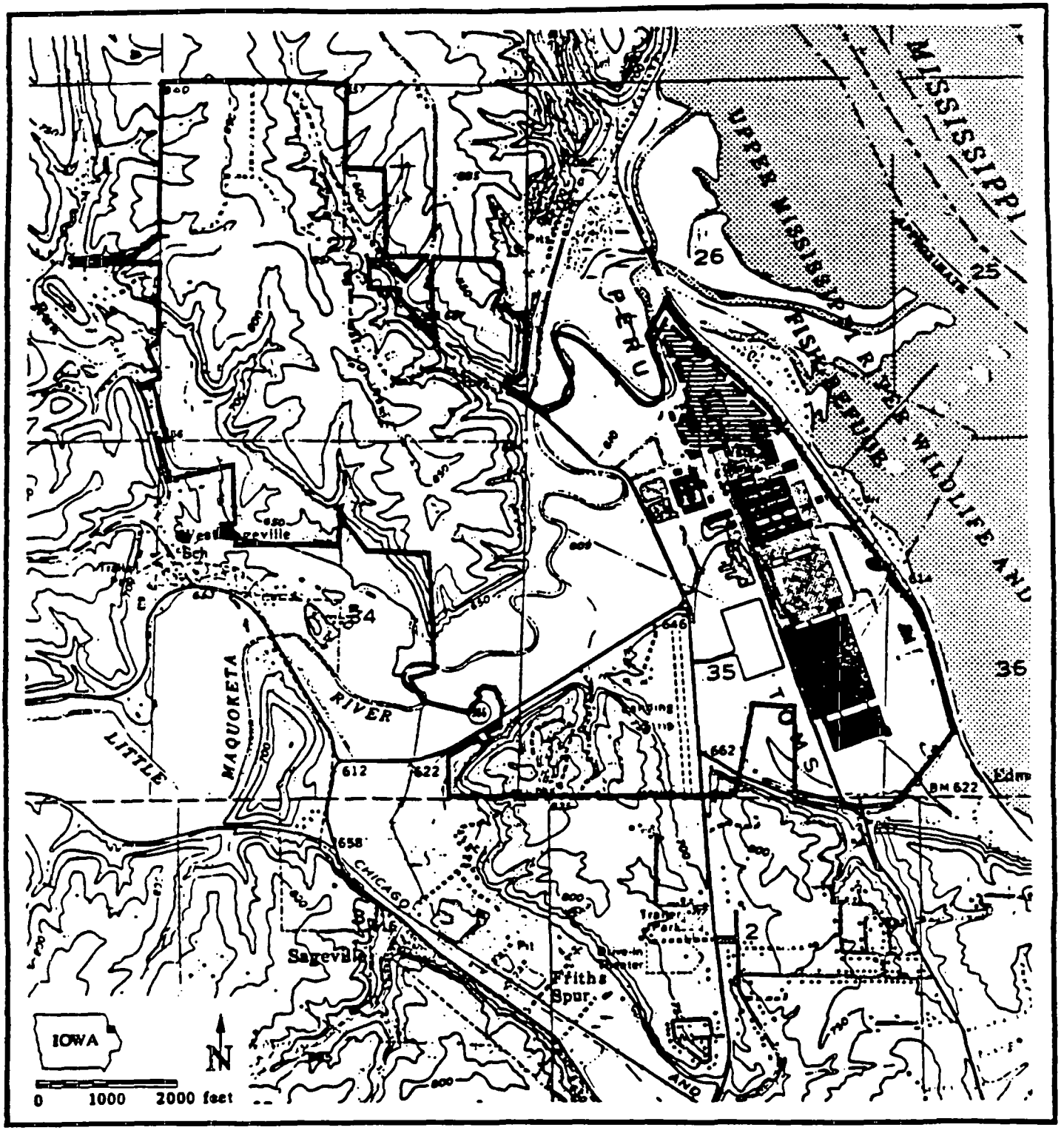
Site Name, Location, and Description

The John Deere Dubuque Works (JDDW) plant is located approximately 2.5 miles north of the city of Dubuque in northeastern Iowa. Plant buildings are located on a relatively flat delta at the confluence of the Little Maquoketa River on the north and the Mississippi on the east. State highway 386 services the plant site and the CMSP & Pacific Railroad lies between the plant and the Mississippi River. The plant property includes an area of 1,447 acres as shown in Figure 1. The factory itself covers over five million square feet and is located in the eastern half of the site. This area also contains parking lots, storage areas, waste disposal areas, and other facilities that serve the plant. The portion of the Mississippi River adjacent to the plant site is presently part of the Upper Mississippi River Wildlife and Fish Refuge, which was established in 1924. Approximately twenty cottages, leased from the Corps of Engineers to private residents, are located on this tract, between the JDDW facility and the river on the Mississippi River flood plain.

The land surface at JDDW is relatively flat with zero to five percent slopes. In limited areas the top soil has been removed and redistributed. The surficial soils over the majority of the plant site consists of loams, which are a mixture of silt, sand, clay, and some organic matter. Silty-loams are present north of the former landfill and along the Little Maquoketa River. Drainage on the plant property is highly variable and is related to the permeability of the soil. The permeability of the loams present over most of the plant property is moderate to low. Soil materials that were once five to twenty-five feet below the surface and are now on the surface have a higher density than the original surficial soils. Other areas have been compacted by heavy equipment, resulting in less pore space and higher density. The surficial soils along the Little Maquoketa are poorly drained due to the nearly level land surface topography. This area is frequently subject to flooding for short periods of time. Surface water drainage at the north end of the plant is, and has been, to the north into the Little Maquoketa. Surface water drainage in the south and central portions of the plant property has historically been to the east and south into the Mississippi River.

The climate for the State of Iowa is characterized by marked seasonal variations. The average annual temperature at Dubuque is 46.6 degrees F., with average temperatures for July and January of 72.6 and 19.2 degrees F. respectively. National Oceanic and Atmospheric Administration records indicate

Figure 1



REGIONAL LOCATION OF JOHN DEERE DUBUQUE WORKS

Approximate Boundary of Former Landfill

Features Mapped in 1956
Features Mapped in 1972
Features Mapped after 1978
Property Boundary

Prepared For: John Deere Dubuque Works
Project Manager: Steven D. Chatman

Geraghty & Miller, Inc.

that the average annual precipitation between 1937 and 1987 at Lock and Dam 11 (located approximately three miles downstream of JDDW) is 31.75 inches, with monthly averages ranging from 0.99 inches in February to 4.39 inches in June. Monthly average wind speeds are highest in the spring at 13 miles per hour.

General land use in Dubuque County and northeastern Iowa is primarily agricultural except near major population centers. The JDDW site, although once farmland, now remains largely undeveloped except in the immediate vicinity of plant operations. Major natural resources other than agricultural land are limestone, sand and gravel, trees, and water. The City of Dubuque is the county seat and the major commercial hub for the region. The area is a national manufacturing center for construction equipment due to the presence of JDDW. Other local industries include meat processing, grain storage and transportation, quarrying, and mining. Lead mining was an important industry in the area during the mid-1800s.

More than 150 sightings of rare species have been reported in Dubuque County. Within a 10-mile radius of the plant there have been 31 reported sightings of 20 rare species. No rare species have been sighted on the JDDW property and only one species, the pirate perch, was sighted immediately adjacent to the property.

The principal surface water bodies affecting ground water resources at the site are the Mississippi River on the east and the Little Maquoketa River on the north and west. The surface elevation of the Mississippi River adjacent to the JDDW site is controlled by Lock and Dam No. 11 which is located approximately three miles downstream at river mile 583.1. The minimum surface water elevation at the JDDW site was calculated to be 601.1 ft. msl. The mean surface water elevation for the Mississippi adjacent to the site was determined to be 602.5 ft. msl and the maximum elevation was calculated to be 614.3 ft. msl. Surface water elevations above Lock and Dam No. 11 can be expected to equal or exceed 613.1 ft. once in 50 years, 616.2 ft. once in 100 years, and 625.9 ft. once in 500 years. Maximum surface water elevations of the Mississippi River adjacent to the JDDW site can be expected to be 0.3 ft. higher.

Floods on the Little Maquoketa River have been well documented since 1935. The greatest flood of record, a 500-year flood, occurred on August 1, 1972. the surface water elevation at the gauging station was 635.85 ft. msl, and the discharge was 40,000 cubic feet per second (cfs). The average discharge for the period of record is 85.1 cfs. The high discharge during flood stages is due to the physical characteristics of the basin and probably to the fact that the gauging station is located just downstream from the confluence of the three principal tributaries.

Hydrogeology

A comprehensive description of aquifers at the JDDW site is given in the RI Report. The information generated by the RI was used to evaluate the possible migration pathways of contaminants beneath the site and also provided the basis for

development and calibration of the numerical ground water model which was, in turn, use to evaluate possible remediation options.

Alluvial sediments at the JDDW site vary in thickness from 100 to 158 feet and consist principally of fine-to coarse-grained sand deposited mainly by glacial meltwaters. A thin silty layer has also been deposited by the Little Maquoketa and Mississippi Rivers. Thin, interbedded gravel lenses are present but these are not significant barriers to vertical and horizontal ground water flows. The plant site is located above the thickest portions of the alluvium in the Peru Bottoms area. Toward the bluffs the elevation of the bedrock surface increases and the alluvial deposits become thinner.

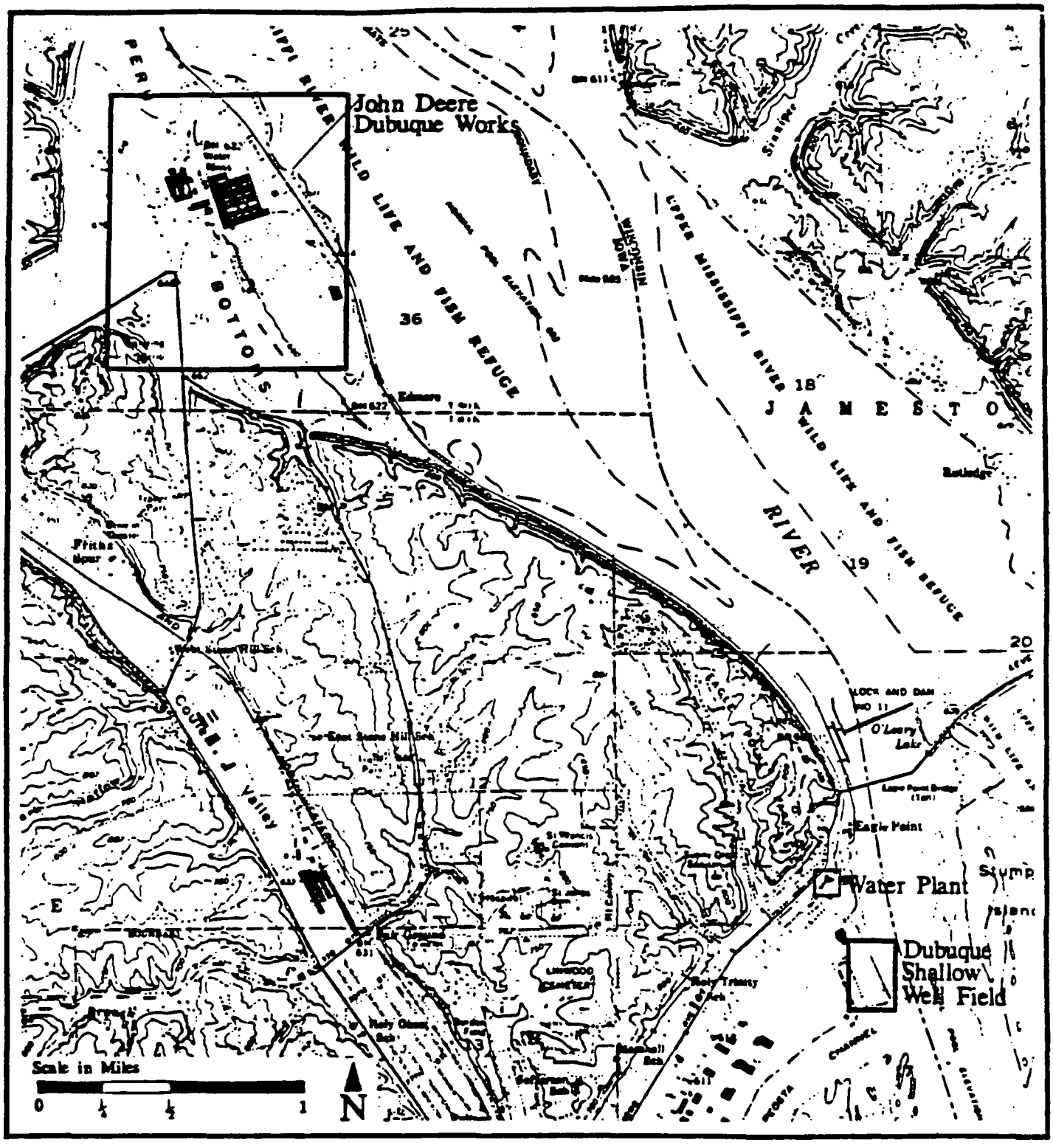
Three distinct bedrock aquifers are present in the Dubuque, Iowa area: The Galena-Platteville aquifer represents the most shallow of the principal bedrock aquifers. The formation consists of limestone and dolomite with thin shaly layers found in the uplands adjacent to the river valley and at the bottom of shallow alluvial filled valleys. This aquifer yields low to moderate quantities of water for domestic supplies. Ground water withdrawal rates are not known. The Cambrian-Ordovician aquifer is a major source of water across the state of Iowa. Wells withdrawing from it can yield from 500 to 750 gpm regionally. The formation is comprised primarily of sand-stones. The Dresbach Group is also comprised of sandstones and represents the deepest of the principal bedrock aquifers. It is present over a large geographic area but yields are generally not as great as those from the Cambrian-Ordovician.

Ground water in the alluvial aquifer near the site is derived from several sources, including direct infiltration of precipitation, leakage from the Little Maquoketa and Mississippi Rivers, and lateral inflow and vertical leakage from bedrock. Underflow from the Maquoketa River valley and slope runoff from adjoining upland areas are also minor sources.

JDDW obtains its water supply from both the alluvial aquifer and the underlying bedrock units, with most coming from the alluvial aquifer. From 1962 to 1988, an average of 0.75 million gallons per day (mgd) was withdrawn from the bedrock aquifer and 3.71 mgd was withdrawn from the alluvial aquifer for a total of 4.46 mgd. Peak demand occurred in 1975 at 7.03 mgd. The 1987 level averaged 3.12 mgd. Water levels in the alluvial aquifer near the site fluctuate largely in response to pumping from plant production wells, and to a lesser extent by variations in aquifer recharge and river stage. Upward movement of ground water from the Cambrian-Ordovician aquifer into the alluvial deposits will continue as long as pumpage from the bedrock production wells or other bedrock wells in the immediate area is not significantly increased.

The City of Dubuque obtains its water supply from alluvial wells along the Mississippi River and wells tapping the underlying bedrock aquifers. The location of this well field is shown in Figure 2. Their location and capacities suggest that the majority of water to the wells is derived from infiltration from the Mississippi River. These wells have no effect on water levels and water supply at the JDDW site.

Figure 2



LOCATION OF WATER PLANT AND ALLUVIAL WELL FIELD FOR DUBUQUE, IOWA

Prepared for: John Deere Dubuque Works | 01MAYS8ADF | Project Manager: Steven D. Chatman

Geraghty & Miller, Inc.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Site History

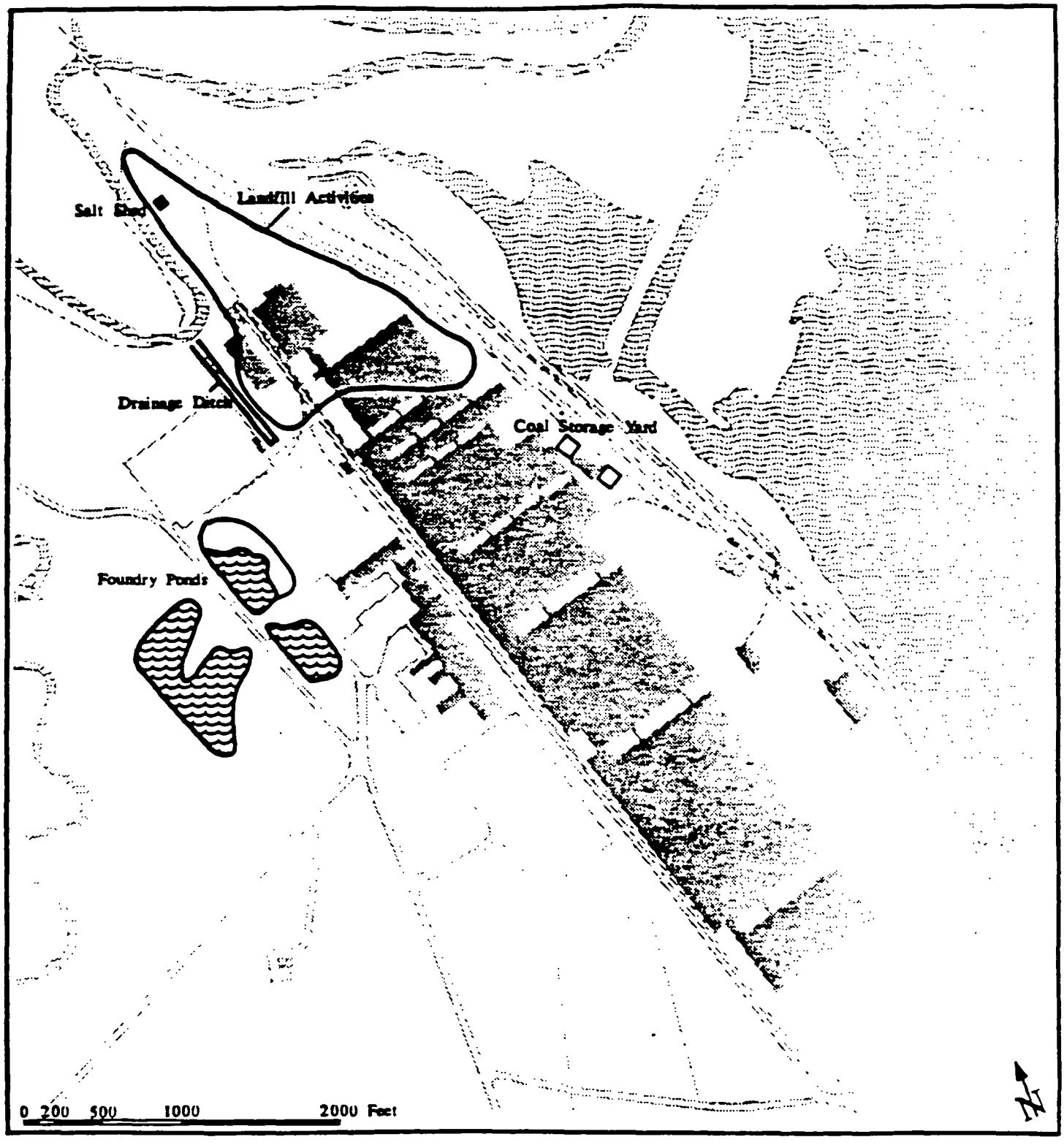
This John Deere facility began operations in 1946. The types of manufacturing processes at JDDW have remained relatively stable; however, factory space has increased from 600,000 square feet to more than 5,000,000 as the product line diversified and manufacturing increased. The waste management history of the facility is complex and varies based on changes in manufacturing processes, raw materials used, modifications in final products, and increasing environmental awareness by JDDW personnel, the public, and state and federal environmental regulatory personnel.

The plant has utilized two separate landfills for waste disposal. The newer of the two, and the one presently in use, is located to the northwest of the plant site. It is equipped with a synthetic liner and a leachate collection system which pumps the collected liquids back into the landfill. The other landfill, shown in Figure 3, is the main concern of the RI/FS study. This older landfill was originally placed in a natural depression caused by the Little Maquoketa floodplain. Before 1974, John Deere had placed their wastes up to the banks of the river. In 1974, the Iowa Natural Resources Council, along with the Iowa Department of Environmental Control (now IDNR), required John Deere to place all wastes at least 140 feet from the river banks. John Deere bulldozed the wastes back within the limits the same year and placed fences around the perimeter. Some flooding of the low areas occurred during the filling operations but no known flooding has occurred since 1965.

Prior to 1968, wastes were placed in the low areas of the old landfill and combustible material was burned. Wastes included caustics (sodium or potassium hydroxide), acids (hydrochloric or sulfuric), petroleum distillents (solvents, grinding oils, etc.), heavy metals (chromium, lead, zinc used in electroplating), cyanide (used in heat treating and tool room), and paint sludges. The only major changes in the manufacturing process that affected types of waste generated were the elimination of cyanide heat treating processes in 1965 and of cyanide zinc electroplating process in 1977. There are no records showing quantities of these materials or whether there were other wastes in addition to those suspected of being placed in the old landfill. In addition to these wastes, an unknown amount of foundry sands were deposited in the old landfill. This sand contained approximately one percent oil-based resin which was used as a hardener.

In 1980, the John Deere-Dubuque Works had a diesel fuel spill. The volume of released fuel was estimated to have been approximately 200,000 gallons. Soil borings showed the fuel was floating on the water table. A diesel fuel recovery system was implemented on November 10, 1980. The recovered fuel was retained for on-site reclamation and the water from the oil-water separator was discharged to the Mississippi River. Eighteen monitoring wells were installed February through June,

Figure 3



LOCATION OF HISTORICAL FEATURES

Water
Building
Railroad
Property Line

Prepared for: John Deere Dubuque Works | 16JUL88ADF | Project Manager: Steven D. Chatman

Geraghty & Miller, Inc.

1981 to monitor the effectiveness of the recovery system. By October 1985, approximately 86,000 gallons of diesel fuel had been recovered. One recovery well (RW-3) remains in operation.

Previous Investigations

JDDW notified the EPA of its status as a hazardous waste site on June 5, 1981. A preliminary assessment report, issued in July 1983, summarized site conditions and cited an initial hazardous waste rating of 34.95 (low to moderate hazard). A site investigation was conducted by Ecology & Environment in 1984 and a report was issued in January 1986.

In 1985 JDDW contracted with Geraghty & Miller, Inc. to perform limited site studies related to the former landfill. Four supplemental monitoring wells were installed to provide additional subsurface data. Ground water samples were collected from 17 on-site monitoring wells and five domestic wells for analyses of metals and volatile organic compounds. John Deere personnel have collected additional ground water samples for analyses. The data from those activities are presented in Appendix I.2 of the RI/FS and are also discussed in Section 4.5 of the main report.

JDDW attempted to estimate the quantities of wastes disposed of on the plant property and, in particular, in the former landfill portion of the plant. This information is contained in a document entitled "Superfund Information John Deere Dubuque Works." The above reports are all on file and available in the Administrative Record.

Enforcement Activities

The site scored 34.95 under EPA's Hazard Ranking System (a score of 28.5 is sufficient to place a site on the National Priority List or NPL). On September 18, 1985, the facility was proposed as a candidate to be placed on the NPL. However, the site was never placed on the final NPL. On June 24, 1988, EPA announced its new national policy in the Federal Register (53 FR 23978) whereby RCRA treatment, storage, or disposal facilities would not be placed on the NPL. As a result of this policy, the EPA announced its intention to remove several sites, including the JDDW site, from the list of sites proposed for the NPL. One of the main purposes of this policy was to avoid spending Superfund money at RCRA sites that are subject to the corrective action authorities of RCRA. The policy does not prohibit site cleanup from proceeding under a CERCLA consent decree pursuant to which the potentially responsible party (PRP) funds the work. Region VII plans to continue to treat the facility as a Superfund site.

Deere and Company is the sole PRP for the site. On September 29, 1986, the EPA Region VII Regional Administrator and Deere and Company entered into a Consent Order pursuant to Section 106(a) of CERCLA which provided for the development and implementation of a RI/FS, with the anticipation that upon completion the EPA would select the appropriate remedial action measures. The RI/FS has been completed pursuant to this order.

Technical discussions between EPA, JDDW, and their respective contractors during the RI/FS are summarized in the Administrative Record for the site.

Deere has indicated a willingness to perform the Remedial Design/Remedial Action pursuant to a consent decree. The Agency anticipates that the agreement with Deere to perform the remedy will be incorporated into a judicial consent decree within the next few months.

COMMUNITY RELATIONS HISTORY

The EPA conducts community relations activities to ensure that the local public has input into the decisions about Superfund actions and is kept well informed about the progress of those actions. The community relations program at this site provides an opportunity for the community to learn about and participate in the Superfund remedial process and site activities.

John Deere Dubuque Works and EPA have an open working relationship. Information sharing is done on an informal basis. Weekly telephone conference calls were held throughout the RI/FS study to coordinate activities and to resolve issues and disagreements. The Company routinely shares its weekly employee bulletins with EPA.

At this time, EPA's community relations activities have included the following:

- -- Established an information repository at the Carnegie-Stout Public Library in Dubuque.
- -- Prepared mailing lists.
- -- Designated an agency contact.
- -- Distributed a fact sheet about project activities to area interested parties.
- -- The Remedial Investigation/Feasibility Study Report and Proposed Plan were made available for public review at the information repository.
- -- Maintained telephone contact with the community and company.
- -- Held a public meeting at the Carnegie-Stout Public Library in Dubuque on September 24, 1988.

SUMMARY OF SITE CHARACTERISTICS

The old landfill was utilized from 1946 to 1974. It is approximately 20 acres in area and is situated on the northern section of the site. Some portions are now covered by buildings and concrete slabs. It's average depth is 15 to 20 feet. No cover material is in place nor does it have a leachate collection system or liner.

It was not possible to estimate the amount of liquid waste disposed in the old landfill. They were basically of two types: 1) waste oils and coolants; and 2) caustics, solvents and paints. Used oils and coolants were disposed of in various ways

both on-site and off-site while the former landfill was active.

Until about 1968, temporary surface impoundments of oil in the former landfill and north and south skimmer ponds were ignited periodically to volatilize hydrocarbons and other combustible materials. JDDW personnel believe these burn areas would now be located beneath the existing northern plant buildings. Prior to 1974, used oil or coolant generally was disposed of by selling to road oilers, spraying on stored coal to increase the energy gained from its burning and spraying to suppress fugitive dust emissions.

Waste solvents are generally depleted by way of evaporative losses prior to treatment or disposal, thus reducing the volume of waste solvents to be treated and discarded. Before 1980, waste solvents were typically blended with used oils and disposed of with the oils. Beginning in 1974, waste solvents were disposed of in the oil reclamation system. Since approximately 1980, waste solvents have been segregated and reclaimed through the services of an off-site contract reclaimer. According to JDDW personnel, solvents, oils, and coolants were discharged directly to the surface water along with other process fluids prior to the start of operation of the wastewater treatment plant in 1977. 1,1,1-Trichloroethane (1,1,1-TCA) is used as a general solvent throughout the plant. Plant wide use of 1,1,1-TCA limits JDDW's ability to strictly control solvent use and disposal. It is possible that unauthorized disposal of small quantities waste oils could result in relatively low concentrations of organic compounds beneath the site.

Caustic solutions and metal-plating acids generally were not directed into the former landfill. Plating bath solutions normally were disposed of off-site via a contract disposer or were mixed with noncontact water, process water, and storm water runoff prior to discharge. It is likely that prior to 1977, caustic solutions and metal plating acids were probably discharged directly to the surface water along with other process fluids.

A John Deere estimate of the total amount of solid wastes materials placed in the landfill include the following:

	Quantity (tons)
Sand and Ash	- 290,000
Cyanides	- 1/2
Heavy metals (arsenic, chromium, lead, and zinc)	- 1/2
Waste Paint sludge	- 2811
Waste paint filters	- 320
Alkali (NaOH salt bath residue)	- 262
Miscellaneous Waste	- 34,107

In order to assess the impact of disposal of these materials, a Remedial Investigation (RI) was conducted. The purpose of the remedial investigation was to collect necessary data to characterize the site and to assess the potential release of hazardous materials from the site. Data collection efforts included surface and subsurface soil sampling, ground

water sampling, and air monitoring. The collected data were then used to evaluate potential hazards associated with possible exposure to the detected contaminants; taking into account toxicity, physical/chemical factors, measured concentrations, and present and future exposure pathways. Results of this process are included in the "Baseline Risk Assessment" below.

The September 15, 1987 RI/FS Work Plan identified known releases of potentially hazardous materials. Areas and events identified in the Work Plan as being potential source areas are:

Old foundry ponds.
Chrome basin leak related to the industrial wastewater treatment plant.
Diesel fuel line leak.
Several isolated waste oil/coolant spills.
Coal storage yard.
Former landfill.

The remedial investigation identified the following areas of concern:

Surface Water- Any chemical discharges through the Company's NPDES system will enter the Mississippi or Maquoketa River systems. Also, surface runoff and seepage from the landfill enters the Little Maquoketa River. Any contaminants contained in the runoff would then enter the Upper Mississippi River Wildlife and Fish Refuge. Chemicals entering the rivers might impact downstream wildlife and biota. Disturbances of the landfill slopes would be a concern in cases of extremely high river water levels, but the landfill slopes appear to be stable. The Company reported that the Little Maquoketa experienced a 500 year flood in 1972 with no instances of slope failure at the landfill.

Potential parameters of concern which were detected in the surface water discharges were benzene, bromodichloromethane, 1,2-dichloroethene, chloroform, 1,1,1-trichloroethane, trichloroethylene, and xylenes.

Ground Water - The plant obtains its water supply from eight production wells located on-site. Two wells are installed into deep bedrock aquifers while six wells are constructed into the alluvial aquifer. The predominant direction of ground water flow in the alluvial aquifer is toward the production wells.

Contamination has been detected in the on-site alluvial production and monitoring wells. The chemicals include: 1,1,1-trichloroethane, 1,1-dichloroethene, carbon tetrachloride, tetrachloroethene, trichloroethene, benzene, nitrate, chromium, iron, and manganese.

Specific sources of ground water contamination were not identified. However, localized areas of contamination appear to exist near production well-3 (PW-3) and soil boring well-3 (SBW-3). The locations of these wells are shown in Figure 4. A nonaqueous phase liquid (NAPL) is currently being recovered in the vicinity of PW-3. This material may be present due to

the diesel fuel spill of 1980. Some of the constituents

detected at PW-3 may be due to dissolution of the NAPL into the ground water system. However, low levels of chlorinated volatile organics, which are not common components of diesel, were also detected in ground water and the NAPL samples. The source of the chlorinated compounds is assumed to be from previous solvent handling practices at the site. Contamination at SBW-3 may be related to a past chrome basin leak (the chrome basin is part of the industrial waste water treatment system).

The City of Dubuque's shallow well field is located about 3.5 miles from the JDDW plant. The contaminants in the alluvial aquifer at JDDW have no influence on ground water at the Dubuque well field.

Surficial Soils - Data indicate some concern for transport of potentially contaminated soil via runoff and seepage from the landfill into the Little Maquoketa. The constituent of concern is lead at the old landfill. Possible exposure points would be direct contact with contaminated soil and ingestion both off-site and at the JDDW grounds.

Air- A large percentage of the immediate plant work area is covered by pavement and buildings. Volatile organic concentrations in soil and sediment samples are minimal and are not expected to be present at levels that would impact overall air quality. Lead could present a concern due to possible inhalation of fugitive dust at the JDDW grounds and the off-site residences along the Mississippi.

Ground Water Flow During Plant Shutdown - Pumpage of production wells on the JDDW property controls ground water flow in the alluvium beneath the site. The flow of water is from the Mississippi River toward the pumping wells. However, in the absence of well pumpage, flow would be toward the Mississippi River and the private wells in the vicinity of JDDW, particularly those to the east between the plant and the Mississippi.

SUMMARY OF SITE RISKS

Baseline Risk Assessment

A baseline (no remedial action) public health evaluation was conducted on the potential hazards associated with possible exposure to contaminants detected at the site. Sampling at the JDDW facility has revealed inorganic metals and several organics in the soils at the former landfill, inorganic metals at the foundry sands area, and petroleum hydrocarbons and solvents beneath the JDDW plant and near the chrome treatment basin. Indicator chemicals were selected to identify the highest risk chemicals at the site so that the risk assessment focused on the chemicals of greatest concern.

Of the constituents found at the site, lead and manganese were designated as indicator chemicals for the inorganic constituents in soils (only low levels of organics were detected). Benzene, carbon tetrachloride, 1,1-dichloroethene, and trichloroethene were designated as indicator organic compounds for ground water. The major pathways of potential exposure to these contaminants are:

- Contact with, and ingestion of, small quantities of surficial soils;
- Inhalation of fugitive dust;
- Swimming in the Mississippi River; and
- Contact with water pumped at the JDDW facility.

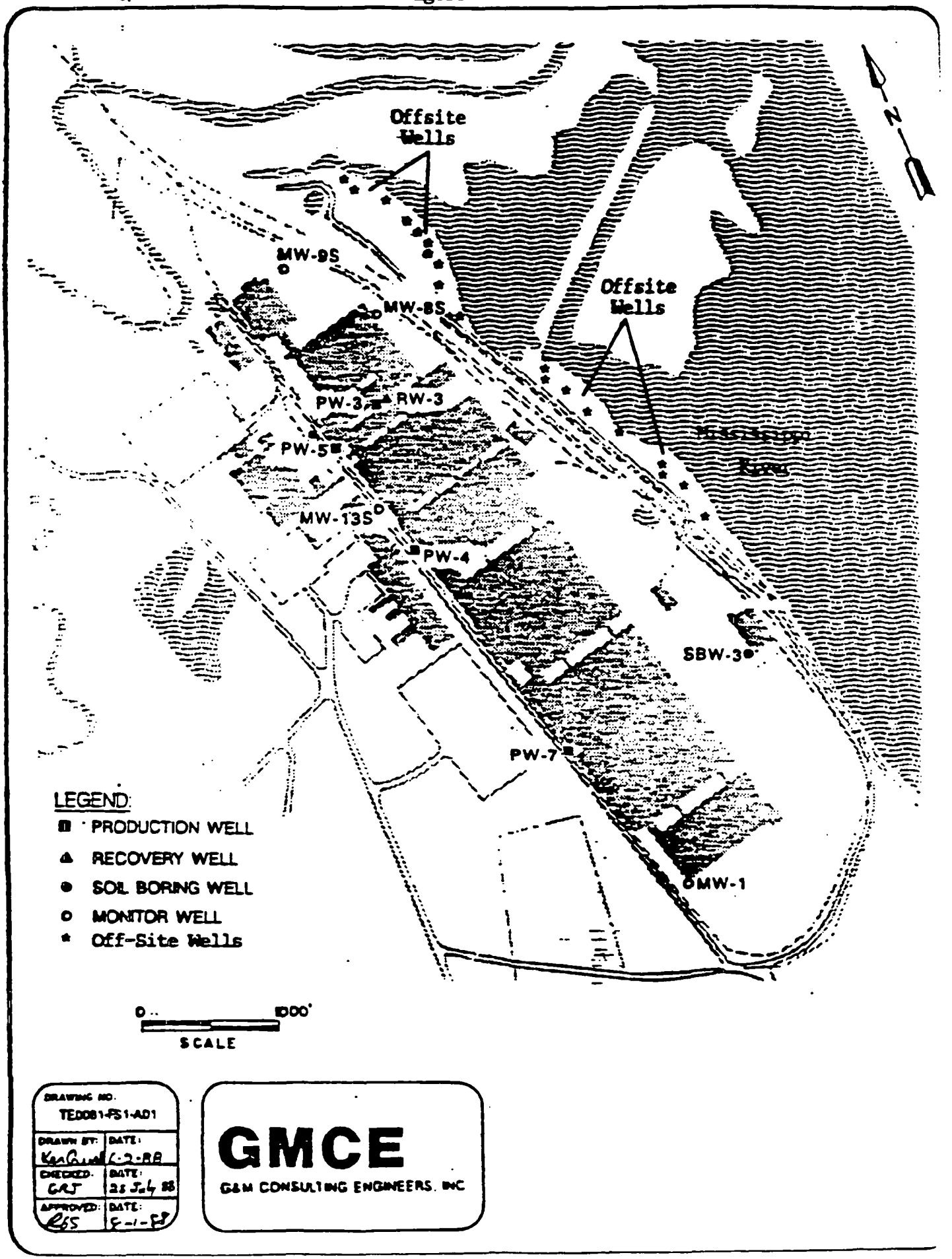
Exposure to the soils at the old landfill and foundry sands area were assessed for workers, off-site residents and hikers. Estimated chronic intake levels of the indicator chemicals were calculated for potential routes of exposure. Human health hazards are considered minimal based on the comparison of estimated intake levels to acceptable chronic intake levels as published by the USEPA in the Superfund Public Health Evaluation Manual.

Discharge of organic constituents to the Mississippi River was assessed for swimming and fish ingestion exposures. Swimming in the Mississippi River in the vicinity of the plant is considered an infrequent event and the constituents detected in the NPDES discharges have low bioconcentration factors. Consequently, the potential for discharged organic constituents producing adverse effects from swimming or fish ingestion is very low.

Environmental risks at the site are considered low. Access to the site is controlled and there has been no identifiable stress to off-site vegetation. Concentrations of the inorganic parameters in the Little Maquoketa and Mississippi Rivers were at background levels and below federal aquatic-life water quality criteria. Bioconcentration factors and biomagnification potential for the organic constituents are low. Therefore, the organic parameters should not concentrate in the aquatic food chain. Overall, the potential for adverse effects to the terrestrial or aquatic ecosystems adjacent to the JDDW facility is low.

Figure 4 shows the production wells at the plant in relation to the Mississippi River and off-site private wells. There are no wells other than the JDDW production wells that are currently being impacted by the organic constituents in the ground water because flow in the alluvial aquifer is toward the production wells. Future hypothetical risks associated with the ground water are related to discontinuation of production well pumping for a period of time sufficient for the organic constituents to migrate to the residences located east of the facility. Based on computer simulations under non-pumping conditions, it appears possible that the concentrations of the indicator chemicals could exceed the federal drinking water standards if pumping were to cease for long periods of time. Concentrations of chemicals in drinking water supplies above these standards would result in

Figure 4


Offsite Wells
MW-9S
MW-8S
Offsite Wells
PW-3
RW-3
PW-5
MW-13S
PW-4
SBW-3
PW-7
MW-1
N
LEGEND:
PRODUCTION WELL
RECOVERY WELL
SOIL BORING WELL
MONITOR WELL
Off-Site Wells
0
1000'
SCALE
DRAWING NO.
TE0081-FS1-AD1
DRAWN BY:
DATE:
CHECKED:
CRT
DATE:
25 July 88
APPROVED:
DATE:
GMCE
G&M CONSULTING ENGINEERS, INC

the potential for adverse health effects. Continued pumping at a minimum rate will maintain the "capture zone" and prevent the off-site wells from becoming contaminated. Current modeling simulations indicate that a pumping rate of 1.2 million gallons per day (mgd) is sufficient to maintain the capture zone.

Plant production water and potable water are also in the process of being separated. Thus, all potable water at the facility will come from uncontaminated deep bedrock aquifer wells. This action will also eliminate future showering exposure, although the potential cancer risks associated with showering are much less than one in a million.

Preliminary results of the risk assessment indicated the need to complete exposure scenarios involving worker exposure to possible air emissions of VOCs. From the production wells, ground water contaminants are pumped into the water distribution system, where plant manufacturing processes dilute, degrade, and volatilize the compounds before they are discharged to a holding pond prior to being discharged to the Little Maquoketa or Mississippi Rivers. JDDW and the EPA agreed to the following tasks to evaluate air emissions:

-- Review of available air monitoring data collected by JDDW through the confined spaces monitoring program.
-- Selection of confined spaces for air sampling based on a review of the JDDW confined spaces monitoring program and the proximity of confined spaces to possible contaminant plumes.
-- Air sampling of the selected confined air spaces using a portable field gas chromatograph.

JDDW has an air monitoring program to test air quality in confined spaces in all plant buildings and facilities. Areas included in the program are open and closed tanks, underground passages, equipment sumps, and selected rooms and buildings. Results from the program showed that, in general, unless a confined space contains a specific chemical as in a vat containing solvent for cleaning metal parts, there does not appear to be any historic problem or concentration of volatile compounds exceeding Occupational Safety and Health Administration (OSHA) worker exposure standards.

John Deere Dubuque Works and their consultant reviewed plant confined spaces and selected two for air sampling based on; (1) the proximity of the confined space to the known NAPL plume or a possible 1,1,1-trichloroethane plume in the south-central portion of the plant, (2) the depth of the confined space below ground (the deeper confined spaces were chosen), and (3) worker accessibility. Two air samples were collected at each confined space. The first was an ambient background air sample above the confined space. The second was collected in the confined air space itself. A portable gas chromatograph was used to perform the analyses. The instrument was calibrated for the following compounds:

Compound	Detection Level(ppb)
1,1,1-trichloroethane	100
1,1-dichloroethane	5
1,2-dichloroethane	100
benzene	5
tetrachloroethene	5
toluene	5
trichloroethane	5

No compounds were reported above the detection levels.

In summary, the primary hazard associated with the JDDW site is the possibility of dissolved organic chemicals impacting off-site domestic wells located east of the plant along the Mississippi River. Maintaining a minimum pumping rate of 1.2 mgd will prevent migration of contaminated ground water to the off-site wells. The reader is encouraged to see the Remedial Investigation Report for a more detailed discussion of the risk assessment.

DOCUMENTATION OF SIGNIFICANT CHANGES

The selected remedy is the one presented as the preferred alternative in the Proposed Plan. There have been no significant changes made as a result of public comments.

DESCRIPTION OF ALTERNATIVES

Table 1 summarizes the effectiveness, implementability, and cost factors of various response actions for both landfill and ground water remediation. Eight alternatives were initially examined and "pre-screened" prior to drafting of the feasibility study. Each included some combination of the Table 1 response actions. One alternative was a contingency plan which was prepared to address the conditions which may occur if the JDDW production wells were shut down for a prolonged period of time, or if production well water required additional treatment.

The preliminary alternatives also included some form of remedial action at the former landfill. With the exception of the contingency plan, all included access restrictions to the landfill. Four of the alternatives considered either a cap or cover to prevent direct contact with contaminated soils and reduce ground water contamination due to percolation and leaching. In addition, two other alternatives included excavation with soil disposal in an on-site RCRA landfill to prevent contaminant leaching, direct contact, and inhalation.

During the RI, a risk assessment (discussed previously) was conducted to determine the potential exposures and associated risks involved with the constituents released to the environment as a result of JDDW past operations. The RI soil data indicated that, in general, contamination was broadly dispersed at relatively low concentrations. Conclusions drawn from the risk assessment indicated that human health hazards at the landfill could be considered minimal, based on comparison of estimated intake levels to acceptable chronic intake levels as published by the USEPA. In addition, contaminated leachate seeping into the ground water is unlikely to be a problem based on EP-toxicity testing. As a result of these determinations, excavation, capping, or covering the landfill were not considered necessary and those parts of the alternatives were eliminated. However, access restrictions, specifically deed restrictions and a security fence, were retained for consideration in order to control future uses of the area.

After preliminary screening, five alternatives were selected for final evaluation. These alternatives and their respective response actions are presented in Figure 5. All of the alternatives include continued pumping of alluvial production wells for on-site containment of the contaminants.

Table 1

RESPONSE ACTION SUMMARY
(Initial Screening of Alternatives)

Soil, Waste, and Air Response Actions	Effectiveness	Implementability	Cost
ACCESS RESTRICTIONS	Deed restrictions are dependent upon long-term enforcement. A security fence is effective if maintained.	Legal requirements necessary for deed restrictions; security fence is easily implemented.	Negligible for deed restrictions; low capital and OEM for security fence.
CAP/COVER: CONTAINMENT	Effective as long as OEM is performed. Risk from direct contact is reduced; contamination of ground water reduced but not eliminated. Capping is a well-established technology.	A cap or cover is easily implemented but there are are legal requirements for deed restrictions.	Low to moderate capital; low to high maintenance depending on type of cover material.
EXCAVATION	Effective and reliable; reduces potential for contaminant leaching. Protection required against dermal contact and inhalation of contaminated dust.	Readily implementable.	Moderate to high capital expenditures.
LAND DISPOSAL (ON-SITE RCRA LANDFILL)	Effective and moderately reliable. OEM required to prevent landfill failure.	RCRA landfill relatively easy to implement. No offsite construction. Permits ??	Moderate capital.
Ground Water Response Actions			
ALTERNATE WATER SUPPLY: ISOLATE POTABLE WATER	Effective in preventing use of contaminated drinking water at the plant; reducing risk to the lower aquifer.	Readily implementable; conventional construction.	Moderate capital, low OEM.
MONITORING OF ALLUVIAL, POTABLE, AND PRODUCTION WELLS	Ground water monitoring will document conditions and extent of plume migration. Does not reduce contamination.	Readily implementable.	Low capital, low OEM.
EXTRACTION OF PRODUCTION AND ALLUVIAL WELLS	Effective and reliable; Ground water monitoring will verify effectiveness of the extraction system. Aquifer drawdown required to maintain zone of influence.	Readily implementable. May incorporate use of existing wells.	Low capital, low OEM.
PHYSICAL TREATMENT WITH EXISTING SYSTEM -ALLUVIAL WELLS & MAPL SPILL	Effective and reliable for removal of suspended solids. Requires sludge disposal.	Implementable; however capacity of existing system will limit volume of water that can be treated.	No additional capital expenditures; moderate OEM.

Table 1
(cont.)

	Effectiveness	Implementability	Cost
BIOLOGICAL TREATMENT WITH EXISTING SYSTEM -ALLUVIAL WELLS	May be effective for removal of readily biodegradable organics Unlikely to be very effective on most contaminants of concern.	Readily implementable, however capacity of system will limit volume of water that can be treated.	No additional capital expenditures; moderate OEM.
PHYSICAL TREATMENT WITH CARBON ABSORPTION AND/OR AIR STRIPPING -PRODUCTION & ALLUVIAL WELLS	Both air stripping and carbon absorption are proven technologies. Treatment of production well water by activated carbon may be ineffective due to large water volumes and relatively low contaminant concentrations. Stripping tower emissions controls probably not required; water vapor may be a problem in winter.	Implementable but pilot testing, design and construction required	Air stripping - low capital, moderate OEM. Carbon absorption - moderate capital, high OEM.
OFF-SITE DISCHARGE	Effective for reducing ground water contamination. Effluent contaminants must not adversely impact Mississippi and Little Maquoketa Rivers.	Readily implementable. Existing discharge permits may require revision.	Low capital, low OEM.

ALTERNATIVE 1 -- NO ACTION

The Superfund program requires that the "no action" alternative be considered at every site. Under this scenario, John Deere would take no further action at the site to control the contamination. Extraction of the ground water from production wells and discharge of wastewaters at selected NPDES outfalls would continue for on-site containment of ground water contamination as part of normal production activities. Under Alternative 1, JDDW would not be required to continue ground water pumpage in the event of plant shutdown. Also, the quality of the plant's potable water supply would not be improved. Monitoring of specified potable and production wells, as well as those installed to monitor the NAPL spill, would continue. The "no action" alternative would not require any capital expenditures by JDDW.

ALTERNATIVE 2 -- EXPOSURE PREVENTION AND CONTAINMENT

This alternative would eliminate the potential risks associated with the alluvial ground water through installation of an alternate water supply for potable water usage at the site. Currently, an alternate water supply is being installed at JDDW to replace alluvial wells PW-4, 5, and 7 as potable water supply wells. The new water supply will use bedrock wells PW-1 and PW-2, which are uncontaminated based on data from the RI. Production well usage will then be as shown in Figure 5. Halting production well pumpage of the bedrock aquifer will also reduce the threat to that aquifer by maintaining an upward gradient. Extraction and monitoring of production wells would continue under normal operations. The alluvial wells and those wells connected with the NAPL spill would be monitored.

ALTERNATIVE 3 -- NAPL MANAGEMENT

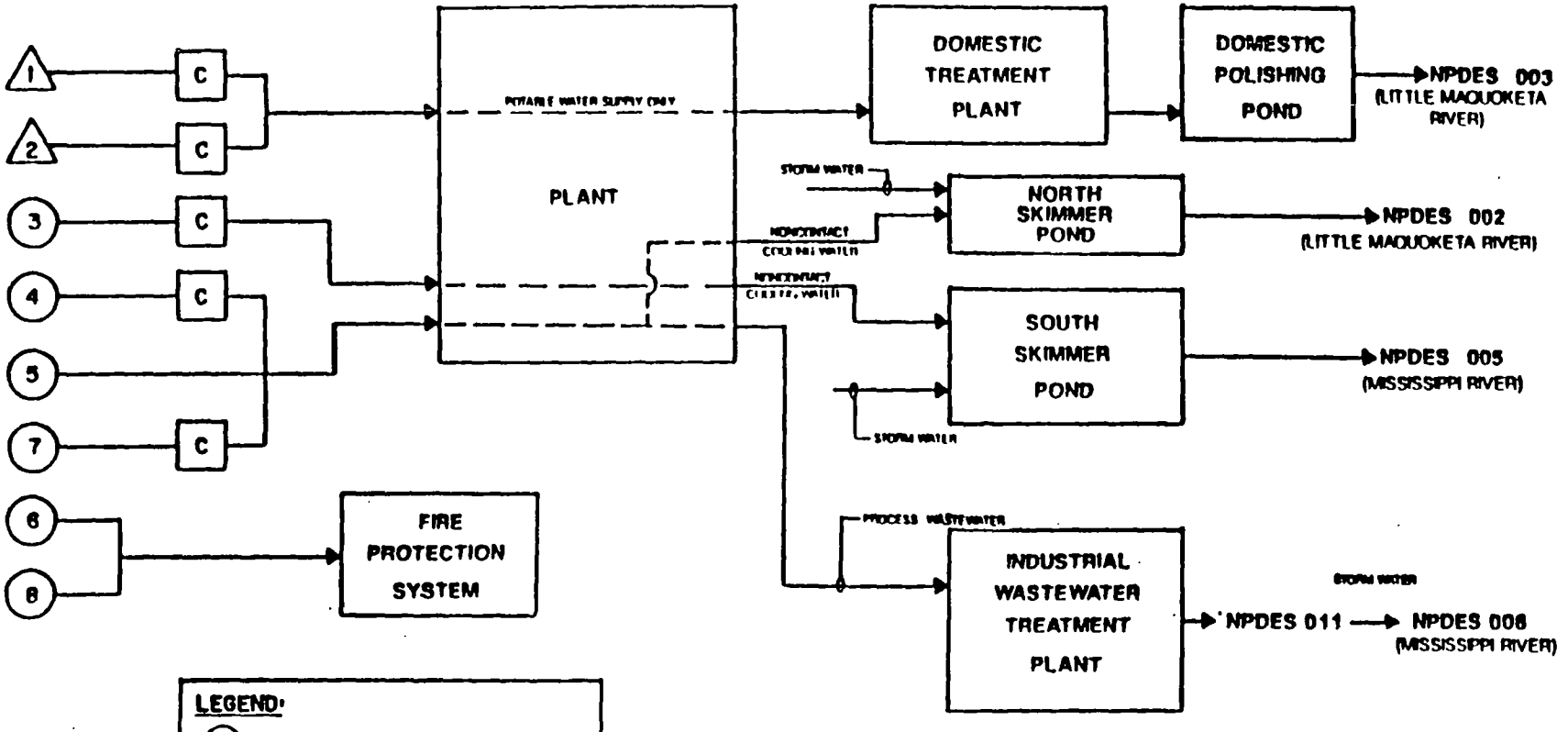
This alternative includes the same actions as alternative 2. In addition, the NAPL spill would be extracted and treated using an existing system (oil/water separation). The existing system consists of a recovery well installed near PW-3 to intercept the NAPL and an API separator. The ground water effluent is discharged to the south skimmer pond and ultimately NPDES 005 (Figure 6). Following implementation of this alternative, floating phase NAPL from the separator would be collected and transported for off-site waste management. Collected NAPL would not be stored on-site for a period longer than 90 days.

Reduction of the PW-3 pumping rate may be considered to reduce the tendency of NAPL to enter the PW-3 well screen. Should PW-3 pumping be reduced, the pumpage rates at PW-4, 5, and 7 would be increased, as necessary, to meet plant water usage needs and to contain potential ground water contamination on-site. Thus, continuation of existing NAPL management methods would supplement the remedial action objective of aquifer restoration.

Figure 5

General Response Action				Alternative 1 No Action	Alternative 2 Exposure Prevention	Alternative 3 Treatment of NAPL	Alternative 4A Treatment of NAPL and SDV-3 area	Alternative 4B Treatment of NAPL and SDV-3 area
Medium	Area of Concern	Technology Type	Process Option					
Ground Water (GW)	Potable Water Supply	Alternate Water Supply	PW1, PW2 Usage		●	●	●	●
		Monitoring	Specified Wells	●	●	●	●	●
	Production Well Water	Monitoring	Specified Wells	●	●	●	●	●
		Extraction	Existing Wells	●	●	●	●	●
		Off-site Discharge	NPDES Outfalls	●	●	●	●	●
	NAPL	Monitoring	Specified Wells	●	●	●	●	●
		Extraction	Existing Wells			●	●	●
		Physical Treatment	Existing System			●	●	●
		Off-site Disposal	Incineration or reclamation			●	●	●
		Off-site Discharge	NPDES Outfalls			●	●	●
	SDV-3 Area	Monitoring	Specified Wells	●	●	●	●	●
		Extraction	Recovery Wells				●	●
		Physical Treatment	Air Stripping					●
		Biological Treatment	Existing Plant				●	●
		Off-site Discharge	NPDES Outfalls				●	●

Figure 6



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ALTERNATIVE 4A -- NAPL AND ALLUVIAL GROUND WATER (SBW-3 AREA) MANAGEMENT

Alternative 4A is basically the same as number 3; that is, an alternate potable water supply, extraction of the production wells, and physical treatment of the NAPL spill. In this case, localized remediation of the alluvial ground water system would also be achieved by extraction of well SBW-3, followed by treatment via the existing biological industrial waste water treatment plant. Treatability studies may be required to determine if the ground water extracted from SBW-3 could be managed in the existing plant. Hydraulic capacity of the plant may also limit the implementablity of this alternative. The biological plant would effectively remove the volatile organics from extracted ground water. Aeration achieved in the carousel ditch of the system should be adequate to remove the volatile organics.

ALTERNATIVE 4B -- NAPL AND ALLUVIAL GROUND WATER (SBW-3 AREA) MANAGEMENT

Alternative 4B is the same as 4A with the exception that an air stripper would be used at SBW-3 for treatment of recovered ground water prior to discharge to the biological plant and eventually the Mississippi River via NPDES outfall 011. Air stripping would probably be performed in either a packed air stripper tower or in an air diffuser tank system. Based on available hydraulic capacities, treated ground water would be discharged into the carousel ditch for additional aeration and VOC removal prior to surface water discharge. Treatability studies may be required to determine the appropriate process options, and to optimize removal efficiencies.

CONTINGENCY PLAN

This plan was prepared to address the conditions which may occur if the JDDW production wells were shut down for a prolonged period of time or if recovered ground water from production wells required additional treatment prior to use as process waters for the plant. John Deere has gone on record as saying appropriate pumping of production wells will be maintained at the site, as necessary.

Prior to implementation of any contingency plan it would be necessary for JDDW and regulatory personnel to evaluate changes in site conditions, regulations, remedial technologies, etc. Studies may be performed to optimize the effectiveness of implementing the contingency plan.

This plan was provided to illustrate remediation strategies that could be implemented. Ground water recovery rates from PW-3, 4, 5, and 7 would be maintained for a minimum total recovery rate of 1.2 mgd, the minimum flow for containment of the alluvial aquifer underlying JDDW. Constituents recovered in ground water could be treated in air stripping units installed at each production well. Treated ground water may

be managed in two different scenarios; 1) treated effluent could be discharged to surface waters from NPDES permitted outfalls via the industrial treatment facility, the sanitary facility, and/or 2) treated effluent could be injected into the alluvial aquifer to recharge the aquifer and form a hydraulic barrier between the impacted ground water and potential off-site ground water users. Use of the hydraulic barrier may make it possible for JDDW to decrease ground water recovery rates and still maintain on-site containment. The existing NAPL recovery system would remain in use and recovered NAPL would be incinerated off-site. Use of the API separator would still be used and ground water still would be discharged to the south skimmer pond and then to NPDES 005.

****

Alternatives 1, 2, 3, 4A, and 4B were then screened with respect to effectiveness, implementability, and cost. This analysis is summarized in Table 2. Alternative 2 was eliminated from further consideration based on the initial screening as presented in the feasibility study report. The alternative was protective by virtue of providing an alternate water supply and alluvial aquifer restoration. However, it did not address the NAPL floating on the ground-water surface near PW-3. If the NAPL is not extracted in a separate system it may be extracted from PW-3, which could impact plant process operations and surface water quality at NPDES outfalls.

Alternatives 1, 3, 4A, and 4B then underwent a more detailed analysis according to nine criteria as defined by EPA in the 1988 draft guidance for conducting a RI/FS. A summary of the detailed analysis of the final alternatives is presented in Table 3.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT. This criterion addresses whether or not a remedy provides adequate protection and describes how risks are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

All of the alternatives, with the exception of the "no action" alternative, would provide adequate protection of human health and the environment. Risks are reduced and controlled by maintaining a capture zone such that contaminated ground water will not migrate off-site and gradually reducing levels of contaminants. Replacement of the potable water supply with the use of uncontaminated bedrock ground water from PW-1 and PW-2 would mitigate the potential risks for direct contact by on-site workers to contaminated ground water. The NAPL recovery system expedites remediation of the alluvial aquifer by removing concentrated quantities of undesirable constituents. This unit consists of an API separator which removes the floating NAPL for subsequent off-site management.

Table 2

Initial Screening of Remedial Alternatives
Feasibility Study: John Deere Dubuque Works
Dubuque, Iowa

Remedial Alternative	Alternative 1 (No Action)	Alternative 2	Alternative 3	Alternative 4A & 4B
	• Ground-water Monitoring • Continued Production Well Pumpage	• Ground-water Monitoring • Continued Production Well Pumpage • Alternate Water Supply	• Ground-water Monitoring • Continued Production Well Pumpage • Alternate Water Supply • NAPL Recovery/Treatment	• Ground-water Monitoring • Continued Production Well Pumpage • Alternate Water Supply • NAPL Recovery/Treatment • SBW-3 Area Management
SCREENING CRITERIA				
Effectiveness				
Protectiveness	• Continued operation of the production wells would prevent off-site migration of ground-water contamination • The potential remains for exposure of JDDW personnel to contaminated potable water	• Addresses the remedial action objectives established in the FS • A minimal risk for worker exposure would result from conducting the remedial actions • The remedial actions conducted would not adversely affect the surrounding community • Continued operation of the production wells would prevent off-site migration of contaminated ground water	• Addresses the remedial action objectives established in the FS • A minimal risk for worker exposure would result from conducting the remedial actions • The remedial actions conducted would not adversely affect the surrounding community • Continued operation of the production wells would prevent off-site migration of contaminated ground water • Recovery of NAPL would enhance aquifer restoration	• Addresses the remedial action objectives established in the FS • A minimal risk for worker exposure would result from conducting the remedial actions • The remedial actions conducted would not adversely affect the surrounding community • Continued operation of the production wells would prevent off-site migration of contaminated ground water • Recovery of NAPL would enhance aquifer restoration • Recovery of contaminated ground water at SBW-3 would enhance aquifer restoration

Table 2
(cont.)

Initial Screening of Remedial Alternatives
Feasibility Study: John Deere Dubuque Works
Dubuque, Iowa

Remedial Alternative	Alternative 1 (No Action)	Alternative 2	Alternative 3	Alternative 4A & 4B
	• Ground-water Monitoring • Continued Production Well Pumpage	• Ground-water Monitoring • Continued Production Well Pumpage • Alternate Water Supply	• Ground-water Monitoring • Continued Production Well Pumpage • Alternate Water Supply • NAPL Recovery/Treatment	• Ground-water Monitoring • Continued Production Well Pumpage • Alternate Water Supply • NAPL Recovery/Treatment • SDW-3 Area Management
SCREENING CRITERIA				
Implementability (Continued)				
Administrative Feasibility	• Approval from regulatory agencies to implement alternative is unlikely	• Approval from regulatory agencies to implement alternative is unlikely due to presence of NAPL	• Approval from regulatory agencies to implement alternative is likely	• Approval from regulatory agencies to implement alternative is likely
	• Adequate work force, materials, specialists are available	• Adequate work force, materials and specialists are available	• Adequate work force, materials and specialists are available	• Adequate work force, materials and specialists are available
		• Remedial action technology components available and could be easily implemented at the site	• Remedial action technology components are available and could be easily implemented at the site	• Remedial action technology components are available and could be easily implemented at the site
Cost (Relative)				
Capital	• Low	• Low	• Moderate	• Moderate
Replacement	• Low	• Low	• Low	• Moderate
O&M	• Low	• Moderate	• Moderate	• Moderate
Retained for Detailed Analysis of Alternatives	• Yes	• No	• Yes	• Yes

Table 2
(cont.)

Initial Screening of Remedial Alternatives
Feasibility Study: John Deere Dubuque Works
Dubuque, Iowa

Remedial Alternative	Alternative 1 (No Action)	Alternative 2	Alternative 3	Alternative 4A & 4B
	• Ground-water Monitoring • Continued Production Well Pumpage	• Ground-water Monitoring • Continued Production Well Pumpage • Alternate Water Supply	• Ground-water Monitoring • Continued Production Well Pumpage • Alternate Water Supply • NAPL Recovery/Treatment	• Ground-water Monitoring • Continued Production Well Pumpage • Alternate Water Supply • NAPL Recovery/Treatment • SSW-3 Area Management
SCREENING CRITERIA				
Effectiveness (Continued)				
Reduction of Toxicity, Mobility or Volume of Waste	• Recovered ground water would be treated to reduce the toxicity, mobility and volume of the aqueous waste constituents detected in the alluvial aquifer	• Recovered ground water would be treated to reduce the toxicity, mobility and volume of the aqueous waste constituents detected in the alluvial aquifer	• Recovered ground water and NAPL would be treated to reduce the toxicity, mobility and volume of the waste streams	• Recovered ground water and NAPL would be treated to reduce the toxicity, mobility and volume of the waste streams
Implementability				
Technical Feasibility	• Remedial actions on-going	• Remedial actions on-going, alternate water supply being implemented	• Remedial actions could be implemented without significant problems	• Remedial actions could be implemented without significant problems
	• Periodic maintenance would be continued for the existing production and monitoring well systems	• Periodic maintenance would be required for the existing production and monitoring well systems	• Periodic maintenance would be required for the existing production and monitoring well systems, and the NAPL remediation system	• Periodic maintenance would be required for the production and monitoring well systems, the NAPL remediation system, and the recovery/treatment system for the SSW-3 area
	• Ground-water monitoring would be required to monitor the effectiveness of remedial activities	• Ground-water monitoring would be required to monitor the effectiveness of remedial activities	• Ground-water monitoring would be required to monitor the effectiveness of remedial activities	• Ground-water monitoring would be required to monitor the effectiveness of remedial activities

Table 3

Comparison of Remedial Alternatives
Feasibility Study: John Deere Dubuque Works
Dubuque, Iowa

	Alternative 1 (No Action)	Alternative 3	Alternative 4A and 4B
Screening Criteria	o Ground-water Monitoring o Continued Production Well Pumpage	o Ground-water Monitoring o Continued Production Well Pumpage o Alternate Water Supply o NAPL Management	o Ground-water Monitoring o Continued Production Well Pumpage o Alternate Water Supply o NAPL Management o SBW-3 Area Management
Short-term Effectiveness	o Potential risks associated with ground-water monitoring would be controlled	o Potential risks reduced for remediation workers	o Potential risks reduced for remediation workers
	o Complete	o Minimal additional threat to the community, surrounding environment, and/or JDDW workers doing remedial activities	o Minimal additional threat to the community, surrounding environment, and/or JDDW workers doing remedial activities
		o Complete in approximately one year.	o Complete in approximately one year
Long-term Effectiveness and Permanence	o Remediates alluvial aquifer	o Remediates alluvial aquifer	o Remediates alluvial aquifer
	o Production and monitor well systems require long-term maintenance	o NAPL and ground-water recovery and treatment systems require monitoring and long-term maintenance	o NAPL and ground-water recovery and treatment systems require monitoring and long-term maintenance
			o Minimal increase in recovery efficiency contributed by recovery well at SBW-3
Reduction of Toxicity, Mobility and Volume	o Toxicity, mobility, and volume of aqueous contaminants in the ground water reduced	o Toxicity, mobility, and volume of aqueous contaminants in the ground water reduced	o Toxicity, mobility, and volume of aqueous contaminants in the ground water reduced
Implementability	o Requires operation and maintenance of existing systems	o Utilizes conventional construction and installation methods	o Utilizes conventional construction and installation methods
	o Potential for additional remedial action in the future	o Negligible potential for additional remedial action	o Negligible potential for additional remedial action

Table 3
(cont.)

Comparison of Remedial Alternatives
Feasibility Study: John Deere Dubuque Works
Dubuque, Iowa

	Alternative 1 (No Action)	Alternative 3	Alternative 4A and 4B
Screening Criteria	o Ground-water Monitoring o Continued Production Well Pumpage	o Ground-water Monitoring o Continued Production Well Pumpage o Alternate Water Supply o NAPL Management	o Ground-water Monitoring o Continued Production Well Pumpage o Alternate Water Supply o NAPL Management o SBW-3 Area Management
Implementability (Continued)		o Materials, personnel, and technologies are available for implementation	o Materials, personnel, and technologies are available for implementation
Cost			
Capital	o None	o $ 800,000	o A: $1,017,500 B: $1,166,000
Replacement	o None	o $ 69,000	o A: $ 69,000 B: $ 161,000
Annual O&M	o $68,100/yr	o $ 278,600/yr	o A: $ 309,300/yr B: $ 315,900/yr
Total Present Worth	o $1,046,900	o $5,151,800	o A: $5,841,200 B: $6,183,200
Compliance with ARARs	o Remedial action goals would be attained unless remediation is limited by best available technologies	o Remedial action goals would be attained unless remediation is limited by best available technologies	o Remedial action goals would be attained unless remediation is limited by best available technologies
		o Recovery of NAPL would address remedial action goals for maximum recoverable amount of NAPL	o Recovery of NAPL would address remedial action goals for maximum recoverable amount of NAPL.
Overall Protection of Human Health and the Environment	o Reduces risk of exposure to ground-water contaminants off-site	o Reduces risk of exposure to ground-water contaminants off-site	o Reduces risk of exposure to ground-water contaminants off-site
	o Risks associated with contact between contaminated water and JDDW workers may still exist	o Reduces risk of direct contact with contaminated water by JDDW workers	o Reduces risk of direct contact with contaminated water by JDDW workers
		o Reduces risk of off-site migration NAPL	o Reduces risk of off-site migration NAPL
State Acceptance	o Unlikely	o Likely	o Likely
Community Acceptance	o Unlikely	o Likely	o Likely

COMPLIANCE WITH ARARs addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other environmental statutes and/or provide grounds for invoking a waiver.

Compliance with ARARs would be accomplished by alternatives 3, 4A, and 4B. Treatment of the recovered NAPL and contaminated ground water will focus on attaining chemical-specific ARARs for surface waters at the discharge points for treated ground water. Specifically, State water quality standards and federal water quality criteria in the Mississippi and Little Maquoketa Rivers would not be violated by the discharges to the NPDES system with these alternatives. In order to assure that these standards and criteria are not violated, the State of Iowa may require additional NPDES permit limitations for any organic contaminants that are discharged during implementation of the selected remedy.

Due to the presence of the NAPL, implementation of Alternative 1, no action, may result in nonattainment of chemical-specific ARARs for surface water at NPDES 005. Extraction of contaminated ground water (all alternatives) will eventually attain federal MCLs and/or meet the State of Iowa's Ground Water Protection Policy.

LONG-TERM EFFECTIVENESS AND PERMANENCE refers to the ability of a remedy to maintain reliable protection of human health and the environment once cleanup goals have been met.

Alternative 3 would replace the current potable water supply with an uncontaminated source. Continual pumpage of plant production wells and NAPL recovery would prevent contaminant migration off-site. Eventually, contaminants would achieve levels that are in compliance with State ARARs. Contaminant reduction already occurs as water is pumped from the affected aquifer, through the various unit processes involved with production, and finally to the NPDES outfalls. Potential risks associated with direct contact with contaminated ground water would also be mitigated. The ground water monitoring system surrounding the plant will assess the effectiveness of the extraction process.

Alternatives 4A and 4B would achieve relatively the same long-term effectiveness and permanence as Alternative 3. The proposed recovery well near SBW-3 might also increase the efficiency of alluvial aquifer remediation. However, it is anticipated that the increase in contamination recovery efficiency contributed by the recovery well near SBW-3 would not significantly reduce the time required for remediation of the alluvial aquifer system. The low levels of contaminants detected in the SBW-3 area would be removed by continued pumping at PW-7, and the additional aquifer restoration provided by a recovery system at SBW-3 was predicted to be minimal. Thus, installation of such a system was deemed unnecessary.

Alternative 1 would not increase the quality of the plant's potable water supply. Discontinuing usage of the NAPL recovery system may also adversely impact the water quality of alluvial ground water extracted from production wells and used as process or potable water at the plant.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME is the anticipated performance of the treatment technologies a remedy may employ.

With the exception of Alternative 4B, treatment using existing systems would be employed. Contaminant reduction would be achieved with all alternatives via the various plant production processes. Alternative 1 does not treat the NAPL spill which would delay reduction of toxicity, mobility, and volume of the contaminants in the alluvial aquifer.

Alternative 3 would recover and treat the NAPL, thus reducing contamination in the alluvial aquifer. Alternatives 4A and 4B's use of a recovery well at SBW-3 would also continue to reduce the toxicity, mobility, and volume of alluvial contamination.

SHORT-TERM EFFECTIVENESS involves the period of time needed to achieve protection from any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

Alternative 3 would replace the potable water supply with an uncontaminated source drawn from the bedrock aquifer. This could be accomplished within one year after initiation of this alternative. Workers would be provided protection as appropriate. The NAPL recovery system and ground water extraction system are currently existing and functional. The NAPL that has been collected thus far has been stored on-site and would be disposed in accordance with prevailing RCRA and/or CERCLA requirements. Off-site disposal of the NAPL could be implemented within three months after initiation of this alternative.

Alternatives 4A and 4B would have the same short-term effectiveness as the preferred alternative. In addition, the SBW-3 recovery system could be installed within nine months of implementation. The biological treatment units are already in use at the site. Alternative 4B may require treatability studies. The design and installation of the air stripping system would be completed within one year of implementation.

Activated carbon filters would have to continue to be maintained at drinking water sources should alternative 1 be implemented because the potable water supply would not be replaced. JDDW workers involved with production well maintenance and ground water monitoring would be provided protection as necessary.

IMPLEMENTABILITY is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.

The no action alternative (number 1) can be readily implemented at the site. The existing ground water monitoring network would be utilized and the program implemented within a short time frame. Likewise, Alternative 3 should pose no significant construction or operation problems. The potable water supply wells, PW-1 and PW-2, are already installed into the bedrock aquifer and are being readied for connection to the domestic water supply. The existing ground water and NAPL recovery systems have been operational for several years and, in

addition, the equipment, specialists and technologies required to implement Alternative 3 are available. Nor would implementation difficulties be expected with 4A and 4B. Installation of the air stripping unit should not present any special difficulties and the biological treatment units are currently operational. However, the capacity of the biological system to treat additional volumes of water may be limited.

COST includes capital costs and operation and maintenance costs. Estimated capital cost of implementing the preferred alternative is $800,000, with replacement and annual O&M costs estimated at $69,000 and $276,600/year respectively. The estimated capital cost, replacement costs, and annual O&M cost for implementation of Alternative 4A are $1,017,500, $69,000, and $305,400/year respectively. The estimated capital cost, replacement cost, and annual O&M cost for Alternative 4B are $1,166,000, $161,000, and $312,000/year respectively. The costs of implementing Alternative 1 relate to ground water monitoring and would be approximately $63,700 /year. A more more detailed cost analysis for each of the final alternatives is presented in the Feasibility Study.

STATE ACCEPTANCE indicates whether, based on its review of the RI/FS and Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.

The Iowa Department of Natural Resources has reviewed the Proposed Plan, the RI/FS Reports, and the draft ROD. The State concurs with the selected remedy (presented below) as indicated by the September 21, 1988 letter from Morris Preston, Iowa Department of Natural Resources, to Glenn Tucker, EPA Remedial Project Officer. Since each of the final alternatives would involve the discharge of certain organic chemicals to the Little Maquoketa and Mississippi Rivers, the NPDES permits may be revised by the State as required.

COMMUNITY ACCEPTANCE reflects local residents' preferences regarding the implementation of specific alternatives.

During the public comment period, concern was raised regarding the ability of the monitoring program to detect spills and whether contamination from JDDW was reaching off-site private wells. The Agency has agreed to require monitoring of a number of off-site wells in response to the concerns of residents living near the site. Specific comments and the Agency's responses are given in the Responsiveness Summary following the Decision Summary Section.

THE SELECTED REMEDY

Alternative 3, the Contingency Plan, and requirements placing future use restrictions on the plant property is the selected remedial action for the John Deere site. The selected remedy will consist of these major actions:

- **Develop an alternate potable water supply for the plant.** The new water supply will use bedrock wells PW-1 and PW-2, which are uncontaminated based on analytical data contained in the RI.
- **Extract water from the alluvial aquifer using the existing production wells.** This action will maintain drawdown around the plant and landfill areas, thus protecting nearby wells and controlling contaminant releases. The production wells and other monitoring wells would be periodically checked for contamination.
- **Continue to extract and treat non-aqueous phase liquid (NAPL) from the alluvium near production well-3.** The source of this material is probably diesel fuel spills and waste oil leaks. Contaminated oils would be collected and transported for off-site waste management.
- **Use deed restrictions to prevent inappropriate use of the property in the future.** Future use of the current plant property will be limited to industrial activities only. In addition, water wells tapping the alluvial aquifer beneath the current JDDW property would not be allowed.
- **Develop, and be prepared to implement, a contingency plan which would assure that contaminants do not migrate off-site in the event of a plant shutdown.** The plan would address conditions which may occur if the plant is shut down for a prolonged period of time, if process modifications are made which decrease production well pumpage below 1.2 mgd or pumping rates developed in the RD/RA, or if constituents recovered in ground water from production wells require additional treatment prior to surface water discharge.

Maintaining a drawdown and controlling ground water flows beneath the plant would assure that contaminants do not migrate to private wells in the vicinity, while extraction and discharge lowers the level of contamination in the ground water. John Deere will monitor the NPDES outfalls to assure that contaminants are not discharged at levels which would cause State water quality standards or federal ambient water quality criteria in the Mississippi and Little Maquoketa Rivers to be violated. The appropriate pumping rate and configuration would be maintained during periods of plant shutdown as well as normal operations. This rate and configuration will be based on computer simulations of ground water flow.

Although some volatile organics and metals will remain in the ground water and soils at the site, these actions will reduce the levels over the long-term while providing protection of human health and the environment. EPA believes the selected remedy is the best balance among the nine evaluation criteria.

Recovery operations will be continued until ground water quality meets the remedial action goals (e.g., Federal primary drinking water standards, USEPA Health Advisories), and until the maximum recoverable amount of NAPL is withdrawn. An evaluation will be conducted every five years, which will consist of a detailed review of the monitoring program and a summary of the effectiveness of site remedial actions. EPA will then make a decision on whether additional remedial measures are required or if remedial actions can be terminated.

STATUTORY DETERMINATIONS

EPA believes the selected remedy satisfies the requirements of Section 121 of CERCLA and is the most appropriate solution for the site.

Protectiveness

The selected remedy mitigates the human health and environmental risks identified in the risk assessment. Replacement of the potable water supply at the JDDW site with the use of uncontaminated bedrock ground water from PW-1 and PW-2 would mitigate the potential risks for direct contact by on-site workers to contaminated ground water. In addition, the alluvial production well extraction rates will continue to maintain the hydraulic gradient of the alluvial aquifer such that ground water flows towards the production wells, effectively containing the contaminated ground water on-site. The NAPL recovery system will also expedite remediation of the alluvial aquifer by removing the NAPL which contains concentrated quantities of undesirable constituents.

Deed restrictions are protective by assuring that the site will remain industrial, and by prohibiting the installation of domestic water wells in the alluvial aquifer beneath JDDW property.

Attainment of Applicable or Relevant and Appropriate Requirements

The recovery of the NAPL and contaminated ground water should restore the alluvial aquifer to the chemical-specific ARARs for ground water. Ground water remediation would be specifically monitored and maintained until chemical-specific ARARs are met or constituent recovery is limited by the best available technologies. Compliance with chemical-specific ARARs for surface water would also be accomplished by monitoring NPDES outfalls and controlling discharges depending upon monitoring results.

Cost Effectiveness

Alternative 3 has the highest cost/benefit ratio among all remedial alternatives evaluated for the site. Capital costs relative to the other final alternatives are moderate, operation and maintenence costs are also moderate, and replacement costs are low. The remedy can be readily implemented at the site because several of the technologies incorporated in Alternative 3

are already in use at JDDW. Tables 2 and 3 summarize the estimated implementation costs for the selected remedy in comparison with other evaluation criteria.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy will provide for long-term effectiveness and permanence as the incorporated technologies are reliable and address potential risks associated with the site. Replacement of the potable water supply, the continual pumpage of plant production wells, and NAPL recovery minimize future potential risks by removing exposures to contaminated ground water and restoring the aquifer.

Preference for Treatment as a Principal Element

The total volume of extracted ground water is not treated using state of the art technologies (e.g. activated carbon filtration). The tremendous volumes of extracted water make such actions impractical. However, the extracted water is used in plant processes; thus the contaminant levels are reduced by such mechanisms as dilution, degradation, and volatilization in conduits, open storage basins, skimmer ponds, and the industrial wastewater treatment system. Ground water in the vicinity of the 1980 diesel fuel spill is treated through the NAPL recovery and treatment system. .FI ROD.RES

RESPONSIVENESS SUMMARY

Record of Decision for John Deere Dubuque Works Dubuque, Iowa

This Responsiveness Summary presents EPA's responses to public comments received regarding the proposed remedial actions for contaminated ground water at the John Deere Dubuque Works site in Dubuque, Iowa. This document addresses all comments received by the Agency during the public comment period conducted as part of the remedy selection process. The Responsiveness Summary is a component of the Record of Decision (ROD) package, which also includes the ROD declaration, ROD summary and index to the administrative record.

Introduction

On August 5, 1988 EPA announced its Proposed Plan for remediation of the ground water contamination at the John Deere Dubuque Works in Dubuque, Iowa. Under the Proposed Plan the preferred remedial alternative would consist of the following major actions:

- Develop an alternate potable water supply for the plant.
- Extract water from the alluvial aquifer using the existing production wells. This action will maintain drawdown around the plant and landfill areas, thus protecting nearby wells and controlling contaminant releases. The production wells and other monitoring wells would be periodically checked for contamination.
- Continue to extract and treat non-aqueous phase liquid (NAPL) from the alluvium near production well-3. The source of this material is probably diesel fuel spills and waste oil leaks.
- Use deed restrictions to prevent inappropriate use of the plant property in the future.
- Develop and be prepared to implement a contingency plan which would assure that contaminants do not migrate off-site in the event of a plant shut down.

Although some volatile organics and metals will remain in the ground water and soils at the site, these actions will reduce the levels over the long-term while providing protection of human health and the environment. EPA believes the preferred alternative represents the best balance among the evaluation criteria used to evaluate remedies.

Public Participation

EPA Region VII received five comment letters in response to its request for public comment on the Proposed Plan and Remedial Investigation/Feasibility Study for the John Deere

Dubuque Works Superfund site. The following are summaries of the written comments received and the Agency's response.

Two commenters expressed dissatisfaction with the time allowed by EPA for submittal of comments. They both stated that they had less than the 21 days between the time they actually received the notice and the public comment closure date.

The minimum time allowed for public comment is 21 days according to EPA regulations. Based upon previous public input regarding this project, the Agency felt that 21 days would be an adequate amount of time for the public to respond. The appropriate documents were made available to the public on August 5, 1988 and an announcement was made requesting comments on that same date in the local newspaper. Shortly thereafter, "fact sheets" were sent to "interested parties" in the vicinity of the plant to further inform them of project actions and plans. These fact sheets would have arrived after the date of formal opening of the public comment period. We acknowledge that the fact sheets should have been sent earlier so they would have arrived at the same time the public notice was published in the newspaper.

To assure that the public, particularly nearby residents, were allowed sufficient opportunity for comment, EPA and John Deere held a public meeting in Dubuque on September 24, 1988. Comments and responses from that meeting are summarized below.

Four commenters live in the immediate vicinity of the plant and expressed concern about either the immediate safety of their water supply or the potential for future contamination. Three people suggested that John Deere make an alternate source of water available to homeowners whose supplies may become threatened if the contamination moves off-site. Two commenters requested that, at the very least, John Deere periodically test their wells.

The off-site well analyses that have been conducted thusfar have not shown any contamination in these wells as a result of activities at JDDW. Potential off-site ground water contamination is currently controlled by production well pumpage. Furthermore, EPA will require that sufficient pumpage continue even in the event of a plant shutdown. A monitoring program designed to detect any potential off-site contaminant migration would also be implemented should this occur. Sampling and analysis of off-site wells would be incorporated into the monitoring program if potential off-site movement were indicated.

However, to alleviate concerns about the current safety of water supplies, **EPA will require the testing of selected private wells in the area on a periodic basis.** The well location and monitoring frequency will be determined in the near future. This program will be reviewed five years after ROD implementation to determine its continued necessity.

One commenter wanted to know where the contaminated well water goes after it is pumped out of the wells. He was concerned since his well was close to the river.

The contaminated well water is not directly discharged to the Mississippi River. It is used in the production processes of the plant. By the time it is eventually discharged to the river, the original concentrations have been reduced and would be further diluted by the river.

One commenter was Deere & Company. Two comments regarded corrections on the size of the old landfill and the volumes of hazardous waste disposed there. Another expressed concern that a statement in the Baseline Risk Assessment Section of the Proposed Plan left the impression that ground water would immediately begin to flow toward private wells if pumpage stopped. One recommended that EPA not specify water withdrawal rates from each well unless shown to be necessary to prevent offsite migration; while another recommended that the Agency not specify specific methods of handling and disposing the NAPL, allowing the Company to choose the methods as long as they meet existing regulations. The final comment requested that RCRA comments and requirements be addressed in the ROD so as to avoid imposition of additional remedial actions after issuance of the ROD.

The Agency has made the appropriate corrections regarding the size of the old landfill and the volumes of hazardous wastes disposed there in the Summary of Site Characteristics Section of the ROD. We will acknowledge, in the risk assessment section of the ROD, that ground water flow would not immediately reverse if pumpage ceased; nor will we specify specific well withdrawal rates and methods of NAPL handling and disposal. Finally, the EPA RCRA Branch has been reviewing the RI/FS and Proposed Plan. Their comments will be taken into account before the ROD is finalized.

The Iowa Department of Natural Resources (IDNR) reviewed the data that was collected at the NPDES outfalls during the RI. In a letter to Deere & Company, they presented the results of a wasteload allocation for JDDW's discharge of ground water to the Little Maquoketa River. The following contaminant levels at Outfall 005 were determined to be required to protect fish flesh for human consumption (i.e. human health criteria for a risk of 10E-6 cancer cases):

Chloroform	**18 ug/l or 1.35 lbs/day**
1,2-dichloroethene	**2.1 ug/l or 0.16 lbs/day**

Concern over contaminated ground water discharges was also expressed by a previous commenter. The IDNR is responsible for overseeing water quality programs and setting discharge limits in the State of Iowa. Since surface water quality standards are considered ARARs for the JDDW site, JDDW must assure that

compliance with these ARARs will be achieved through monitoring the NPDES outfalls and, if necessary, implementation of additional treatment to meet any mandated permit requirements.

One commenter noted that no mention was made of an oil film on a sand pit located near the residences. This person was concerned since his water supply is located "less than 150 feet from the sand pit." He was also was concerned about the cancer risks associated with the site and felt that people in the area be "notified of these dangers." He also requested a meeting between area residents, John Deere, and EPA.

Based upon the results of the remedial investigation, the contamination that can be attributed to activities of JDDW has been contained either on the JDDW property or beneath it. We do not know, at this time, where the source of the oil in the sand pit is. The potential health risks for both plant workers and off-site residents have been evaluated and are presented in the Risk Assessment Section of the RI. It appears unlikely that there are unacceptable health effects currently associated with site contaminants, based on exposure scenarios presented in the risk assessment.

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In response to the request for a meeting and to also allow more time for public input, EPA and John Deere held a public meeting at the Carnegie-Stout Public Library in Dubuque on September 24. The remainder of the Responsiveness Summary summarizes the questions, comments, responses, and answers that were voiced at that meeting. A copy of the transcript of the meeting is available in the Administrative Record.

How much more time will it take to recover the 1980 spill material?

There will always some material left because the oil attaches to the soil particles and all of it can not be extracted. Usually 50 to 60 percent is the maximum that can be recovered. The Company is continuing to extract material, but there is a possibility that they may very well have recovered about all they can at this time.

When will the bedrock water wells be implemented?

Construction is already underway and the system should be on-line and functional by the first of the year.

Doubt was expressed about whether the monitoring program program would be able to detect contaminant releases off-site, such as through the storm sewers. The commenter cited specific spill incidents. In addition, how will the program insure that the diesel fuel recovery system and

process water withdrawal wells operate properly?

The Company has implemented an Oil Spill Prevention and Countermeasure Plan as well as other measures to prevent such spills in the future. EPA has a role and responsibility to see that John Deere monitors these systems according to our standards and reporting requirements. If problems are detected, they will be required to take corrective actions. These various requirements will be explained in the Consent Decree which will be lodged in federal district court making it relatively easy to enforce compliance.

A primary concern of residents was that diesel fuel from the 1980 spill was getting into their wells. Severe taste and odor problems were cited.

The diesel fuel recovery system, plus the other withdrawal wells draw water in such a fashion as to capture the plume and prevent migration off-site. The RI/FS Study showed that the ground water pumpage is controlling the contaminants that were found at the site. This does not mean that there are not some contaminants in the private wells. However, our study results show that when the off-site private well sampling was conducted, no evidence of toxic contaminants was found that could be linked with the site. Some secondary contaminants that could affect taste and odor were detected, but we don't believe that John Deere is the source of these problems.

Based on the written requests and concerns expressed at the public meeting, EPA will require monitoring at representative off-site private wells in the vicinity.

Concern was expressed over the long-term health consequences of contaminants, especially heavy metals.

Potential health effects posed by contaminants at the site have been evaluated, and to the best of our knowledge, there is no predictable or measurable health effects that can be anticipated from the concentrations that are present. While we cannot be sure that acceptable safe levels will not change in the future, the current contaminant levels are present in acceptable concentrations for the given exposure settings.

Are there any materials that were used in the construction of the dike that could affect water quality?

We do not know at this time. EPA will ask John Deere to review their files to see if we can determine what was disposed there and what potential impact it might have.

Dead fish and high water temperatures have been periodically observed near the pumping station on the Mississippi.

John Deere withdraws non-contact cooling water and then puts it back into the river, adding about 20 degrees temperature

during the process. That is the only thing that is added to it. Thermal radiation during the summertime can also increase the temperature. The discharge is a regulated NPDES discharge.

One resident expressed concern that the residents could be evicted from the Corps of Engineers owned property. Were this to occur, the resident's wells could no longer be used as monitoring points.

The Corps and EPA are separate Federal Agencies. EPA does not have any influence over any of the Corps leasing activities. The monitoring system we are relying upon is not dependent on the private wells that are located near the facility.

Could the tremendous volume of water that John Deere is pumping have an affect on water quality in the area?

The alluvial aquifer of the Mississippi River is probably one of the most productive aquifers anywhere in the country. The aquifer is capable of yielding those quantities of water, and recharge from the river is almost continuous. By pumping large volumes of water, the flow of the contaminated ground water is toward the Company production wells and not the off-site wells.

What are the long-term consequences to the biota in the in the vicinity, particularly in the river?

The organic chemicals are the types that degrade in the environment fairly rapidly and they do not tend to bioaccumulate in the body. In terms of heavy metals, they do have a tendency to bioaccumulate, but they are also the type of metals that people are naturally exposed to in the environment. The body has mechanisms to use these chemicals and to dispose of excess amounts to a degree. You run into problems when there is an overdose of these chemicals, but we do not have over-exposure conditions at John Deere.

There is a "ponding condition" in the Mississippi adjacent to the plant, but siltation processes are also taking place. Metals are settling out in the river but are also being covered up at the same time; so we are not actually running into a situation where lead is increasing at unacceptable levels at the bottom surface.

What happens to the ground water that is extracted?

It is used in the various process operations throughout the plant. Some of it goes through an oil/water separator. Most is merged and then discharged to the Mississippi and Little Maquoketa Rivers.

How are discharges to the Mississippi River monitored?

Water is monitored before it actually goes into the discharge pipes. John Deere meets all of the current Iowa NPDES discharge

standards relative to the required parameters and monitoring frequency. Results are periodically reported to the State and they periodically inspect John Deere's discharges.

The organic contaminants detected in the discharges are not currently in John Deere's permits to discharge. Mr. Morris Preston, from the Iowa Department of Natural Resources, stated that the permits are periodically reviewed and this is an appropriate time to look at the additional information that has become available, and determine if those limits are acceptable. EPA has also told John Deere that there may be additional, more stringent NPDES permit requirements in the future coming from the State.

What is the extent of the contaminated aquifer that underlies the John Deere plant? Is it controlled by land faults?

We know the extent of the aquifer and the extent of the contamination. We believe that migration of contaminants off-site is being controlled. These assertions have been documented in the RI Report. There is no evidence at all to indicate any interaction with faults that would impact the flow.

What are the obstacles that are connected with cleaning up the old landfill?

A determination has to be made on how bad the situation is based on the concentration of materials throughout the depth of the landfill, concentrations near the surface, and whether any material is leaching out of it into the ground water. In the case of John Deere, lead was found to be the primary contaminant of concern at the old landfill. However, it is not impacting the groundwater, nor is it in the type of setting that people are likely to be exposed to unsafe levels at the surface.

One resident requested access to the plant drinking water and yearly testing of his well by John Deere.

John Deere maintained that they have not affected the off-site wells and they have an adequate monitoring program in effect. They do not plan, at this time, to provide water for the off-site residents. As state above, the Agency will require sampling of a representative number of off-site wells.

Is it possible for ground water to be released over the top of the aquifer?

The water's surface is drawn down in a conical shape around the well(s), so that water is also within the capture zone. All of the water migrates toward the well(s).

Will the coal storage area have any impact on the wells?

Soil samples were taken and wells installed nearby to address

this question. Some metals were detected in the soil but not in the ground water. So, the ground water does not appear to be impacted by the coal storage area and even if it was, it would go back to John Deere via the production wells.

What standards are applied to construction of the new landfill?

The landfill is a permitted sanitary landfill, subject to inspections by the State of Iowa. Hazardous wastes are not disposed there. It is lined and has a leachate collection system to prevent ground water contamination.

APPENDIX C

Consent Decree/Performance Standards

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF IOWA
EASTERN DIVISION

UNITED STATES OF AMERICA, Plaintiff, v. DEERE & COMPANY, INC., Defendant.	)	CIVIL ACTION NO.

CONSENT DECREE

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EASTERN DIVISION

UNITED STATES OF AMERICA, Plaintiff, v. DEERE & COMPANY, INC., Defendant.	)	CIVIL ACTION NO.

CONSENT DECREE

WHEREAS, the United States of America ("United States"), on behalf of the Administrator of the United States Environmental Protection Agency ("EPA"), has filed a Complaint in this matter against Deere & Company, Inc. ("Deere" or the "Settling Defendant"), involving a portion of the John Deere Dubuque Works (the "Site"), pursuant to Sections 104, 106 and 107 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986, 42 U.S.C. §§ 9604, 9606 and 9607 (hereinafter "CERCLA");

WHEREAS, pursuant to Section 122 of CERCLA, 42 U.S.C. § 9622, the United States and Deere stipulate and agree to the making and entry of this Consent Decree ("Decree" or "Consent Decree") without any admission of liability for any purpose as to any allegation or matter arising out of the pleadings or otherwise;

WHEREAS, the parties recognize and the Court, by entering this Consent Decree, finds that implementation of this Decree will expedite cleanup of the Site and avoid expensive and protracted litigation between the parties and that entry of this Decree, therefore, is in the public interest;

NOW, THEREFORE, it is hereby Ordered, Adjudged and Decreed:

I. JURISDICTION

1. This Court has jurisdiction over the subject matter of this action and over the parties. The Complaint states claims upon which, if the allegations were proved, relief might be granted. For purposes of this Decree and the underlying Complaint, Deere agrees not to challenge this Court's jurisdiction to enter, modify, enforce and/or terminate this Consent Decree.

II. SETTLING DEFENDANT

2. Deere & Company, Inc. is a Delaware corporation with its principal place of business in Moline, Illinois. Deere is authorized to do business in Iowa and owns and operates the John Deere Dubuque Works, which is located approximately 2.5 miles north of the city of Dubuque, Iowa, near the confluence of the Little Maquoketa and Mississippi Rivers. The Site, which consists of 296.81 acres more or less in the northeast portion of Deere's 1447 acre Dubuque Works facility, is identified on the plat map in Appendix 1 to this Decree, which is attached hereto and incorporated by reference herein. The plat map in Appendix 1 also identifies adjacent areas "A" and "B", which are not part of

the Site, but are covered by the restrictions in paragraph 23 of the Decree.

III. SITE HISTORY

3. Since 1946, Deere has manufactured heavy equipment and industrial machinery at the Dubuque Works facility. Between 1946 and 1974, Deere utilized a landfill on the northern section of the Site for disposal of waste materials generated by its operations at the facility.

4. Waste materials disposed of at the old landfill included caustics, solvents, used oils and coolants and heavy metals, such as lead, arsenic, chromium and zinc, which are hazardous substances pursuant to Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

5. Subsequent sampling and analysis indicated the presence of contaminants in and around the old landfill, principally in the groundwater in the alluvial aquifer under the Site, which is a source of process/production water for the facility. Groundwater contamination in the alluvial aquifer beneath the Site is the principal subject of the remedial action contemplated by this Decree.

6. By publication in the Federal Register on September 18, 1985, 50 Fed.Reg. 37950, EPA proposed the John Deere Dubuque Works for inclusion on the National Priorities List ("NPL"), pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605. The NPL is a statutory mechanism for identifying sites on the basis of

potential hazard, for the purpose of determining priorities for Superfund-financed cleanup.

7. Pursuant to Section 106(a) of CERCLA, 42 U.S.C. § 9606(a), the parties negotiated and, on September 30, 1986, EPA Region VII issued an Administrative Consent Order (In the Matter of John Deere Dubuque Works, Docket No.86-F-0001), in which Deere agreed to perform a Remedial Investigation and Feasibility Study ("RI/FS") for the Site and to pay the response costs incurred by the United States in connection with oversight and review of the RI/FS.

8. By publication in the Federal Register on June 24, 1988, 53 Fed.Reg. 23978, EPA proposed to delete the Site from the proposed NPL on the ground that it was also subject to corrective action authorities under the Resource Conservation and Recovery Act, as amended ("RCRA"), 42 U.S.C. §§ 6901 et seq. The 1988 proposal noted that EPA would continue to examine such RCRA-related sites on a case-by-case basis and, in appropriate cases, might repropose such sites for the NPL.

9. Pursuant to Section 3010 of RCRA, 42 U.S.C. § 6930, on or about July 21, 1980, Deere notified EPA of its hazardous waste management activity at the John Deere Dubuque Works. Deere subsequently submitted a RCRA Part A application and several amended Part A applications to EPA for a permit for treatment, storage and/or disposal of hazardous wastes at its Dubuque Works, thereby achieving interim status pursuant to Section 3005(e) of RCRA, 42

U.S.C. § 6925(e). Hazardous wastes and/or constituents have been released into the environment at the Dubuque Works facility.

10. After the June 1988 Federal Register proposal, EPA Region VII determined that remedial action at the Site could proceed under Section 122(d) of CERCLA, 42 U.S.C. § 9622(d).

11. Pursuant to Section 117 of CERCLA, 42 U.S.C. § 9617, on August 12, 1988, EPA published notice of the completion of the Feasibility Study and of the proposed plan for remedial action at the Site and provided opportunity for public comment on these matters. Various persons, including the Settling Defendant, provided comments on the proposed plan. EPA prepared a summary of responses to these comments, which were included in the administrative record.

12. EPA's decision on the final remedial action for the Site is embodied in a Record of Decision ("ROD") signed by the Regional Administrator, Region VII, on September 29, 1988. A copy of the ROD is attached hereto as Appendix 2 and is incorporated by reference herein. The State of Iowa, through its Department of Natural Resources, has concurred with the remedy selected in the ROD.

13. The remedial action selected in the ROD requires: (1) the installation and maintenance of an alternative system for supplying potable water at the Site, using the uncontaminated deep bedrock aquifer under the Site; (2) continued extraction of water from the alluvial aquifer under the Site at rates which will maintain an inward gradient adequate to contain contaminants

and prevent migration to private wells off-Site; and (3) the development of contingency plan(s) to ensure that contaminants in the alluvial aquifer do not migrate off-Site in the event of plant shutdown or process modifications which decrease pumpage rates from the alluvial aquifer, with provisions for additional treatment, if necessary, to satisfy applicable surface water limitations on discharge. The selected remedy also requires: (4) the continued extraction of non-aqueous phase liquid ("NAPL") from the alluvium and the subsequent discharge of the groundwater effluent through NPDES outflows, with the remaining materials to be transported for off-Site management as RCRA hazardous wastes. The performance standards for the work to be performed hereunder, which are identified in paragraph 32 of this Decree, permit alternative disposition of the remaining materials if it is demonstrated that such alternative measures meet all applicable or relevant and appropriate requirements and EPA approves such alternative measures.

IV. GENERAL PROVISIONS

A. Definitions

14. Unless otherwise noted, the terms used in this Consent Decree shall have the meaning ascribed to them in CERCLA.

B. Objective of the Parties

15. The objective of the parties in entering into this Consent Decree is to protect the public health, welfare and the environment from release or threatened release of hazardous substances, pollutants and/or contaminants from the Site by the

implementation of remedial and monitoring activities.

C. Commitment of Settling Defendant

16. Settling Defendant agrees to finance and perform the remedial action, maintenance and monitoring activities at the Site in accordance with the ROD, as set forth more fully in Section V of this Decree. Settling Defendant also agrees to reimburse the United States for its response costs, as set forth more fully in Section XV of the Decree.

D. Binding Effect

17. This Consent Decree applies to and is binding upon the parties and upon their successors and assigns.

18. In the event of conveyance of all or any portion of the Site and/or adjacent areas A and B identified in Appendix 1 hereto, the deed restrictions specified in paragraph 23 of this Section shall run with the land and be binding upon all successors in title.

19. Settling Defendant shall provide a copy of this Decree, as entered, to each contractor and subcontractor retained to perform the work required by the Decree and shall condition all such contracts and subcontracts on compliance with its terms. Settling Defendant shall be responsible to the United States to ensure that its contractors and subcontractors perform such work in accordance with the terms of this Decree.

E. Applicable, Relevant and Appropriate Requirements

20. All work performed pursuant to this Decree shall be in accordance with all legally applicable or relevant and appropri-

ate requirements as provided by Section 121(d) of CERCLA, 42 U.S.C. § 9621(d). The United States has determined that the obligations and procedures set forth in this Decree are consistent with its authority to establish appropriate remedial measures for the Site and that the final plan embodied in the ROD is consistent with the National Contingency Plan, 40 C.F.R. Part 300, and is protective of human health and the environment.

21. Pursuant to Section 121(e) of CERCLA, 42 U.S.C. § 9621(e), no federal, State or local permits are required for work pursuant to this Decree which is conducted entirely on-Site. As to any off-Site activities required under this Decree, Deere shall make timely application for and use best efforts to obtain all applicable permits and approvals, including, but not limited to, an amended NPDES permit.

F. Conveyance of the Site

22. Within thirty (30) days of entry of this Decree by the Court, Deere, as Settling Defendant and owner of the Site, shall submit a copy of the Decree to the Recorder's Office, Dubuque County, State of Iowa for recording.

23. The Site and adjacent areas A and B, which are covered by the restrictions in this paragraph, are identified in the plat map in Appendix 1 hereto. The Site and the adjacent areas so identified (or any portion thereof) may be freely conveyed, provided, however, that the deed or other instrument of conveyance shall contain restrictions which run with the land and which: (1) prohibit use of the Site and adjacent area A for

residential or agricultural purposes; (2) prohibit use of adjacent area B for residential purposes; and (3) prohibit the construction, installation, maintenance or use of any alluvial wells on the Site and on adjacent areas A and B for the purpose of extracting water for human drinking purposes or for irrigation of food or feed crops. Deere, in any such deed or instrument of conveyance, shall also reserve such access (by easement, right of way or otherwise) as may be necessary to implement its obligations under this Decree.

24. In the event of such conveyance, Deere shall notify EPA within five (5) days after closing and shall provide EPA with a copy of the deed or other instrument of conveyance. In advance of any such closing, Deere shall notify the proposed transferee in writing of the book and page numbers in the Decree, as recorded, which contain the deed restrictions and right of access required in the preceding paragraph of this Section.

25. In the event the Site is conveyed, Deere shall continue to satisfy all the obligations imposed by this Decree, unless and to the extent EPA approves the performance of any such obligations by its successor in title. Deere shall submit a request for such EPA approval in accordance with the procedures in Section XI of this Decree. Such request shall include a description of the specific obligations which are proposed to be performed by the successor in title and a financial assurance, in the form specified in Section XIII of this Decree, of the successor's ability to satisfy the obligation(s), provided,

however, that Deere shall have the option of providing such financial assurance on behalf of its successor in title.

26. The deed restrictions and reservation of access required in paragraph 23 of this Section may be terminated upon certification of the completion of the remedial action required hereunder, in accordance with the procedures in Section XIV of this Decree. After such certification, EPA, upon request by Deere, shall join in an appropriate instrument terminating such restrictions in a form suitable for recording.

V. WORK TO BE PERFORMED

27. Deere shall perform the remedial design and remedial action for the Site (hereinafter the "work") which are described in the ROD in the manner described in the Statement of Work ("SOW"), which is attached hereto as Appendix 3 and incorporated by reference herein.

28. All work to be performed pursuant to this Decree shall be under the direction and supervision of a qualified professional engineer or contractor with expertise in hydrogeology and experience in hazardous waste cleanup, who is familiar with applicable EPA Superfund Remedial Design and Remedial Action Guidances. Prior to initiation of any work at the Site, Deere shall notify EPA in writing of the identity and qualifications of the proposed supervising engineer or contractor and of any other contractors and/or subcontractors to be used in carrying out the work. Selection of any such contractor and/or subcontractor

shall be subject to approval by EPA, in accordance with the provisions in Section XI of this Decree.

29. Within 60 days of the expiration of the public comment period following the lodging of this Decree, Deere shall submit the Preliminary (30% segment) Remedial Design to EPA for its approval. The Preliminary (30%) Remedial Design shall include the following: (1) Section 1.0--Introduction and Background; (2) Table of Contents and Introduction to Appendix C--Groundwater Management Plan; (3) Table of Contents and Introduction to Appendix D--Contingency Plan; (4) Draft Appendix E--Quality Assurance Project Plan ("QAPP"); and (5) Draft Appendix F--Site Safety Plan. A summary of the modeling objectives, constraints, variables and simulations to be performed for completion of the groundwater management and contingency plans will also be included in the Preliminary (30%) Remedial Design. Within 30 days after receipt of EPA approval of the Preliminary (30%) Remedial Design, Deere shall submit the Prefinal (90%) Remedial Design to EPA. The Prefinal (90%) Remedial Design shall include the draft sections and appendices specified in the SOW. Within 30 days of receipt of EPA approval of the Prefinal (90%) Remedial Design, Deere shall submit the Final (100%) Remedial Design to EPA.

30. The Final Remedial Design shall contain detailed plans, specifications and schedules for the design, performance, maintenance and monitoring of the remedial action at the Site and

shall be developed in conformance with the ROD, the SOW and the applicable EPA Remedial Design and Remedial Action Guidance(s). In the event that the Decree as agreed to by Deere is modified before its entry (by reason of comments received during the public comment period or by order of the Court) and such modifications require revision of the Remedial Design or segments thereof previously submitted, at Deere's request the time period for submission of the revised Remedial Design or segments may be extended by EPA, by as much time as may actually be required to complete the revision(s).

31. The Final Remedial Design, as approved by EPA, shall be deemed incorporated by reference and made an enforceable part of this Decree and shall be implemented by Deere in accordance with its terms.

32. The work performed by Deere pursuant to this Decree, at a minimum, must comply with the performance standards set forth in Appendix 4, which is attached hereto and incorporated by reference herein.

33. After approval of the Final Remedial Design, either party may determine that other tasks, in addition to those specifically set forth in the Statement of Work or the Remedial Design, are necessary to achieve the remedial objectives of the ROD and of this Decree. If Deere so determines, it shall submit a detailed plan with specifications and schedules for the additional work to EPA, for its approval.

34. If EPA determines that other tasks are necessary, it shall advise Deere in writing of the additional work and the basis for its determination that such work is necessary. If Deere agrees with EPA's determination, within 60 days of receipt of the EPA notification, or such other time as may be agreed upon by the parties, it shall submit a detailed plan with specifications and schedules for the additional work to EPA, for its approval.

35. If Deere disagrees with EPA's determination as to the need for and/or the extent of the additional work, the parties shall attempt to resolve such disagreement informally. If the disagreement is not resolved informally within 30 days of receipt of the EPA notice, Deere may invoke the formal dispute resolution procedures in Section XVIII of this Decree.

36. Upon EPA approval of plans submitted under paragraph 33 or 34 of this Section, the standards, specifications and schedules for the additional work shall be incorporated automatically into the Final Remedial Design and shall be implemented by Deere in accordance with such provisions. In the event Deere does not prevail in the dispute resolution process referred to in the preceding paragraph, Deere's plan for the additional work shall be submitted to EPA for approval within 60 days of receipt of the final determination in the dispute resolution process. Upon approval, such plan, similarly, shall be incorporated automatically into the Final Remedial Design and shall be implemented by Deere in accordance with its provisions.

VI. EPA PERIODIC REVIEW

37. In accordance with Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), EPA shall review the remedial action program at the Site at least every five years after initiation of the remedial action to assure that human health and the environment are being protected by the remedy being implemented.

38. If, upon such review, EPA determines that other work, in addition to that set forth in the Statement of Work and the Remedial Design, is necessary to achieve the remedial objectives of the ROD and of this Decree, it shall advise Deere in writing of the additional work and the basis for its determination that the work is necessary. Thereafter the provisions and procedures in paragraphs 34 through 36 of this Decree (governing work determined by EPA to be necessary after completion of the Remedial Design), shall apply to such additional work.

39. If upon such review, EPA determines that a fundamental alteration is required in the selected remedy with respect to scope, performance or cost, or that further response action not included in the ROD or the SOW is appropriate at the Site, it shall provide Deere with an opportunity to confer on the proposed alteration or further response action and to submit written comments for the record during the public comment period provided under Section 117 of CERCLA, 42 U.S.C.§ 9617.

40. After termination of this Consent Decree as provided in Section XIV, Deere shall cooperate with EPA's periodic review program by promptly notifying EPA if it discontinues pumping or

ceases to extract water from the alluvial aquifer at rates which will maintain an inward gradient condition adequate to contain contaminants.

VII. QUALITY ASSURANCE, SAMPLING

41. The quality assurance project plan submitted as part of the Remedial Design shall comply with EPA's Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAM-005/80) and, upon notification by EPA, with any amendments to those guidelines effective during the course of the work. Deere shall use the quality assurance, quality control and chain of custody procedures specified in its QAPP for all sample collection and analysis conducted pursuant to this Decree.

42. The parties waive any objection to the admissibility in evidence of (but not as to the weight to be accorded) sampling data generated consistent with the QAPP in any further proceedings under this Decree. Deere, in its contracts, shall require that EPA personnel or authorized representatives be permitted access to any laboratory utilized by Deere and/or its contractors in implementing this Decree. In addition, Deere shall have such laboratory or laboratories analyze samples submitted by EPA for quality assurance/quality control review consistent with the QAPP.

43. Deere shall make available to EPA the results of all sampling, tests or other data generated by it in the course of implementing this Decree, and shall submit these results in the quarterly progress reports required by Section IX of this Decree.

44. At the request of EPA, Deere shall permit EPA and/or its authorized representatives to split or take duplicates of any samples collected by it in the course of implementing this Decree, provided, however, that the samples requested by EPA shall not exceed fifteen percent (15%) of the total samples collected, with the further proviso that EPA shall have the right to obtain at least one split or duplicate sample from each sampling event. Deere shall notify EPA not less than ten (10) days in advance of any such sample collection activity, unless another time period is approved in advance by the EPA Remedial Project Manager. In addition, EPA shall have the right to take such additional samples as it may deem necessary.

VIII. ACCESS

45. EPA and its designated contractors shall have access at all reasonable times to the Site for the purpose of conducting activities authorized by or related to implementation of this Decree, including, but not limited to: (1) monitoring the remedial action; (2) verifying any data or information submitted to EPA; (3) conducting investigations relating to contamination at or near the Site; (4) obtaining samples; (5) assessing the need for, planning or implementing additional response actions at or near the Site; and (6) inspecting and copying records, operating logs, contracts or other documents related to and necessary to assess compliance with the Decree.

46. To the extent that the area where work required under this Decree is owned or controlled by persons other than Deere,

Deere shall use its best efforts to obtain access from such persons for Deere and for EPA and its designated representatives, as necessary to implement this Decree. If access is not obtained, Deere shall promptly notify the United States, which may thereafter exercise its statutory authorities to obtain access.

47. Notwithstanding any other provision of this Decree, the United States retains all its access, information gathering, inspection and enforcement authorities and rights under CERCLA, RCRA and other applicable statutes and regulations.

IX. REPORTING REQUIREMENTS

48. Settling Defendant shall submit written quarterly progress reports to EPA which describe the actions taken toward achieving compliance with this Decree, including: (1) all results of sampling, monitoring and other data received by Settling Defendant during the preceding quarter's work; (2) all activity completed under the Remedial Design during the previous quarter; (3) all activity scheduled for the next quarter; and (4) information regarding percentage of completion of the Remedial Design, any unresolved or anticipated delays that may affect the schedule for completing the work and a description of efforts made to mitigate such delays. Beginning with the quarter following the effective date of this Decree, the quarterly progress reports are to be submitted by the fifteenth day of January, April, July and October of each year. In addition to the quarterly progress reports specified in this paragraph, the

performance standards for the work to be performed under this Decree, which are contained in Appendix 4 hereto, require certain other reports and monthly submissions. Deere shall provide such reports and submissions to EPA in accordance with the terms of the performance standards.

49. In performance of its obligations under this Decree, Deere is subject to the requirements of Section 103(a) of CERCLA, 42 U.S.C. § 9603(a) with respect to reporting of certain releases of hazardous substances to the National Response Center. Deere shall immediately notify the EPA Regional Project Manager ("RPM") orally of any such releases and shall provide the RPM with copies of all written reports submitted to the National Response Center.

X. ENDANGERMENT AND FUTURE RESPONSE

50. In the event of any action or occurrence during performance of the work which causes or threatens a release of a hazardous substance, pollutant or contaminant, or which may present an imminent and substantial endangerment to public health or welfare or the environment, Deere shall immediately notify the EPA RPM, his alternate or the EPA Region VII Emergency Response Section, as available, as in the preceding Section of this Decree. Deere shall take all feasible action to prevent, abate or minimize such release or endangerment. To the extent possible given the exigencies of the circumstances, such action shall be in accordance with the applicable provisions of the health and safety contingency plan submitted as part of the Remedial Design.

51. Nothing in the preceding paragraph shall be deemed to limit the authority of the United States or this Court to take, direct or order any appropriate action to protect human health and the environment or to prevent, abate or minimize any imminent and substantial endangerment to the public health or the environment because of an actual or threatened release of hazardous substances on, at or from the Site.

XI. SUBMISSIONS REQUIRING AGENCY APPROVAL

52. After review of any plan, report or other item which is required to be submitted for EPA approval under this Decree, EPA shall either: (1) approve the submission; (2) disapprove the submission and notify Settling Defendant of its deficiencies and/or propose modifications to cure the deficiencies.

53. In the event of approval of a submission, Deere shall implement any action required in the plan, report or other item, as approved.

54. If EPA disapproves and/or proposes modifications to Deere's submission, it shall provide Deere with a written statement of comments or reasons for its decision. Within 30 days of receipt of such EPA statement, Deere shall submit a revised plan, report or item which satisfactorily addresses each of the EPA concerns.

55. Within 30 days of receipt of the revised submission, EPA shall notify Deere of its approval or disapproval. If the submission is disapproved, EPA shall provide Deere with a written statement of its reasons and/or comments. Within fifteen (15)

days of receipt of any disapproval under this paragraph, Deere shall either: (a) submit a final revision which satisfactorily addresses each EPA comment, or (b) invoke the dispute resolution procedures set forth in Section XVIII of this Decree.

XII. EPA REMEDIAL PROJECT MANAGER AND DEERE PROJECT COORDINATOR

56. Deere and EPA have notified each other of the name, address and telephone number of the designated EPA Remedial Project Manager ("RPM") and alternate and the Deere Project Coordinator ("DPC") and alternate. If the RPM or DPC initially designated is changed, the successor shall be identified to the other party at least five days before the change.

57. The EPA RPM shall have the authority vested in a Remedial Project Manager/On-Scene Coordinator ("RPM/OSC") by the National Contingency Plan, 40 C.F.R. Part 300, including, without limitation, the authority to halt, conduct or direct any work required by this Decree and to take or direct any necessary response action when the RPM/OSC determines that conditions at the Site may present an imminent and substantial endangerment to public health or welfare or the environment. The Deere Project Coordinator shall have primary responsibility for implementation of the remedial work required under this Decree.

58. EPA may designate other representatives, including EPA employees, contractors and consultants, to serve as Site representatives to monitor the progress of any activity undertaken pursuant to this Decree.

XIII. FINANCIAL ASSURANCES

59. Deere shall demonstrate its ability to complete the work required by this Decree and to pay all claims that may arise from its performance, by obtaining and presenting to EPA for its approval, within thirty (30) days of entry of the Decree, one of the following: (1) a performance bond; (2) a letter of credit; or internal corporate financial information sufficient to satisfy the United States that its net assets are sufficient to make additional financial assurances unnecessary. If internal corporate financial information is relied upon, the standards used to determine the adequacy of Deere's financial resources shall be equivalent to those set forth in 40 C.F.R. Part 265, Subpart H. EPA will have sixty (60) days from receipt of the financial assurance or information to determine its adequacy and to communicate its determination to Deere. If EPA determines that such assurance or information is inadequate, within thirty days of receipt of such determination, Deere shall submit one of the two other forms of assurance to EPA for its approval. If Deere's financial ability is established by means of internal financial information, it shall submit updated financial information annually, on the anniversary of the effective date of this Decree or such other date as may be agreed upon by the parties.

60. In no event shall work required under this Decree be delayed pending submission and approval of financial assurances under this Section.

XIV. CERTIFICATION OF COMPLETION

61. For purposes of this Decree, "completed remedial action" means completion of all extraction, treatment and other measures taken on and off-Site which are necessary to restore the alluvial groundwater quality at the Site to the levels specified in the performance standards in Appendix 4 to this Decree.

62. Within ninety days after Deere concludes that the remedial action has been completed, it shall so notify EPA, by submission of a written report signed by a registered professional engineer certifying that the remedial action has been completed in satisfaction of the requirements of this Decree. If EPA determines that the remedial action has not been satisfactorily completed, it shall notify Deere of any activities which must be continued or completed, with a written statement of the reasons for its determination. Deere shall perform or complete such activities in accordance with the EPA notice, provided, however, that if Deere disagrees with the EPA determination, it may invoke the dispute resolution provisions in Section XVIII of this Decree.

63. EPA shall certify completion of the remedial action upon either: (a) an EPA conclusion, following the initial or any subsequent notification of completion by Deere, that the remedial action has been completed in accordance with this Decree, or (b) a final determination in the dispute resolution process which upholds Deere's position. Such certification by EPA shall

constitute the "certification of completion" referred to in Sections XX and XXV of this Decree.

XV. REIMBURSEMENT OF RESPONSE COSTS

64. As used in this Decree, "response costs" shall include all expenses and disbursements incurred or to be incurred by the United States for oversight, administrative, removal, remedial and enforcement activities in connection with the Site, including, without limitation, inspection, monitoring, sampling, analysis and verification of the adequacy of work performed pursuant to this Decree.

65. Pursuant to the Administrative Consent Order issued by EPA on September 30, 1986 and Section 104 of CERCLA, 42 U.S.C. § 9604, Settling Defendant has reimbursed the United States for response costs incurred in connection with overseeing and reviewing the conduct of the RI/FS for the Site. The parties have agreed that no reimbursement is due the United States for response costs incurred prior to entry of the September 30, 1986 Administrative Order.

66. Settling Defendant shall also reimburse the United States for all response costs incurred by the United States since the ROD for the Site was signed on September 29, 1988. EPA shall send Settling Defendant a demand for payment of such costs, together with an appropriate accounting of the costs claimed, on a quarterly or annual basis at EPA's discretion, provided, however, that response costs, if any, for the period September 29 and 30, 1988, shall be included in the accounting for fiscal year

("FY") 1990 or the first quarter thereof. Payment in the amount of the demand shall be made within thirty (30) days of Deere's receipt of each demand. All payments shall be made by certified check payable to the EPA Hazardous Substances Superfund. The checks and/or the transmittal letters shall reference the name of the Site, the Court, caption and civil action number of this case and the applicable Department of Justice case number (90-11-2-322) and shall be sent to:

Mellon Bank
Attention: Superfund Accounting
EPA Region VII (Comptroller Branch)
P.O. Box 360748M
Pittsburgh, Pennsylvania 15252

Copies of the check and the transmittal letter shall be sent to EPA and to the United States.

67. If the amount of the demand is not paid within thirty (30) days of its receipt, interest on the unpaid response costs shall accrue from the date of receipt by Deere of the demand for payment. Interest shall be at the rate determined annually by the Secretary of the Treasury for interest on investments of the Hazardous Substances Superfund, pursuant to Section 107(b) of CERCLA, 42 U.S.C. § 6907(b). The current interest rate, for the period October 1, 1988 through September 30, 1989, is 8.39 percent per annum. On October 1 of each succeeding fiscal year, any unpaid balance will begin accruing interest at the rate determined for that year by the Secretary of the Treasury. Interest on the unpaid balance of response costs will be compounded annually until such costs and accrued interest are

paid in full. Payments shall be applied first to any interest due and then to payment of principal.

68. Each demand for payment shall include an itemized statement of unreimbursed response costs incurred prior to the date of the demand, together with any interest due thereon. The statement shall include (a) the Department of Justice's costs, (b) EPA's payroll costs, including the names of the persons charging time to the Site, the pay period, the number of hours and the applicable salary and benefit amounts for such persons; (c) EPA's travel costs, including the names of the persons charging such travel and the applicable transportation, per diem and incidental costs; (d)EPA's contract costs, including a brief synopsis of actions completed, contractor estimate of dollar costs, actual dollar amounts, date(s) paid and invoice number(s) for such payments; and e) EPA's indirect costs, including the amount computed on the basis of direct labor hours.

69. The pendency of any dispute resolution proceeding relating to response costs pursuant to Section XVIII of this Decree shall not excuse Deere from making any payment required under this Section at the time such payment is due, nor shall it stay the accrual of interest on the total amount outstanding. If Deere is successful in the dispute resolution proceeding, however, payment(s) made and interest accrued during pendency of the proceeding shall be applied to reduce any outstanding response cost balance. If there is no outstanding balance, such

payments shall be credited toward the next payment required under this Section or, at EPA's option, may be refunded to Deere.

XVI. LIABILITY AND INSURANCE

70. The United States shall not be liable for any injuries or damages to persons or property resulting from any acts or omissions of Deere, its officers, employees, agents, receivers, trustees, successors, assigns, contractors or any other person acting on its behalf in carrying out any activities pursuant to the terms of this Decree. Deere shall not be liable for and does not assume liability for any injuries or damages to persons or property resulting from acts or omissions of the United States or any person acting by, through or under it or on its behalf in carrying out any activity under this Decree.

71. Deere and/or its contractors shall maintain insurance coverage in an amount sufficient to insure against all claims of injury and property damage caused to third parties arising from the remedial activities at the Site. In lieu of such coverage, Deere, at its option, may provide evidence of financial capacity sufficient for purposes of self-insurance pursuant to the requirements set forth in 40 C.F.R. Part 265, Subpart H.

72. Deere shall satisfy, or ensure that its contractors satisfy, all applicable laws and regulations regarding workers' compensation coverage for all persons performing work on its behalf in implementing this Decree. Prior to commencing on-Site work, Deere shall provide EPA with copies of the applicable insurance policies or other evidence of required coverage.

XVII. FORCE MAJEURE

73. "Force Majeure" is defined for purposes of this Decree as an event arising from causes entirely beyond the control of Settling Defendant or of any entity controlled by it, including its contractors and subcontractors, which delays or prevents performance of any obligation under this Decree and which Settling Defendant could not overcome by due diligence. "Force Majeure" events may include, but are not limited to, denial by applicable governmental agencies of any permit or authorization necessary to implement the remedial action required under this Decree, provided, however, that Deere has used its best efforts to obtain such permit or authorization on a timely basis. Force Majeure shall not include unanticipated or increased costs or expenses of any of the Work or changed financial circumstances of the Settling Defendant.

74. If circumstances occur which may delay or prevent completion of any phase of the work or timely achievement of any deadline or schedule under this Decree, Settling Defendant shall notify the RPM orally within twenty-four hours after it first becomes aware of such circumstances. Within five working days thereafter, it shall supply EPA with a written explanation of the cause(s) of the delay or noncompliance, the anticipated duration of the delay, the measures taken and to be taken to prevent or minimize the delay and the timetable for implementation of such measures. Failure to provide such timely oral and written notice

shall constitute a waiver of any claim of Force Majeure with respect to the circumstances in question.

75. If EPA agrees that the delay is or was caused by a Force Majeure event, the parties shall modify the Remedial Design (or the adversely affected plans or schedules in the Remedial Design) to provide such additional time as may be necessary to complete the specific phase or any succeeding phase of the work adversely affected by the delay. Such additional time shall correspond to the actual delay resulting from the Force Majeure event, including any unavoidable delay associated with restarting interrupted activities. In any dispute resolution proceeding regarding a delay in performance, Settling Defendant shall have the burden of proving that (1) the delay or noncompliance was caused by a Force Majeure event; and (2) the amount of additional time requested is necessary to compensate for that event.

XVIII. DISPUTE RESOLUTION

76. Any dispute which arises under or with respect to this Decree shall in the first instance be the subject of informal negotiations between the parties. The period for informal negotiations shall not exceed thirty days from the time Settling Defendant notifies EPA in writing of the existence of the dispute, unless such period is extended by agreement between the parties.

77. At the end of the 30 day informal negotiation period, EPA shall provide Settling Defendant with a written statement of its resolution of the disputed matter, which shall be binding

unless Settling Defendant, within ten (10) days after its receipt, invokes the administrative dispute resolution procedures in this Section. Such procedures shall be invoked by submission of a written notice to the Director of the Waste Management Division, EPA Region VII. Within ten days after submission of such notice, Settling Defendant shall submit a written statement of its position ("Statement of Position") on the matter in dispute to the Director of the Waste Management Division. The Statement of Position may include factual information, analysis or opinion supporting Settling Defendant's position and shall include all supporting documentation relied upon. Settling Defendant shall have the burden of coming forward with evidence and of persuasion on all factual issues. Within ten days after receipt of Settling Defendant's Statement of Position, EPA shall submit its Statement of Position. The administrative record shall include the Settling Defendant's notice invoking the dispute resolution procedure, the parties' Statements of Position and all supporting documentation.

78. Upon review of the administrative record, the Director of the Waste Management Division, EPA Region VII, shall issue a final determination resolving the dispute. This determination shall be "final administrative action", which shall be binding on the parties unless judicial review is sought pursuant to the following paragraph.

79. Any determination issued by the Director of the Waste Management Division pursuant to the preceding paragraphs of this

Section shall be reviewable by this Court, provided that a petition seeking such review is filed within twenty days of receipt of the determination. As to any dispute which relates to the adequacy of work performed or to be performed pursuant to this Decree, or to the adequacy or appropriateness of plans, procedures or other items relating to the work or otherwise requiring approval by EPA under this Decree, judicial review of the determination shall be on the administrative record and shall be upheld unless it is arbitrary and capricious or otherwise not in accordance with law. As to other disputes, nothing herein shall prevent the United States from arguing that the Court should apply the arbitrary and capricious standard to review of the administrative determination.

80. The dispute resolution procedures in this Section shall be the exclusive mechanism for resolving disputes arising under or related to this Consent Decree. The fact that dispute resolution is not specifically referenced in individual Sections of this Decree is not intended to and shall not bar Deere from invoking the procedures in this Section with respect to any disputed issue arising under the Decree.

81. Invocation of the procedures in this Section shall not extend or postpone any obligation, schedule or deadline of Deere under this Decree, provided, however, that stipulated penalties, if any, with respect to the disputed matter shall accrue but payment of such penalties shall be stayed pending resolution of the dispute. If final resolution of the dispute is in favor of

Deere, no stipulated penalties shall be payable. If Deere does not prevail on the disputed issue, stipulated penalties (which will have accrued from the first day of noncompliance) shall be paid as provided in Section XIX of this Decree, provided, however, that at the end of the dispute resolution process, the Court may adjust the stipulated penalties as the interests of justice may require.

XIX. STIPULATED PENALTIES

82. Subject to Sections XVII (Force Majeure) and XVIII (Dispute Resolution) of this Decree, Deere shall pay stipulated penalties as set forth below:

(a) Penalties related to timeliness of submittals. For failure to meet the deadlines set forth in Sections IX, XIII, XIV and XVI, Deere shall pay stipulated penalties in the following amounts for each day during which the delay continues:

Period of delay	Amount/Day
1st through 14th day	$500
15th through 30th day	$1000
31st day and beyond	$2000

For failure to meet the deadlines in Section V, including timelines in the Statement of Work (Appendix 3 hereto) and in the performance standards (Appendix 4) and in Section XI, Deere shall pay stipulated penalties in the following amounts for each day during which the delay or noncompliance continues:

Period of delay	Amount/Day
1st through 14th day	$1000
15th through 30th day	$2000
31st day and beyond	$4000

(b) Other penalties. For failure to make samples available to EPA as required under Section VII of this Decree, Déere shall pay a stipulated penalty of $2000 for each such sampling event. For failure to meet any other substantive requirement in this Consent Decree as to which there is no specific time requirement or which is not covered specifically in subsection (a) of this paragraph, Deere shall pay stipulated penalties in the amount set forth below:

Period of Failure to Comply	Amount/Day
1st through 14th day	$1500
15th through 30th day	$5000
31st day and beyond	$10,000

83. Stipulated penalties shall begin to accrue on the day after performance is due or noncompliance occurs and shall continue to accrue through the final day of correction of the noncompliance. Nothing herein shall prevent the simultaneous accrual of separate penalties for separate violations of this Decree.

84. All penalties due EPA under this Section shall be payable within thirty (30) days of receipt by Deere of notification of noncompliance from EPA or, if dispute resolution

is invoked, within thirty (30) days of receipt by Deere of the final administrative determination or order of the Court. Interest shall begin to accrue on the unpaid balance at the end of such thirty-day period, at the rate established by the Department of the Treasury under 31 U.S.C. § 3717. A handling charge will be assessed at the end of each thirty-day late period and a six percent (6%) per annum penalty will be assessed if the initial penalty is not paid within ninety days after it is due.

85. Stipulated penalties shall be paid by certified check(s) payable to the EPA Hazardous Substances Superfund, which shall be sent to:

Mellon Bank
Attention: Superfund Accounting
EPA Region VII (Comptroller Branch)
P.O. Box 360748M
Pittsburgh, Pennsylvania 15251

The check(s) and/or transmittal letters shall reference the name of the Site, the Court, caption and civil action number of this case, and the applicable Department of Justice case number (90-11-2-322), and shall indicate that the payment is on account of stipulated penalties. Copies of the check(s) and transmittal letter(s) shall be sent to the United States and to EPA.

86. The stipulated penalties set forth above shall be in addition to any other remedies, sanctions or penalties which may be available to the United States by reason of Settling Defendant's failure to comply with the requirements of this Decree.

XX. COVENANTS NOT TO SUE BY PLAINTIFF

87. Except as specifically provided in paragraphs 88 and 89 of this Section, the United States covenants not to sue or to take administrative action against Deere for any civil claims or causes of action with respect to the Site (as defined in paragraph 2 of this Decree) arising under Sections 106 and/or 107 of CERCLA, 42 U.S.C. § 9606 and 9607, and Section 3008(h) of RCRA, 42 U.S.C. § 6928(h). Except for future liability relating to additional response activities at the Site not identified in the ROD or the SOW, these covenants not to sue shall take effect upon certification of completion by EPA of all remedial action required by this Decree. Subject to the provisions in paragraphs 88 and 89, the United States also covenants not to sue or to take administrative action under Section 3008(h) of RCRA as long as Deere is in full compliance with the requirements of this Decree. Any covenant not to sue under Section 3008(h) of RCRA is limited to the geographic area defined as the Site in paragraph 2 of this Decree and specifically excludes any and all areas outside of the boundaries of the Site as so defined. The covenants not to sue in this paragraph extend to Deere only and to no other person.

88. (a) Pre-certification reservations. Notwithstanding any other provisions of this Decree, the United States reserves the right to institute proceedings in this action or in a new action seeking to compel Settling Defendant (1) to perform additional response work at the Site or (2) to reimburse the United States for response costs if, prior to EPA certification of completion

of the work, conditions at the Site previously unknown to the United States are discovered after entry of this Decree or information is received, in whole or in part after the entry of this Decree, and these previously unknown conditions or information indicates that the remedial action is not protective of human health and the environment.

(b) Post-certification reservations. Notwithstanding any other provision of this Decree, the United States reserves the right to institute proceedings in this action or in a new action seeking to compel Settling Defendant (1) to perform additional response actions at the Site or (2) to reimburse the United States for response costs if, subsequent to certification of completion of the work by EPA, conditions at the Site are discovered or information is received, in whole or in part after the certification of completion of the work, and these previously unknown conditions or information indicates that the remedial action is not protective of human health and the environment.

89. The covenants not to sue set forth above pertain only to claims or causes of action set forth in paragraph 87 hereof. The United States reserves all rights against Settling Defendant with respect to any other matters, including but not limited to:

(1) claims based on a failure by Settling Defendant to meet a requirement of this Consent Decree;

(2) liability arising from the past, present or future disposal, release or threat of release of hazardous

substances outside of and not attributable to the Site;

(3) liability for disposal of any hazardous substances taken from the Site;

(4) liability for damages for injury to, destruction of or loss of natural resources; and

(5) claims based on criminal liability.

XXI. COVENANTS BY SETTLING DEFENDANT

90. Settling Defendant covenants not to sue the United States for any claims related to or arising out of the work to be performed under this Decree, including, but not limited to, any direct or indirect claim for reimbursement under Section 106(b)(2) of CERCLA, 42 U.S.C. § 9606(b)(2). Nothing in this Decree shall be deemed to constitute preauthorization of a claim within the meaning of Section 111 of CERCLA, 42 U.S.C. § 9611, or 40 C.F.R. § 300.25(d).

91. Deere waives any defenses based on the doctrines of res judicata, collateral estoppel and/or claim splitting which it may have in this action or in any other proceeding by the United States for further remediation of environmental problems not covered by this Decree at the John Deere Dubuque Works.

XXII. ACCESS TO INFORMATION

92. Upon request, Settling Defendant shall provide to EPA all documents and information within its possession or control, or that of its contractors, agents or representatives, relating

to activities at or near the Site in implementation of this Decree, including, without limitation, sampling, analysis and chain of custody records, manifests, trucking logs, receipts, reports, correspondence and other documents related to remedial activities. Settling Defendant shall also make available to EPA its employees, contractors, agents, or representatives with knowledge of relevant facts concerning performance of the work, for purposes of investigation, information gathering or testimony.

93. Except as provided in the following paragraph, Settling Defendant may assert business confidentiality claims as to all or any part of any document submitted to EPA under this Decree, to the extent permitted by and in accordance with the procedures in Section 104(e)(7) of CERCLA, 42 U.S.C. §9604(e)(7), and 40 C.F.R. Part 2, Subpart B (§§ 2.201 et seq.) EPA reserves the right to challenge any such claim of confidentiality pursuant to the procedures in 40 C.F.R. Part 2, Subpart B. If no claim of confidentiality is asserted with respect to a specific document or information when it is submitted to EPA, the public may be given access to such documents or information without further notice to Settling Defendant. If Deere asserts a confidentiality claim for any document or information which is denied initially by EPA and Deere seeks review of such determination, such confidential status shall be maintained until completion of the review procedures provided in 40 C.F.R. Part 2, Subpart B.

94. No claim of confidentiality shall be made with respect to any sampling or analytical data or as to any information

specified in Section 104(e)(7)(F) of CERCLA, 42 U.S.C. § 9604(e)(7).

XXIII. RETENTION OF RECORDS

95. For six (6) years after EPA certification of completion of the work required by this Decree, Settling Defendant shall retain all records and documents in its possession or control that relate in any manner to the Site. Thereafter, Settling Defendant shall notify the United States at least ninety days prior to the destruction of any such records and, upon request, shall relinquish custody of the records to EPA.

96. Until certification of completion of the work, Settling Defendant shall preserve, and shall instruct its contractors and agents to preserve, all documents, records, and information relating to performance of the work required by this Decree. Upon certification of completion of the work, EPA may request Settling Defendant to deliver any or all such documents and records to EPA. EPA, in its discretion, may waive this requirement in whole or in part.

XXIV. NOTICES AND SUBMISSIONS

97. Whenever this Decree requires written notice to be given or a report, request for approval or other document to be sent by one party to another, it shall be directed to the individuals and addresses specified below, or to such other individuals as the parties may hereafter designate in writing:

As to the United States:

Chief, Environmental Enforcement Section
Land and Natural Resources Division
Department of Justice
10th & Pennsylvania Avenue, N.W.
Washington, D.C. 20530
Re: DOJ # 90-11-2-322

As to EPA:

Glenn Tucker, Remedial Project Manager
Waste Management Division
U.S. Environmental Protection Agency
Region VII
726 Minnesota Avenue
Kansas City, Kansas 66101

As to Deere & Company, Inc.:

George K. Hellert, Deere Project Coordinator
Production Engineering Services Department 976
John Deere Dubuque Works
John Deere Road
P.O. Box 538
Dubuque, Iowa 52004

XXV. EFFECTIVE AND TERMINATION DATES

98. This Decree shall be effective on the date it is entered by the Court.

99. Upon notice to the Court by EPA that it has certified the remedial work as complete and that Settling Defendant has satisfied all its obligations with respect to response costs and stipulated penalties, this Decree shall terminate on the motion of either party. Termination of this Decree shall not affect the covenants not to sue in Sections XX and XXI of this Decree.

XXVI. RETENTION OF JURISDICTION

100. This Court retains jurisdiction over the subject matter and the parties to this action for the purpose of issuing such

further orders or directions as may be necessary and appropriate to construe, implement, modify, enforce, terminate or reinstate the terms of this Consent Decree or for such further relief as the interests of justice may require.

XXVII. MODIFICATION

101. No modification shall be made to this Decree without written notice to and approval by the parties and the Court.

XXVIII. COMMUNITY RELATIONS

102. Settling Defendant shall cooperate with EPA in providing information to the public regarding the remedial action to be taken under this Decree. As requested by EPA, Settling Defendant shall participate in the preparation of such information and in public meetings which may be held or sponsored by EPA to explain activities at or relating to the Site.

XXIX. LODGING AND OPPORTUNITY FOR PUBLIC COMMENT

103. In accordance with Section 122(d)(2) of CERCLA, 42 U.S.C. § 9622(d)(2), and 28 C.F.R § 50.7, this Consent Decree shall be lodged with the Court for a period of not less than thirty (30) days for public notice and comment. Settling Defendant consents thereafter to the entry of the Decree without further notice. The United States reserves the right, under Section 122(d)(2), to withdraw or withhold its consent if such comments disclose facts or considerations which indicate that the proposed Decree is inappropriate, improper, or inadequate. In the event that the Decree as agreed to by Deere is modified before entry, (by reason of comments received during the public

comment period or by action of the Court), the provisions in paragraph 28 of this Decree governing extensions of time for submission of a revised Remedial Design shall apply.

XXX. SIGNATORIES

104. The undersigned representative of each party to this Consent Decree certifies that he or she is authorized to execute and legally bind such party to this Decree.

105. Settling Defendant has identified, on the attached signature page, the name and address of an agent who is authorized to accept service of process by mail on its behalf with respect to all matters arising under or relating to this Decree. Settling Defendant agrees to accept service in such manner and to waive the formal service requirements in Rule 4 of the Federal Rules of Civil Procedure and any applicable Local Rules of this Court.

SO ORDERED THIS 18th DAY OF December, 1989.

Copies mailed on DEC 18 1989
to counsel of record or pro se
parties as shown on the docket
sheet.
M. Hill
Deputy Clerk

David R. Hansen
United States District Judge

THE UNDERSIGNED PARTIES enter into this Consent Decree relating to the John Deere Dubuque Works Superfund Site and submit it to the Court for approval and entry.

FOR THE UNITED STATES OF AMERICA

Date: 10-15-89

RICHARD B. STEWART
Assistant Attorney General
Land and Natural Resources Division
U.S. Department of Justice
Washington, D.C.

MIRIAM L. CHESSLIN
Trial Attorney
Environmental Enforcement Section
Land and Natural Resources Division
U.S. Department of Justice
Post Office Box 7611, Ben
Franklin Station
Washington, D.C. 20044

Date: 9-21-89

MORRIS KAY
Regional Administrator
U.S. Environmental Protection
Agency
Region VII

9/13/89

GERHARDT BRAECKEL
Assistant Regional Counsel
U.S. Environmental Protection
Agency
Region VII

FOR DEERE & COMPANY, INC.

Date: 08 Sep 89

JAMES D. WHITE
Vice-President of Manufacturing,
Industrial Equipment Division

Agent authorized to accept service on behalf of Deere & Company, Inc.:

Name: Frank S. Cottrell

Title: Corporate Secretary

Address: Deere & Company
John Deere Road
Moline, Illinois 61265

PERFORMANCE STANDARDS FOR KEY ELEMENTS OF THE SELECTED REMEDY FOR THE JOHN DEERE DUBUQUE SITE

1. Develop an alternate potable water supply for the Site.

The alternate potable water supply for the plant, which is to be developed from the deep bedrock aquifer under the Site, shall comply with all applicable maximum contaminant levels ("MCL"s) established under Section 300g-1 of the Safe Drinking Water Act, 42 U.S.C. § 300g-1, and codified at 40 C.F.R. Part 141.

2. Continue to extract water from the alluvial aquifer under the Site, at rates which will maintain an inward gradient condition adequate to contain contaminants and prevent migration to private wells off-Site.

(a) Pumpage rate. Simulations performed during the RI/FS estimated that a minimum pumpage rate of 1.2 million gallons per day ("mgd") would maintain an inward gradient condition adequate to contain the contaminant plume in the alluvial groundwater beneath the Site. As part of the Remedial Design phase of the work, Deere shall review existing data and further analyze the hydrology beneath the Site to more accurately estimate the minimum pumping rate required to capture the contaminated groundwater flow. After EPA approval of the well management plan in the Remedial Design, any proposed change in the pumping and hydrological schemes not provided for in the well management plan, together with the simulation models and methods on which such proposed change(s) are based, shall be submitted to EPA for

review and approval, in accordance with the procedures in Section XI of this Decree.

(b) Maintenance and verification of hydraulic gradient.

As part of verification that contaminants are not migrating off-Site, a minimum of three piezometer pairs shall be utilized near the perimeter of the Site. On the southern perimeter, shallow monitoring wells 1 and 20 shall be used; on the eastern perimeter, shallow monitoring wells 5 and 6 shall be used and on the northern perimeter, shallow monitoring wells 10 and 11 shall be used. Other wells may be substituted for these well pairs or additional piezometer pairs may be installed, if necessary, with EPA approval.

Automated water level differential recorders shall be installed on each piezometric well pair (as described above) in the monitoring network. Subject to approval by EPA, either continuous recorders or electronic recorders may be used. In the event that digital (rather than analog) devices are used, each device shall provide measurements at least as frequent as one measurement each four hours. The measurement system must be capable of providing water level differentials accurate to at least 0.01 feet. Before commencement of the hydraulic monitoring specified in this paragraph, Deere shall submit a registered professional surveyor's report documenting the accuracy of its measurement capability to 0.01 feet. Deere shall operate the groundwater withdrawal system so that the groundwater elevation measured at the outer well of the piezometric pair is higher than

the groundwater elevation at the inner well for that pair. The water levels in monitoring wells 11 and 5 shall be at least 0.15 feet greater than the water levels in monitoring wells 10 and 6, respectively. The water level in monitoring well 20 shall be at least 0.10 feet greater than the water level in monitoring well 1. The difference in water levels at each well pair shall be calculated on a rolling annual average basis. The Mississippi River stage as it occurs adjacent to the Site shall be recorded on a normally scheduled working day basis accurate to within 0.1 feet. Deere shall submit water level measurements and substantiating calculations to EPA on a quarterly basis as part of the reporting required under Section IX of the Consent Decree. As an additional method to verify that contaminants are not migrating off-Site, water levels in shallow on-Site monitoring wells 1, 5, 6, 7, 8, 9, 10, 11, 13, 18, 19 and 20, PZ-7-86 and X-17 shall be measured and contour maps of water levels (in these monitoring wells and in the Mississippi and Little Maquoketa Rivers) shall be prepared and submitted to EPA as part of the quarterly reporting required under Section IX of the Consent Decree.

Monthly contour maps shall be prepared and submitted to EPA for a minimum of four quarters, beginning with the first quarterly report required after the effective date of the Decree. If after four quarters, the water levels in the three designated piezometer pairs indicate a consistent inward gradient, contour maps shall thereafter be prepared on a quarterly basis for the next two years. Preparation of monthly contour maps shall

resume, however, if Deere's pumping rates are adjusted to or below the minimum allowable rates defined in the EPA-approved well management plan. In such case, preparation and submittal of monthly contour maps shall continue until an inward gradient is demonstrated for four successive quarters. The contour mapping requirement shall be re-evaluated during the first periodic review conducted pursuant to Section VI of this Decree and shall be terminated or continued, as the case may be, on the basis of the data previously submitted.

(c) Monitoring performance of the withdrawal well system.

As part of the Remedial Design, Deere shall submit a groundwater monitoring and management plan to monitor performance of the withdrawal well system. The groundwater monitoring system shall comply with the general standards for such systems set forth at 40 C.F.R. § 264.97. The monitoring plan shall also include measurement of the hydrologic gradient, as described more fully above. Alluvial production wells PW-3, 4, 5 and 7, paired monitoring wells 9, 11, 13 and 20, monitoring wells 6, 7S, 8S, 12 and 16 and SBW-3 shall be sampled quarterly for the first year after the effective date of this Decree and annually thereafter for benzene, carbon tetrachloride, chloroform, copper, hexavalent chromium, 1,1-dichloroethane, 1,1-dichloroethene, 1,2-dichloroethene, ethylbenzene, lead, 1,1,2,2-tetrachloroethane, tetrachloroethene, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethene and xylene.

Pumpage for each production well shall be recorded on a normally scheduled working week basis using data from the totalizing meters or other EPA-approved measuring device. All water level, analytic and calibration data and reports generated in the course of operation and/or evaluation of the withdrawal well system shall be submitted to EPA on a quarterly basis, as set forth more fully in Section IX of the Consent Decree.

(d) Discharge of surface water from the Site.

Deere's current Iowa National Pollutant Discharge Elimination System ("NPDES") Permit #31-26-1-07 (EPA #IA 0000051), dated January 26, 1987, does not regulate all the constituents of concern listed in Table 1 hereto. Deere has requested the Iowa Department of Natural Resources ("IDNR") to issue a revised NPDES permit which addresses all of these constituents of concern for Outfalls 002, 005 and 011. In order to establish a database for the establishment of NPDES limitations for these constituents, Deere shall conduct a surface water discharge monitoring program for Outfalls 002, 005 and 011, in accordance with a monitoring plan and schedule which shall be submitted for approval by IDNR and by EPA prior to commencement of the program. The plan shall assure collection of representative discharge samples and shall provide for the recording of outfall flow data.

All samples collected pursuant to the approved monitoring plan shall be analyzed for the parameters of concern listed in Table 1, using the EPA test procedures for analysis of pollutants specified in 40 C.F.R. Part 136. The monitoring results shall be

submitted to IDNR and to EPA in accordance with the schedule in the approved monitoring plan.

In the event that Deere does not obtain a revised Iowa NPDES permit which addresses the constituents of concern for Outfalls 002, 005 and 011, EPA-established surface water discharge limits for the constituents listed in Table 1 (and the associated reporting and monitoring requirements) shall become effective one year from the date of entry of this Consent Decree and will be incorporated automatically into these performance standards. Such EPA-established limits will remain in effect until such time as a revised NPDES permit, which has been reviewed by EPA in accordance with the procedures in 40 C.F.R. § 123.44, is issued by IDNR. It is expressly understood and agreed, however, that Deere's current Iowa NPDES permit regulates the discharge of lead, copper and hexavalent chromium at Outfall 011 and that the existing limits for these metals shall remain in effect for Outfall 011 until such time as a revised permit is issued by IDNR.

EPA discharge limits for the constituents of concern will be based on the levels specified in the applicable State Water Quality Standards promulgated pursuant to Iowa Code §§ 455B.105 and 455B.173 or the National Ambient Water Quality Criteria issued pursuant to the Section 304(a) of the Clean Water Act, 33 U.S.C. § 1314(a), for human health fish consumption, whichever are more stringent. If fish consumption criteria are unavailable for any constituent, chronic aquatic life criteria will be used

for the constituent in question. If neither fish consumption nor aquatic life criteria are available for any constituent, Integrated Risk Information System ("IRIS") reference doses will be used (in conjunction with EPA-approved bioaccumulation factors and the assumption of a 70 kg. adult consuming 6.5 mg/day of fish) to calculate values for that constituent.

All EPA calculations will be performed in accordance with the equation and the definitions in Table 2, which are attached hereto. Background chemical data from the Mississippi and the Little Maquoketa Rivers will be used, as available. If no data are available, or if concentrations during the sampling period are determined to be "none detected," background concentrations of 0 mg/l will be used.

(e) Completion of the Work. Deere shall continue to extract alluvial groundwater until such time as the constituents in the water listed in Table 1 hereto are reduced to or below all applicable MCLs established under Section 300g-1 of the Safe Drinking Water Act, 42 U.S.C. § 300g-1, and codified at 40 C.F.R. § Part 141, or all applicable Iowa State groundwater remediation regulations, whichever are more stringent. The extraction requirement shall terminate and this aspect of the work shall be considered completed for purposes of certification pursuant to Section XVI of the Consent Decree when monitoring indicates that alluvial water quality beneath the Site has been at or below the relevant MCLs or Iowa groundwater remediation regulations for four consecutive quarters or if Deere demonstrates to EPA that

contaminant concentrations are below background levels. For constituents for which there is no MCL or State requirement, the sources listed below shall be used to identify completion levels. The sources shall be relied upon in descending order -- i.e., if the first source does not provide a level (or method of calculating a level) for the constituent, the second source shall be used, if the second source does not provide a level the third source shall be used, etc. The sources include: (1) proposed MCLs; (2) EPA Office of Drinking Water Lifetime Health Advisory Levels; (3) calculated requirements based on the Integrated Risk Information System (IRIS") verified reference dose or 10^{-6} cancer potency factor and ingestion of 2 liters of water per day by a 70 kg. adult; and (4) the EPA Office of Research and Development Health Effects Assessment Criteria.

3. Develop contingency plans to ensure that contaminants in the alluvial aquifer do not migrate off-Site in the event of plant shutdown or modifications which decrease pumpage rates.

The contingency plan shall ensure that the minimum pumpage rates and hydraulic gradient requirements established above are maintained and that all applicable monitoring and reporting requirements are adhered to in the event of plant shutdown, slowdown or process modifications which would otherwise decrease pumpage rates below the critical value which prevents off-Site migration of contaminants. The contingency plan shall also provide for additional treatment of alluvial groundwater, if necessary, to satisfy applicable Consent Decree and/or NPDES limitations on discharge.

4. Continue to extract non-aqueous phase liquid ("NAPL") from the alluvium and to separate the NAPL, with the groundwater effluent to be discharged through NPDES outflows and the remaining materials to be transported for off-Site management as a RCA hazardous waste, unless Deere demonstrates that alternative disposition measures meet all applicable or relevant and appropriate requiremens and EPA approves such alternative measures.

(a) NAPL Management. Deere shall continue to extract NAPL from the alluvium and to separate the NAPL from the groundwater, with the groundwater effluent to be discharged through NPDES outflows and the remaining materials to be transported for off-Site disposal as a RCRA hazardous waste, as provided for more specifically in the Remedial Design. It is understood and agreed, however, that Deere may propose alternative treatment, storage, use or disposal measures for the separated NAPL in a subsequent NAPL management plan, to be submitted to EPA for review and approval. Such plan shall include the results of a hazardous waste determination conducted by Deere pursuant to 40 C.F.R. § 262.11. Deere shall also demonstrate in the NAPL management plan that its proposed alternative disposition measure(s) meet the substantive technical requirements of all applicable or relevant and appropriate laws and regulations, notwithstanding the fact that no permit is required for on-Site disposition of the material pursuant to Section 121(e)(1) of CERCLA, 42 U.S.C. § 9621(e)(1). No alternative disposition of separated NAPL shall be undertaken unless and until EPA approves the NAPL management plan.

(b) Recordkeeping. Deere shall record the volume of NAPL and the volume of contaminated groundwater withdrawn on a

normally scheduled working week basis for each recovery well and shall include such information in the quarterly reports required under Section IX of the Consent Decree.

(c) Monitoring performance of the NAPL withdrawal system.

Deere shall sample and analyze groundwater at the Site for constituents associated with NAPL. Specifically, Deere shall sample monitoring wells SBW-3, 6, 7S, 8S, 12 and 13S and production wells 3, 4 and 5 for benzene, toluene, ethylbenzene, xylene, trichloroethylene quarterly for the first year after the effective date of this Decree and annually thereafter. This sampling and analysis may be conducted concurrently with the requirements in paragraph 2(c) hereof.

(d) Completion of the work. Deere shall continue NAPL monitoring and recovery operations until no more than 1/4 of an inch of NAPL is detected and verified in recovery well RW-3 and no more than 1/8 inch of NAPL is detected and verified in monitoring wells 4, 6, 7S, 8S, 12 and 13S and recovery wells 4, 5 and G-s. When 1/4 inch or less of NAPL at RW-3 and/or 1/8 inch or less of NAPL is detected at any other of the above listed wells, the well in question shall be purged of three well volumes and allowed to stabilize for 24 hours before a verification measurement is undertaken.

Before certifying completion of the NAPL phase of the work pursuant to Section XVI of the Consent Decree, Deere shall sample and analyze groundwater at the Site for benzene, toluene, ethylbenzene, trichloroethylene, xylene and total petroleum

hydrocarbons at the wells listed immediately above in this paragraph. The extraction and treatment requirements shall terminate and this aspect of the work shall be considered completed when monitoring and analysis indicate that the cleanup levels specified in paragraph 2(e) hereof are satisfied for benzene, toluene, xylene, ethylbenzene and trichloroethylene for four consecutive quarters.

TABLE 1

CONSTITUENTS OF CONCERN

Benzene

Carbon Tetrachloride

Chloroform

Hexavalent Chromium

Copper

1,1-Dichloroethane

1,1-Dichloroethene

1,2-Dichloroethene

Ethylbenzene

Lead

1,1,2,2-Tetrachloroethane

Tetrachloroethene

Toluene

1,1,1-Trichloroethane

1,1,2-Trichloroethane

Trichloroethene

Xylene

TABLE 2

WASTE ALLOCATION CALCULATIONS

EQUATION: $C_{outfall} = \frac{Ccv\ (Qoutfall + Qstream) - Cstream\ (Qstream)}{Qoutfall}$

where:

C_{cv} = Water Quality Criteria - Human Health, Fish Consumption, Iowa Water Quality Standard, Calculated Fish Consumption Values Based on IRIS Reference Doses

$Q_{outfall}$ = Average Outfall Flow on NPDES Permit

Q_{stream} = Mississippi = 1/100 7Q10
Little Maquoketa = 1/4 7Q10

C_{stream} = 0 mg/1

7Q10 - Mississippi = 12,730 cfs
Little Maquoketa = 7.4 cfs

$Q_{outfall\ 002}$ = 2.534 MGD

$Q_{outfall\ 005}$ = 9 MGD

$Q_{outfall\ 011}$ = 0.35 MGD

Assumed that flows from outfalls 005 and 011 discharged within the same mixing zone were considered as one discharge stream.

APPENDIX D

NPDES Permit

IOWA DEPARTMENT OF NATURAL RESOURCES

National Pollutant Discharge Elimination System (NPDES) Permit

PERMITTEE

JOHN DEERE DUBUQUE WORKS
18600 SOUTH JOHN DEERE ROAD
P.O. BOX 538
DUBUQUE, IA 52004

IDENTITY AND LOCATION OF FACILITY

JOHN DEERE DUBUQUE WORKS
Section 35, T 90N, R 2E
DUBUQUE County, Iowa

IOWA NPDES PERMIT NUMBER: 3126107

RECEIVING STREAM

LITTLE MAQUOKETA & MISSISSIPPI

DATE OF ISSUANCE: 09 03 1992

ROUTE OF FLOW

DATE OF EXPIRATION: 09 01 1997

YOU ARE REQUIRED TO FILE FOR RENEWAL OF THIS PERMIT BY: 03 05-1997

EPA NUMBER: IA0000051

This permit is issued pursuant to the authority of section 402(b) of the Clean Water Act (33 U.S.C 1342(b)), Iowa Code section 455B.171, and rule 567--64.3, Iowa Administrative Code. You are authorized to operate the disposal system and to discharge the pollutants specified in this permit in accordance with the effluent limitations, monitoring requirements and other terms set forth in this permit.

You may appeal any conditions of this permit by filing a written notice of appeal and request for administrative hearing with the director of this department within 30 days of your receipt of this permit.

Any existing, unexpired Iowa operation permit or Iowa NPDES permit previously issued by the department for the facility identified above is revoked by the issuance of this Iowa NPDES operation permit.

FOR THE DEPARTMENT OF NATURAL RESOURCES

Larry J. Wilson, Director

By

Wayne Farrand, Supervisor
Wastewater Permits Section
ENVIRONMENTAL PROTECTION DIVISION

Permit Number: 3126107

Outfall Number	Description
002	NONCONTACT COOLING WATER, DRINKING FOUNTAIN DRAINS AND STORM WATER DISCHARGE THROUGH THE NORTH SEDIMENTATION POND WHICH IS EQUIPPED WITH AN OIL SKIMMER.
003	TREATED DOMESTIC WASTEWATER FROM AN EXTENDED AERATION TREATMENT PLANT WITH POLISHING POND.
004	CONDENSER COOLING WATER FROM ELECTRICAL GENERATOR
005	NON-CONTACT COOLING WATER,DRINKING FOUNTAIN DRAINS AND STORM WATER DISCHARGE THROUGH THE SOUTH SEDIMENTATION POND WHICH IS EQUIPPED WITH AN OIL SKIMMER.
006	BUILDINGS W-3,4,5 AND C-26,27 STORM WATER ONLY DISCHARGE.
008	DISCHARGE CONSISTS OF TRACTOR WASH BOOTH DRAIN, OPTIONAL LANDFILL LEACHATE WHEN RECIRCULATION IS NOT VIABLE AND STORM WATER DISCHARGE THRU A SEDIMINTATION POND
009	BUILDING V STORM WATER ONLY DISCHARGE.
010	DRINKING FOUNTAIN DRAINS AND BUILDING W-6 STORM WATER DISCHARGE.
011	WASTEWATER FROM A PHYSICAL CHEMICAL AND BIOLOGICAL TREATMENT PLANT WHICH TREATS ALL PROCESS WASTEWATER FROM THE FACILITY
014	NORTH END AREA STORM WATER ONLY DISCHARGE FROM A PALLET RECLAIM AND SCRAP SALVAGE AREA
015	NORTH V-LOT STORM WATER ONLY DISCHARGE FROM A PARTS STORAGE YARD.
016	NORTH V-LOT AREA STORM WATER ONLY DISCHARGE FROM A TRACTOR STORAGE YARD.
017	RINGLE YARD AREA STORM WATER ONLY DISCHARGE FROM A TRACTOR STORAGE AND SHIPPING YARD.
018	CENTER V-LOT STORM WATER ONLY DISCHARGE FROM A TRACTOR STORAGE YARD.
019	SOUTH V-LOT STORM WATER ONLY DISCHARGE FROM A TRACTOR STORAGE YARD.
020	SOUTH TRUCK GATE STORM WATER ONLY DISCHARGE FROM VEHICLE PARKING AREAS.
021	BUILDING W-18 STORM WATER ONLY DISCHARGE
027	W-18 ACCESS ROAD STORM WATER ONLY DISCHARGE.

Effluent Limitations

Permit Number: 3105107

OUTFALL NO.: 002 NONCONTACT COOLING WATER, DRINKING FOUNTAIN DRAINS AND STORM WATER DISCHARGE THROUGH THE NORTH SEDIMENTATION POND

You are prohibited from discharging pollutants except in compliance with the following effluent limitations

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		2.5340	3.8000	MGD				
PH - MINIMUM - MAXIMUM	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
OIL AND GREASE	YEARLY	FINAL		10.0000	15.0000	MG/L		211.00	317.00	LBS/DAY
TEMPERATURE	YEARLY	FINAL			95.0000	FAREN-EIT				

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 003 TREATED DOMESTIC WASTEWATER FROM AN EXTENDED AERATION TREATMENT PLANT WITH POLISHING POND.

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		.2000	.2400	MGD				
BIOCHEMICAL OXYGEN DEMAND (BOD5)	YEARLY	FINAL		30.0000	45.0000	MG/L		50.00	75.00	LBS/DAY
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL		30.0000	45.0000	MG/L		50.00	75.00	LBS/DAY
PH - MINIMUM - MAXIMUM	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
CHLORINE, TOTAL RESIDUAL	YEARLY	FINAL		.0930	.1700	MG/L		.07	.10	LBS/DAY
COLIFORM FECAL	SUMMER	FINAL			20.7000	#/100				
TEMPERATURE	YEARLY	FINAL			95.0000	FAHRENHEIT				

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 004 CONDENSER COOLING WATER FROM ELECTRICAL GENERATOR.

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

		EFFLUENT LIMITATIONS							
		Concentration				Mass			
Wastewater Parameter	Season Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY FINAL		21.0000	23.0000	MGD				
PH (MINIMUM - MAXIMUM)	YEARLY FINAL	6.0000		10.0000	STD UNITS				
CHLORINE, TOTAL RESIDUAL	YEARLY FINAL			.2000	MG/L				

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Effluent Limitations

Permit Number: 3125[illegible]

OUTFALL NO.: 005 NON-CONTACT COOLING WATER,DRINKING FOUNTAIN DRAINS AND STORM WATER DISCHARGE THROUGH THE SOUTH SEDIMENTATION POND

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		9.0000	13.5000	MGD				
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
OIL AND GREASE	YEARLY	FINAL		10.0000	15.0000	MG/L		75.00	126.00	185.04
TEMPERATURE	YEARLY	FINAL			85.0000	FAHRENHEIT				

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31

Permit Number: 3126107

Effluent Limitations

OUTFALL NO.: 008 DISCHARGE CONSISTS OF TRACTOR WASH BOOTH DRAIN, OPTIONAL LANDFILL LEACHATE WHEN RECIRCULATION IS NOT VIABLE AND

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		.0450	.1350	MGD				
AMMONIA NITROGEN (N)	JAN	FINAL		41.0000	62.0000	MG/L		14.00	21.00	LBS/DAY
AMMONIA NITROGEN (N)	FEB	FINAL		41.0000	62.0000	MG/L		14.00	21.00	LBS/DAY
AMMONIA NITROGEN (N)	MAR	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	APR	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	MAY	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	JUN	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	JUL	FINAL		15.0000	22.0000	MG/L		4.90	7.40	LBS/DAY
AMMONIA NITROGEN (N)	AUG	FINAL		15.0000	22.0000	MG/L		4.90	7.40	LBS/DAY
AMMONIA NITROGEN (N)	SEP	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	OCT	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	NOV	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	DEC	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
CADMIUM,TOTAL (AS CD)	YEARLY	FINAL		.0700	.1310	MG/L		.10	.15	LBS/DAY
CHROMIUM,HEXAVALENT (AS CR)	YEARLY	FINAL		.1600	.2300	MG/L		.09	.13	LBS/DAY
COPPER,TOTAL (AS CU)	YEARLY	FINAL		.1500	.2200	MG/L		.06	.12	LBS/DAY
LEAD,TOTAL (AS PB)	YEARLY	FINAL		.5200	.7900	MG/L		.22	.33	LBS/DAY
TEMPERATURE	YEARLY	FINAL			95.0000	FAREN-EIT				
ZINC,TOTAL (AS ZN)	YEARLY	FINAL		1.3100	1.9600	MG/L		.71	1.06	LBS/DAY

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Permit Number: 3126107

Effluent Limitations

OUTFALL NO.: 011 WASTEWATER FROM A PHYSICAL CHEMICAL AND BIOLOGICAL TREATMENT PLANT WHICH TREATS ALL PROCESS WASTEWATER FROM THE

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		.3500	.4000	MGD				
BIOCHEMICAL OXYGEN DEMAND (BOD5)	YEARLY	FINAL		30.0000	45.0000	MG/L		88.00	131.00	LBS/DAY
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL		31.0000	60.0000	MG/L		91.00	175.00	LBS/DAY
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
CADMIUM,TOTAL (AS CD)	YEARLY	FINAL		.2600	.5100	MG/L		.76	1.49	LBS/DAY
CHROMIUM,HEXAVALENT (AS CR	YEARLY	FINAL		.2700	.4100	MG/L		.82	1.20	LBS/DAY
CHROMIUM,TOTAL (AS CR	YEARLY	FINAL		1.7100	2.7700	MG/L		5.00	8.00	LBS/DAY
COPPER,TOTAL (AS CU)	YEARLY	FINAL		.6300	.9400	MG/L		1.83	2.73	LBS/DAY
CYANIDE,TOTAL (AS CN)	YEARLY	FINAL		.2000	.3000	MG/L		.58	.88	LBS/DAY
LEAD,TOTAL (AS PB)	YEARLY	FINAL		.4300	.6900	MG/L		1.26	2.00	LBS/DAY
NICKEL,TOTAL (AS NI)	YEARLY	FINAL		2.3800	3.9800	MG/L		7.00	11.62	LBS/DAY
OIL AND GREASE	YEARLY	FINAL		26.0000	52.0000	MG/L		76.00	152.00	LBS/DAY
SILVER,TOTAL (AS AG)	YEARLY	FINAL		.2400	.4300	MG/L		.70	1.26	LBS/DAY
TEMPERATURE	YEARLY	FINAL			95.0000	FAREN-EIT				
TOTAL TOXIC ORGANICS	YEARLY	FINAL			2.1300	MG/L			6.00	LBS/DAY
ZINC,TOTAL (AS ZN)	YEARLY	FINAL		1.4800	2.6100	MG/L		4.32	7.62	LBS/DAY

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Non-Standard Effluent Limitations

Permit Number: 3126-07

OUTFALL NO.: 002 NONCONTACT COOLING WATER, DRINKING FOUNTAIN DRAINS AND STORM WATER DISCHARGE THROUGH THE NORTH SEDIMENTATION POND

Wastewater Parameter	Non-Standard Limits
ACUTE TOXICITY, CERIODAPHNIA	EFFLUENT TOXICITY - NO POSITIVE TOXICITY RESULTS
ACUTE TOXICITY, PIMEPHALES	EFFLUENT TOXICITY - NO POSITIVE TOXICITY RESULTS.

Non-Standard Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 004 CONDENSER COOLING WATER FROM ELECTRICAL GENERATOR.

Waste-water Parameter	Non-Standard Limits
TEMPERATURE	THE MAXIMUM INCREASE IN TEMPERATURE SHALL NOT EXCEED 5.4 DEGREES C.

Non-Standard Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 005 NON-CONTACT COOLING WATER,DRINKING FOUNTAIN DRAINS AND STORM WATER DISCHARGE THROUGH THE SOUTH SEDIMENTATION PON

Wastewater Parameter	Non-Standard Limits
ACUTE TOXICITY, CERIODAPHNIA	EFFLUENT TOXICITY - NO POSITIVE TOXICITY RESULTS.
ACUTE TOXICITY, PIMEPHALES	EFFLUENT TOXICITY - NO POSITIVE TOXICITY RESULTS.

Non-Standard Effluent Limitations

Permit Number: 3'26'07

OUTFALL NO.: 011 WASTEWATER FROM A PHYSICAL CHEMICAL AND BIOLOGICAL TREATMENT PLANT WHICH TREATS ALL PROCESS WASTEWATER FROM THE

Wastewater Parameter	Non-Standard Limits
BIOCHEMICAL OXYGEN DEMAND (BOD5)	THE BIOLOGICAL PORTION OF THE TREATMENT SYSTEM THAT CONTRIBUTES WASTEWATER TO THIS OUTFALL WAS APPROVED WITHOUT DUPLICATE UNITS, BASED ON JOHN DEERE'S ASSURANCE THAT OTHER PROCESSES INCLUDING FILTERS, STORAGE TANKS AND HAULING TO OTHER SITES ARE AVAILABLE AND WILL PROVIDE EQUIVALENT TREATMENT RELIABILITY. ACCEPTABLE RELIABILITY WILL DEPEND ON THE CONTINUED AVAILABILITY OF THOSE PROCESSES INTO THE FUTURE AND ON THE GOOD FAITH EFFORTS OF OPERATING PERSONNEL TO IMPLEMENT THEM AS NECESSARY. FAILURE OF ANY TREATMENT UNIT WILL NOT BE CONSIDERED A VALID REASON FOR VIOLATING EFFLUENT STANDARDS.
ACUTE TOXICITY, CERIODAPHNIA	EFFLUENT TOXICITY - NO POSITIVE TOXICITY RESULTS
ACUTE TOXICITY, PIMEPHALES	EFFLUENT TOXICITY - NO POSITIVE TOXICITY RESULTS

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or Table VII of Chapter 63 of the rules, or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
002	FLOW	5/WEEK	24 HR TOTAL	FINAL EFFLUENT
002	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
002	OIL AND GREASE	1/WEEK	GRAB	FINAL EFFLUENT
002	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT
002	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
002	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
002	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
003	FLOW	7/WEEK	24 HR TOTAL	RAW WASTE OR FINAL EFFLUENT(FLOW)
003	BIOCHEMICAL OXYGEN DEMAND (BOD5)	1/WEEK	24 HR COMP	RAW WASTE
003	BIOCHEMICAL OXYGEN DEMAND (BOD5)	1/WEEK	24 HR COMP	FINAL EFFLUENT
003	TOTAL SUSPENDED SOLIDS	1/MONTH	24 HR COMP	RAW WASTE
003	TOTAL SUSPENDED SOLIDS	1/MONTH	24 HR COMP	FINAL EFFLUENT
003	AMMONIA NITROGEN (N)	1/3 MONTHS	24 HR COMP	FINAL EFFLUENT
003	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	RAW WASTE
003	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
003	CHLORINE,TOTAL RESIDUAL	2/WEEK	GRAB	EFFLUENT AFTER DISINFECTION WHEN CHLORINE IS USED
003	COLIFORM,FECAL	1/3 MONTH	GRAB	EFFLUENT AFTER DISINFECTION - APRIL 1 TO OCTOBER 31 ONLY.
003	DISSOLVED OXYGEN (MINIMUM - MAXIMUM)	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	SOLIDS,MIXED LIQUOR SUSPENDED	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	TEMPERATURE	1/WEEK	GRAB	RAW WASTE
003	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or Table VII of Chapter 63 of the rules, or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
003	TEMPERATURE	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	30-MINUTE SETTLEABILITY	2/WEEK	GRAB	AERATION BASIN CONTENTS
004	FLOW	1/MONTH	24 HR TOTAL	FINAL EFFLUENT
004	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT
004	CHLORINE,TOTAL RESIDUAL	1/BATCH	GRAB	CONDENSER OUTLET #2.
004	CHLORINE,TOTAL RESIDUAL	1/BATCH	GRAB	CONDENSER OUTLET # 4.
004	TEMPERATURE	1/MONTH	GRAB	FINAL EFFLUENT
004	TEMPERATURE	1/MONTH	GRAB	RIVER INTAKE UPSTREAM OF ACTUAL INTAKE BEYOND INFLUENCE OF RE-CIRCULATED WATER.
005	FLOW	5/WEEK	24 HR TOTAL	FINAL EFFLUENT
005	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
005	OIL AND GREASE	1/WEEK	GRAB	FINAL EFFLUENT
005	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT
005	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
005	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
005	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
006	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
008	FLOW	1/MONTH	24 HR TOTAL	FINAL EFFLUENT
008	AMMONIA NITROGEN (N)	1/3 MONTH	GRAB	FINAL EFFLUENT
008	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT
008	CADMIUM,TOTAL (AS CD)	1/MONTH	GRAB	FINAL EFFLUENT
008	CHROMIUM,HEXAVALENT (AS CR)	1/MONTH	GRAB	FINAL EFFLUENT

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or Table VII of Chapter 63 of the rules, or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD)

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
008	COPPER, TOTAL (AS CU)	1/MONTH	GRAB	FINAL EFFLUENT
008	LEAD, TOTAL (AS PB)	1/MONTH	GRAB	FINAL EFFLUENT
008	TEMPERATURE	1/MONTH	GRAB	FINAL EFFLUENT
008	ZINC, TOTAL (AS ZN)	1/MONTH	GRAB	FINAL EFFLUENT
008	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
009	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
010	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
011	FLOW	7/WEEK	24 HR TOTAL	FINAL EFFLUENT
011	BIOCHEMICAL OXYGEN DEMAND (BOD5)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	TOTAL SUSPENDED SOLIDS	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	PH (MINIMUM - MAXIMUM)	2/WEEK	GRAB	FINAL EFFLUENT
011	CADMIUM, TOTAL (AS CD)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	CHROMIUM, HEXAVALENT (AS CR)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	CHROMIUM, TOTAL (AS CR)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	COPPER, TOTAL (AS CU)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	CYANIDE, TOTAL (AS CN)	1/6 MONTH	GRAB	FINAL EFFLUENT
011	LEAD, TOTAL (AS PB)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	NICKEL, TOTAL (AS NI)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	OIL AND GREASE	2/WEEK	GRAB	FINAL EFFLUENT
011	SILVER, TOTAL (AS AG)	1/6 MONTH	24 HR COMP	FINAL EFFLUENT
011	TEMPERATURE	2/WEEK	GRAB	FINAL EFFLUENT

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or Table VII of Chapter 63 of the rules, or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD)

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Waste-water Parameter	Sample Frequency	Sample Type	Monitoring Location
011	TOTAL TOXIC ORGANICS	1/6 MONTH	GRAB	FINAL EFFLUENT
011	ZINC, TOTAL (AS ZN)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	BENZENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	ETHYLBENZENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1,2 TRICHLOROETHANE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1-DICHLOROETHENE(1,1-DICHLOROETHYLEN	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1-DICHLOROETHANE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,2-DICHLOROETHENE(1,2-DICHLOROETHYLEN	1/6 MONTH	GRAB	FINAL EFFLUENT
011	CHLOROFORM	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1,1-TRICHLOROETHANE(METHYL CHLOROFOR	1/6 MONTH	GRAB	FINAL EFFLUENT
011	CARBON TETRACHLORIDE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1,2,2,-TETRACHLOROETHANE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TRICHLOROETHENE(TRICHLOROETHYLENE)	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TETRACHLOROETHENE(TETRACHLOROETHYLENE)	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TOLUENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	XYLENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
011	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
014	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
015	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
016	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT

Permit Number: 3126107

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or Table VII of Chapter 63 of the rules, or other methods approved in writing by the department, shall be utilized.

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(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
017	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
018	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
019	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
020	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
021	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
027	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT

Permit Number: 3126107 Special Monitoring Requirements

ANTENNACRAFT

Outfall Number	Description
002	STORMWATER

SEE THE ATTACHED STORM WATER DISCHARGE REQUIREMENTS FOR ADDITIONAL MONITORING FOR THE FOLLOWING OUTFALLS:

002, 005, 006, 008, 009, 014, 015, 014, 015, 016, 017, 018, 019, 020, 021, AND 027.

004 CHLORINE, TOTAL RESIDUAL

SAMPLES SHALL BE COLLECTED AT THE CONDENSER DISCHARGE BEFORE MIXING WITH OTHER WASTESTREAMS. SAMPLES NEED TO BE COLLECTED ONLY ON DAYS THAT THE CONDENSER IS CHLORINATED.

011 TOTAL TOXIC ORGANICS

TOTAL TOXIC ORGANICS POLLUTANTS SHALL BE LIMITED ONLY TO THE FOLLOWING PARAMETERS:

1,1 DCE	1,1,2-TRICHLOROETHANE
1,1 DCA	BENZENE
T-1,2-DCE	TETRACHLOROETHENE
CHLOROFORM	1,1,2,2-TETRACHLOROETHANE
1,1,1-TCA	TOLUENE
CARBON TET.	ETHYLBENZENE
TCE	XYLENE

MONITORING AND REPORTING REQUIREMENTS FOR CONTINUOUS DISCHARGE - continued

Compliance with the temperature limitations for Outfall 004, which prohibits the discharge of water which would increase the ambient stream temperature by more than 3°C (5.4°F), shall be determined using the following formula for calculating temperature increase:

$$T = \frac{(D)}{Q} \times (T_d - T_q)$$

Where:

T = temperature increase across mixing zone

T_d = temperature of discharge (°F)

T_q = temperature of river at intake (°F)

D = discharge flow (mgd)

Q = mixing zone flow (82.3 mgd)

The temperature of the river at intake (T_q) shall be measured upstream of the actual intake at a point beyond the influence of re-circulated water flow.

WF:MS:pla/90-27.10

Facility Name: John Deere Dubuque Works
Permit Number: 31-26-1-07

Ceriodaphnia and Pimephales Toxicity Effluent Testing

1. The initial toxicity tests at Outfalls #002, #005 and #011 shall be conducted within three (3) months of permit issuance and at least annually thereafter.

2. Effluent toxicity testing procedures used to demonstrate compliance with permit limits shall be those listed in the Standard Operating Procedure: Effluent Toxicity Testing, Iowa Department of Natural Resources, March 1991, and Chapters 567-60.2 and 567-63.4(2), Iowa Administrative Code.

3. The diluted effluent samples must contain a minimum of the following percentages of effluent and no more than the following percentages of culture water:

Outfall	Effluent Water	Culture Water
002	84.5%	15.5%
005	76.8%	23.2%
011	4.0%	96.0%

4. One valid positive toxicity result will require quarterly testing for effluent toxicity.

5. Two successive valid positive toxicity results or three positive results out of five successive valid effluent toxicity tests will require a toxic reduction evaluation to be completed to eliminate the toxicity.

6. Toxicity testing results shall be reported on DNR Form 542-1381 and submitted to the DNR field office when the monthly operating report is submitted.

Definition: **"Positive toxicity result"** means a statistical difference of mortality rate between the control and the diluted effluent sample. For more information see Standard Operating Procedure: Effluent Toxicity Testing, Iowa Department of Natural Resources and Chapters 567-60.2 and 567-63.4, Iowa Administrative Code.

RECORD COPY

File Name: John Deere Dubuque Works

Series: Iowa 31-26-1-07

STATE OF IOWA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROGRAM
AMENDMENT TO NPDES PERMIT

Iowa NPDES Permit No: 31-26-1-07
Date of Issuance: September 3, 1992
Date of Expiration: September 1, 1997
Date of this Amendment: November 25, 1992

EPA NUMBER: IA0000051

Name and Mailing Address of Applicant:

John Deere Dubuque Works
P.O. Box 538
Dubuque, IA 52004

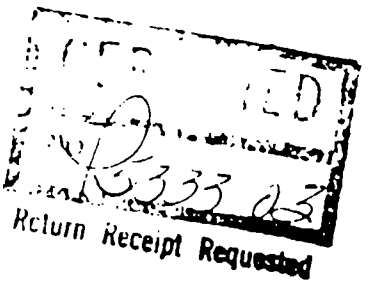
Identity and Location of Facility:

John Deere Dubuque Works
Section 35, T90N, R2E, Dubuque County, Iowa

Pursuant to the authority of Iowa Code Section 455B.174, and of Rule 567--64.3, Iowa Administrative Code, the Director of the Iowa Department of Natural Resources has issued the above referenced permit. Pursuant to the same authority the Director hereby amends said permit as set forth below:

Effluent limitations for Outfall 008 shall be revised. Replace page 13 through page 18 with the attached replacement pages.

For the Department of Natural Resources:



Larry J. Wilson, Director

By _____
Wayne Farrand, Supervisor
Wastewater Permits Section

ENVIRONMENTAL PROTECTION DIVISION

(WF:bkp/WWPM329P01.01)

Effluent Limitations

Permit Number: 3126107

OUTFALL NO.: 008 DISCHARGE CONSISTS OF TRACTOR WASH BOOTH DRAIN, OPTIONAL LANDFILL LEACHATE WHEN RECIRCULATION IS NOT VIABLE AND

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

			EFFLUENT LIMITATIONS							
			Concentration				Mass			
Wastewater Parameter	Season	Type	7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		.0450	.1350	MGD				
AMMONIA NITROGEN (N)	JAN	FINAL		41.0000	62.0000	MG/L		14.00	21.00	LBS/DAY
AMMONIA NITROGEN (N)	FEB	FINAL		41.0000	62.0000	MG/L		14.00	21.00	LBS/DAY
AMMONIA NITROGEN (N)	MAR	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	APR	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	MAY	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	JUN	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	JUL	FINAL		15.0000	22.0000	MG/L		4.90	7.40	LBS/DAY
AMMONIA NITROGEN (N)	AUG	FINAL		15.0000	22.0000	MG/L		4.90	7.40	LBS/DAY
AMMONIA NITROGEN (N)	SEP	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	OCT	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	NOV	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
AMMONIA NITROGEN (N)	DEC	FINAL		15.0000	22.0000	MG/L		5.10	7.60	LBS/DAY
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
CADMIUM,TOTAL (AS CD)	YEARLY	FINAL		.2400	.3500	MG/L		.08	.12	LBS/DAY
CHROMIUM,HEXAVALENT (AS CR)	YEARLY	FINAL		.1900	.2800	MG/L		.06	.10	LBS/DAY
COPPER,TOTAL (AS CU)	YEARLY	FINAL		.1800	.2700	MG/L		.06	.09	LBS/DAY
LEAD,TOTAL (AS PB)	YEARLY	FINAL		.6300	.9500	MG/L		.21	.32	LBS/DAY
TEMPERATURE	YEARLY	FINAL			95.0000	FARENHEIT				
ZINC,TOTAL (AS ZN)	YEARLY	FINAL		1.5000	2.3000	MG/L		.53	.80	LBS/DAY

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Permit Number: 3126107

Monitoring and Reporting Requirements

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Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
002	FLOW	5/WEEK	24 HR TOTAL	FINAL EFFLUENT
002	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
002	OIL AND GREASE	1/WEEK	GRAB	FINAL EFFLUENT
002	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT
002	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
002	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
002	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
003	FLOW	7/WEEK	24 HR TOTAL	RAW WASTE OR FINAL EFFLUENT(FLOW)
003	BIOCHEMICAL OXYGEN DEMAND (BOD5)	1/WEEK	24 HR COMP	RAW WASTE
003	BIOCHEMICAL OXYGEN DEMAND (BOD5)	1/WEEK	24 HR COMP	FINAL EFFLUENT
003	TOTAL SUSPENDED SOLIDS	1/MONTH	24 HR COMP	RAW WASTE
003	TOTAL SUSPENDED SOLIDS	1/MONTH	24 HR COMP	FINAL EFFLUENT
003	AMMONIA NITROGEN (N)	1/3 MONTH	24 HR COMP	FINAL EFFLUENT
003	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	RAW WASTE
003	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
003	CHLORINE,TOTAL RESIDUAL	2/WEEK	GRAB	EFFLUENT AFTER DISINFECTION WHEN CHLORINE IS USED.
003	COLIFORM,FECAL	1/3 MONTH	GRAB	EFFLUENT AFTER DISINFECTION - APRIL 1 TO OCTOBER 31 ONLY.
003	DISSOLVED OXYGEN (MINIMUM - MAXIMUM)	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	SOLIDS,MIXED LIQUOR SUSPENDED	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	TEMPERATURE	1/WEEK	GRAB	RAW WASTE
003	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT

Monitoring and Reporting Requirements

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(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day, following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
003	TEMPERATURE	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	30-MINUTE SETTLEABILITY	2/WEEK	GRAB	AERATION BASIN CONTENTS
004	FLOW	1/MONTH	24 HR TOTAL	FINAL EFFLUENT
004	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT
004	CHLORINE,TOTAL RESIDUAL	1/BATCH	GRAB	CONDENSER OUTLET #2.
004	CHLORINE,TOTAL RESIDUAL	1/BATCH	GRAB	CONDENSER OUTLET # 4.
004	TEMPERATURE	1/MONTH	GRAB	FINAL EFFLUENT
004	TEMPERATURE	1/MONTH	GRAB	RIVER INTAKE UPSTREAM OF ACTUAL INTAKE BEYOND INFLUENCE OF RE-CIRCULATED WATER.
005	FLOW	5/WEEK	24 HR TOTAL	FINAL EFFLUENT
005	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
005	OIL AND GREASE	1/WEEK	GRAB	FINAL EFFLUENT
005	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT
005	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
005	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
005	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
006	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
008	FLOW	1/MONTH	24 HR TOTAL	FINAL EFFLUENT
008	AMMONIA NITROGEN (N)	1/3 MONTH	GRAB	FINAL EFFLUENT
008	PH (MINIMUM - MAXIMUM)	1/MONTH	GRAB	FINAL EFFLUENT
008	CADMIUM,TOTAL (AS CD)	1/MONTH	GRAB	FINAL EFFLUENT
008	CHROMIUM,HEXAVALENT (AS CR)	1/MONTH	GRAB	FINAL EFFLUENT

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

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Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
009	COPPER,TOTAL (AS CU)	1/MONTH	GRAB	FINAL EFFLUENT
008	LEAD,TOTAL (AS PB)	1/MONTH	GRAB	FINAL EFFLUENT
009	TEMPERATURE	1/MONTH	GRAB	FINAL EFFLUENT
008	ZINC,TOTAL (AS ZN)	1/MONTH	GRAB	FINAL EFFLUENT
008	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
009	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
010	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
011	FLOW	7/WEEK	24 HR TOTAL	FINAL EFFLUENT
011	BIOCHEMICAL OXYGEN DEMAND (BOD5)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	TOTAL SUSPENDED SOLIDS	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	PH (MINIMUM - MAXIMUM)	2/WEEK	GRAB	FINAL EFFLUENT
011	CADMIUM,TOTAL (AS CD)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	CHROMIUM,HEXAVALENT (AS CR)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	CHROMIUM,TOTAL (AS CR)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	COPPER,TOTAL (AS CU)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	CYANIDE,TOTAL (AS CN)	1/6 MONTH	GRAB	FINAL EFFLUENT
011	LEAD,TOTAL (AS PB)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	NICKEL,TOTAL (AS NI)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	OIL AND GREASE	2/WEEK	GRAB	FINAL EFFLUENT
011	SILVER,TOTAL (AS AG)	1/6 MONTH	24 HR COMP	FINAL EFFLUENT
011	TEMPERATURE	2/WEEK	GRAB	FINAL EFFLUENT

Monitoring and Reporting Requirements

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Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
011	TOTAL TOXIC ORGANICS	1/6 MONTH	GRAB	FINAL EFFLUENT
011	ZINC, TOTAL (AS ZN)	2/WEEK	24 HR COMP	FINAL EFFLUENT
011	BENZENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	ETHYLBENZENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TRICHLOROETHANE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1-DICHLOROETHENE(1,1-DICHLOROETHYLEN	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1-DICHLOROETHANE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,2-DICHLOROETHENE(1,2-DICHLOROETHYLEN	1/6 MONTH	GRAB	FINAL EFFLUENT
011	CHLOROFORM	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1,1-TRICHLOROETHANE(METHYL CHLOROFOR	1/6 MONTH	GRAB	FINAL EFFLUENT
011	CARBON TETRACHLORIDE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	1,1,2,2,-TETRACHLOROETHANE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TRICHLOROETHENE(TRICHLOROETHYLENE)	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TETRACHLOROETHENE(TETRACHLOROETHYLENE)	1/6 MONTH	GRAB	FINAL EFFLUENT
011	TOLUENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	XYLENE	1/6 MONTH	GRAB	FINAL EFFLUENT
011	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
011	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
014	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
015	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
016	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT

Monitoring and Reporting Requirements

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Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
017	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
018	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
019	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
020	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
021	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
022	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
023	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
024	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
025	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
026	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
027	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
028	STORMWATER *	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
*	Stormwater when applicable in			
	accordance with special monitoring			
	requirements (see page 18).			

Outfall Number	Description
002	STORMWATER

SEE THE ATTACHED "STORM WATER DISCHARGE REQUIREMENTS" FOR OUTFALL APPLICABILITY AND MONITORING PARAMETERS. WHERE AN OUTFALL REQUIRES STORMWATER MONITORING, THE MONITORING SHALL BE CONDUCTED AT THE FREQUENCY AND LOCATION SPECIFIED BY THE "MONITORING AND REPORTING REQUIREMENTS". THE PERMITTED OUTFALLS WHICH MUST BE EVALUATED FOR MONITORING APPLICABILITY UNDER THE "STORMWATER DISCHARGE REQUIREMENTS" ARE AS FOLLOW:
002, 005, 006, 008, 009, 010, 014, 015, 016, 017, 018, 019, 020, 021, 022, 023, 024, 025, 026, 027, AND 028.

004 CHLORINE,TOTAL RESIDUAL

SAMPLES SHALL BE COLLECTED AT THE CONDENSER DISCHARGE BEFORE MIXING WITH OTHER WASTESTREAMS. SAMPLES NEED TO BE COLLECTED ONLY ON DAYS THAT THE CONDENSER IS CHLORINATED

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011 TOTAL TOXIC ORGANICS

TOTAL TOXIC ORGANICS POLLUTANTS SHALL BE LIMITED ONLY TO THE FOLLOWING PARAMETERS:

1,1 DCE	1,1,2-TRICHLOROETHANE
1,1 DCA	BENZENE
T-1,2-DCE	TETRACHLOROETHENE
CHLOROFORM	1,1,2,2-TETRACHLOROETHANE
1,1,1-TCA	TOLUENE
CARBON TET.	ETHYLBENZENE
TCE	XYLENE

STATE OF IOWA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROGRAM
AMENDMENT TO NPDES PERMIT

Iowa NPDES Permit No: 31-26-1-07
Date of Issuance: September 3, 1992
Date of Expiration: September 1, 1997
Date of Previous Amendment: November 25, 1992
Date of this Amendment: January 21, 1994

EPA NUMBER: IA0000051

Name and Mailing Address of Applicant:

John Deere Dubuque Works
P.O. Box 538
Dubuque, Iowa 52004

Identity and Location of Facility:

John Deere Dubuque Works
Section 35, T90N, R02E
Dubuque County, Iowa

Pursuant to the authority of Iowa Code Section 455B.174, and of Rule 567–64.3, Iowa Administrative Code, the Director of the Iowa Department of Natural Resources has issued the above referenced permit. Pursuant to the same authority the Director hereby amends said permit as set forth below:

This amendment revises the effluent limitations for total residual chlorine for outfall #003 and adds a new effluent limitation and monitoring requirement for total residual chlorine for outfall #002. This amendment also adds a schedule to the permit for achieving compliance with the new total residual chlorine limitation for outfall #002. Replace pages #3, #4 and #13 of your permit with the attached pages and add the attached compliance schedule page to the permit.

For the Department of Natural Resources:

Larry J. Wilson, Director

By _____
WAYNE FARRAND, Supervisor
Wastewater Section

ENVIRONMENTAL PROTECTION DIVISION

cc: Field Office #1

Effluent Limitations

OUTFALL NO.: 003 TREATED DOMESTIC WASTEWATER FROM AN EXTENDED AERATION TREATMENT PLANT WITH POLISHING POND.

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

Wastewater Parameter	Season	Type	EFFLUENT LIMITATIONS							
			Concentration				Mass			
			7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		.2000	.2400	MGD				
BIOCHEMICAL OXYGEN DEMAND (BOD5)	YEARLY	FINAL		30.0000	45.0000	MG/L		50.00	75.00	LBS/DAY
TOTAL SUSPENDED SOLIDS	YEARLY	FINAL		30.0000	45.0000	MG/L		50.00	75.00	LBS/DAY
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
CHLORINE, TOTAL RESIDUAL	YEARLY	FINAL		.0190	.0290	MG/L		.03	.04	LBS/DAY
COLIFORM, FECAL	SUMMER	FINAL			20.7000	10*3#/100				
TEMPERATURE	YEARLY	FINAL			95.0000	FARENHEIT				

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31

Permit Number: 3126107

OUTFALL NO.: 002 NONCONTACT COOLING WATER, DRINKING FOUNTAIN DRAINS AND STORM WATER DISCHARGE THROUGH THE NORTH SEDIMENTATION POND

You are prohibited from discharging pollutants except in compliance with the following effluent limitations:

Wastewater Parameter	Season	Type	EFFLUENT LIMITATIONS							
			Concentration				Mass			
			7 Day Average	30 Day Average	Daily Maximum	Units	7 Day Average	30 Day Average	Daily Maximum	Units
FLOW	YEARLY	FINAL		2.5340	3.8000	MGD				
PH (MINIMUM - MAXIMUM)	YEARLY	FINAL	6.0000		9.0000	STD UNITS				
CHLORINE,TOTAL RESIDUAL	YEARLY	FINAL		.0190	.0290	MG/L		.55	.82	LBS/DAY
OIL AND GREASE	YEARLY	FINAL		10.0000	15.0000	MG/L		211.00	317.00	LBS/DAY
TEMPERATURE	YEARLY	FINAL			95.0000	FARENHEIT				
ACUTE TOXICITY, CERIODAPHNIA	YEARLY	FINAL						1.00		NON TOXIC
ACUTE TOXICITY, PIMEPHALES	YEARLY	FINAL						1.00		NON TOXIC

NOTE: If seasonal limits apply, summer is from April 1 through October 31, and winter is from November 1 through March 31.

Monitoring and Reporting Requirements

(a) Samples and measurements taken shall be representative of the volume and nature of the monitored wastewater.

(b) Analytical and sampling methods as specified in 40 CFR Part 136 or Table VII of Chapter 63 of the rules, or other methods approved in writing by the department, shall be utilized.

(c) Chapter 63 of the rules provides you with further explanation of your monitoring requirements.

(d) You are required to report all data including calculated results needed to determine compliance with the limitations contained in this permit. This includes daily maximums and minimums, 30-day averages and 7-day averages for all parameters that have concentration (mg/l) and mass (lbs/day) limits. Also, flow data shall be reported in million gallons per day (MGD).

(e) Results of all monitoring shall be recorded on forms provided by the department, and submitted to the department by the fifteenth day following the close of the reporting period. Your reporting period is on a monthly basis, ending on the last day of each month.

Outfall Number	Wastewater Parameter	Sample Frequency	Sample Type	Monitoring Location
002	FLOW	5/WEEK	24 HR TOTAL	FINAL EFFLUENT
002	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
002	CHLORINE,TOTAL RESIDUAL	1/2 WEEKS	GRAB	FINAL EFFLUENT
002	OIL AND GREASE	1/WEEK	GRAB	FINAL EFFLUENT
002	TEMPERATURE	1/WEEK	GRAB	FINAL EFFLUENT
002	ACUTE TOXICITY, CERIODAPHNIA	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
002	ACUTE TOXICITY, PIMEPHALES	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
002	STORMWATER	1/12 MONTHS	24 HR COMP	FINAL EFFLUENT
003	FLOW	7/WEEK	24 HR TOTAL	RAW WASTE OR FINAL EFFLUENT(FLOW)
003	BIOCHEMICAL OXYGEN DEMAND (BOD5)	1/WEEK	24 HR COMP	RAW WASTE
003	BIOCHEMICAL OXYGEN DEMAND (BOD5)	1/WEEK	24 HR COMP	FINAL EFFLUENT
003	TOTAL SUSPENDED SOLIDS	1/MONTH	24 HR COMP	RAW WASTE
003	TOTAL SUSPENDED SOLIDS	1/MONTH	24 HR COMP	FINAL EFFLUENT
003	AMMONIA NITROGEN (N)	1/3 MONTH	24 HR COMP	FINAL EFFLUENT
003	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	RAW WASTE
003	PH (MINIMUM - MAXIMUM)	1/WEEK	GRAB	FINAL EFFLUENT
003	CHLORINE,TOTAL RESIDUAL	2/WEEK	GRAB	EFFLUENT AFTER DISINFECTION WHEN CHLORINE IS USED
003	COLIFORM,FECAL	1/3 MONTH	GRAB	EFFLUENT AFTER DISINFECTION - APRIL 1 TO OCTOBER 31 ONLY.
003	DISSOLVED OXYGEN (MINIMUM)	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	SOLIDS,MIXED LIQUOR SUSPENDED	2/WEEK	GRAB	AERATION BASIN CONTENTS
003	TEMPERATURE	1/WEEK	GRAB	RAW WASTE

APPENDIX E

Summary of Groundwater Analytical Data

Analytical Results, JDDW Long-Term Ground-Water Monitoring Program

					Organics													
	Sample Date	Hex Chrome (mg/L)	Copper (ug/l)	Lead (ug/l)	1,1-DCE (ug/L)	1,1-DCA (ug/L)	1,2-DCE (ug/L)	Chloroform (ug/L)	1,1,1-TCA (ug/L)	Carbon Tet (ug/L)	TCE (ug/L)	1,1,2-TCA (ug/L)	Benzene (ug/L)	PCE (ug/L)	1,1,2,2-Tetra (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Xylenes (ug/L)
Performance Standard		0.182	1300	15	7	990	70	6	200	0.3	3	3	1	0.7	0.089	1000	700	10000
MW6	28-Feb-90	<0.01	<5	11.6	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW6	08-May-90	<0.01	<4.0	11.6	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW6	30-Aug-90	<0.01	<4.0	3.3	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW6	08-Nov-90	<0.01	<5.0	2.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW6	03-Jul-91	R	10.7	<1.0	<10	<10	3 J	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	<10
MW6	12-Aug-92	<0.01	<25	<3.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW6	25-Aug-93	<0.01	<3.0	<1.0	<10	<10	2	<10	1	<10	7	<10	<10	<10	<10	<10	<10	<10
MW6	19-Jul-94	<0.01	<25	<6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	<1.0	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5
MW7S	27-Feb-90	<0.01	<5	<1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW7S	08-May-90	0.01	<4.0	<2.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW7S	29-Aug-90	<0.01	4.6	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW7S	09-Nov-90	<0.01	<5.0	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW7S	03-Jul-91	R	12.7	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW7S	12-Aug-92	<0.01	<25	<3.0	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
MW7S	17-Nov-92	<0.01	<25	<3.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW7S	25-Aug-93	<0.01	3.1	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW7S	19-Jul-94	<0.01	<25	5.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5
MW8S	26-Feb-90	<0.01	<5	9.8	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW8S	08-May-90	0.02	<4.0	4.6	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW8S	30-Aug-90	<0.01	<4.0	1.8	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW8S	07-Nov-90	<0.01	<5.0	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW8S	02-Jul-91	R	<6.0	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW8S	12-Aug-92	<0.01	<25	<3.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW8S	25-Aug-93	<0.01	<3.0	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW8S	19-Jul-94	<0.01	<25	<6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5

NA - Not analyzed

R - Rejected due to matrix interference

J - Estimated

Exceeds Performance Standards

Analytical Results, JDDW Long-Term Ground-Water Monitoring Program

					Organics													
	Sample Date	Hex. Chrome (mg/L)	Copper (ug/l)	Lead (ug/l)	1,1-DCE (ug/L)	1,1-DCA (ug/L)	1,2-DCE (ug/L)	Chloroform (ug/L)	1,1,1-TCA (ug/L)	Carbon Tet (ug/L)	TCE (ug/L)	1,1,2-TCA (ug/L)	Benzene (ug/L)	PCE (ug/L)	1,1,2,2-Tetra (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Xylenes (ug/L)
Performance Standard		0.182	1300	15	7	990	70	6	200	0.3	3	3	1	0.7	0.089	1000	700	10000
MW9D	26-Feb-90	<0.01	<5	1.6	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW9D	08-May-90	0.01	4.5	<2.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW9D	30-Aug-90	<0.01	4.1	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW9D	08-Nov-90	<0.01	<5.0	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW9D	02-Jul-91	R	<6.0	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW9D	11-Aug-92	<0.01	<25	<3.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW9D	24-Aug-93	<0.01	5	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW9D	19-Jul-94	<0.01	<25	7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<1.0	1.8	<0.5	<0.5
MW9S	26-Feb-90	<0.01	<5	4.7	<5	<5	<5	<5	9	<5	1 J	<5	<5	4 J	<5	<5	<5	<5
MW9S	08-May-90	0.01	<4.0	<2.0	<5	<5	<5	<5	8	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW9S	30-Aug-90	<0.01	<4.0	<1.0	<5	<5	<5	<5	5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW9S	07-Nov-90	<0.01	<5.0	<1.0	<5	<5	<5	<5	13	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW9S	02-Jul-91	R	<6.0	<1.0	<10	5 J	4 J	<10	20	<10	4 J	<10	<10	10	<10	<10	<10	<10
MW9S	11-Aug-92	<0.01	<25	<3.0	<5.0	3.2 J	3.7 J	<5.0	18	<5.0	5.4 J	<5.0	<5.0	11	<5.0	<5.0	<5.0	<5.0
MW9S (dup)	11-Aug-92	<0.01	<25	<3.0	<5.0	2.8	3.3	<5.0	17	<5.0	5.1	<5.0	<5.0	11	2	<5.0	<5.0	<5.0
MW9S	24-Aug-93	<0.01	<3.0	1.3	<10	6	10	<10	23	<10	6	<10	1	17	<10	<10	<10	<10
MW9S	19-Jul-94	<0.01	<25	< 6	<0.5	0.37 J	< 0.50	<0.5	0.8	<0.5	< 0.50	<1.0	< 0 50	1.2	<1.0	< 0.50	< 0.50	< 0.50
MW9S (dup)	19-Jul-94	NA	NA	NA	<10	< 10	< 10	<10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
MW11D	27-Feb-90	<0.01	<5	2.5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW11D	10-May-90	<0.01	<4.0	<2.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW11D	30-Aug-90	0.012	5.8	1.7	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW11D	10-Nov-90	<0.01	<5.0	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW11D	03-Jul-91	R	7.3	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW11D	12-Aug-92	<0.01	<25	<3.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW11D	24-Aug-93	0.019	<3.0	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW11D	20-Jul-94	< 0.010	<25	< 6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5

NA - Not analyzed

R - Rejected due to matrix interference

J - Estimated

Exceeds Peformance Standards

Analytical Results, JDDW Long-Term Ground-Water Monitoring Program

					Organics													
	Sample Date	Hex. Chrome (mg/L)	Copper (ug/l)	Lead (ug/l)	1,1-DCE (ug/L)	1,1-DCA (ug/L)	1,2-DCE (ug/L)	Chloroform (ug/L)	1,1,1-TCA (ug/L)	Carbon Tet (ug/L)	TCE (ug/L)	1,1,2-TCA (ug/L)	Benzene (ug/L)	PCE (ug/L)	1,1,2,2-Tetra (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Xylenes (ug/L)
Performance Standard		0.182	1300	15	7	990	70	6	200	0.3	3	3	1	0.7	0.089	1000	700	10000
MW11S	27-Feb-90	0.14	<5	<1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW11S	10-May-90	<0.01	<4.0	<2.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW11S	30-Aug-90	<0.01	4.3	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW11S	10-Nov-90	0.022	<5.0	,1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW11S	03-Jul-91	R	<6.0	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW11S	12-Aug-92	< 0.010	<25	<3.0	<5 0	<5 0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5 0	<5.0	<5.0	<5 0	<5.0	<5.0
MW11S	07-Sep-93	< 0.010	<3.0	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW11S	20-Jul-94	< 0.010	<25	< 6	<0.5	0.26 J	<0.5	<0.5	<0.5	<0.5	<0.5	<1 0	<0.5	<0 5	<1.0	0.32 J	<0.5	<0.5
MW12	26-Feb-90	<0.01	<5	8.4	<5	7	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW12	08-May-90	0.04	4.6	2.3	<5	13	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW12	29-Aug-90	<0.01	6.2	3.1	<5	10	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW12	07-Nov-90	<0.01	<5.0	1.5	<5	<5	7	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW12	03-Jul-91	R	10.7	<1.0	<10	29	3 J	<10	1 J	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW12	11-Aug-92	< 0.010	<25	<3.0	<5.0	23	<5.0	<5.0	<5.0	<5.0	<5.0	<5 0	<5.0	<5.0	<5.0	<5.0	<5.0	<5 0
MW12	07-Sep-93	< 0.010	5.6	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW12	20-Jul-94	< 0.010	4.3 J	< 6	<0.5	<0.5	<0.5	<0.5	<0 5	<0.5	<0.5	<1 0	<0.5	<0 5	<1.0	<0.5	<0.5	<0.5
MW13D	27-Feb-90	<0.01	<5	3.3	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW13D	09-May-90	<0.01	<4.0	<2 0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW13D	29-Aug-90	0.01	4.6	1.6	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW13D	08-Nov-90	<0.01	<5 0	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW13D	03-Jul-91	R	<6 0	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW13D	12-Aug-92	< 0.010	<25	<3 0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	< 5 0	<5.0	<5 0	<5 0	<5.0	<5 0
MW13D	24-Aug-93	< 0.010	<3.0	<1 0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW13D	20-Jul-94	< 0.010	<25	< 6	<0 5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0 5	<0 5	<1.0	<0.5	<0.5	<0.5

NA - Not analyzed R - Rejected due to matrix interference J - Estimated Exceeds Performance Standards

Analytical Results, JDDW Long-Term Ground-Water Monitoring Program

					Organics													
	Sample Date	Hex. Chrome (mg/L)	Copper (ug/l)	Lead (ug/l)	1,1-DCE (ug/L)	1,1-DCA (ug/L)	1,2-DCE (ug/L)	Chloroform (ug/L)	1,1,1-TCA (ug/L)	Carbon Tet (ug/L)	TCE (ug/L)	1,1,2-TCA (ug/L)	Benzene (ug/L)	PCE (ug/L)	1,1,2,2-Tetra (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Xylenes (ug/L)
Performance Standard		0.182	1300	15	7	990	70	6	200	0.3	3	3	1	0.7	0.089	1000	700	10000
MW13S	26-Feb-90	<0.01	<5	3.1	<5	<5	<5	<5	<5	<5	<5	<5	<5	14	<5	<5	<5	<5
MW13S	09-May-90	<0.01	<4.0	<2.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	13	<5	<5	<5	<5
MW13S	29-Aug-90	<0.01	6	<1 0	<5	<5	<5	<5	<5	<5	<5	<5	<5	12	<5	<5	<5	<5
MW13S	08-Nov-90	<0.01	<5.0	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	6	<5	<5	<5	<5
MW13S	03-Jul-91	R	10.6	<1.0	<10	<10	<10	<10	2 J	<10	<10	<10	<10	6 J	<10	<10	2 J	4 J
MW13S	12-Aug-92	< 0.010	<25	<3	<5.0	<5.0	<5.0	1.3 J	<5 0	<5.0	<5.0	<5.0	48	<5.0	<5.0	2 J	6.1	10
MW13S	25-Aug-93	< 0.010	3.9	1.5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW13S	20-Jul-94	< 0.010	< 25	< 6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.51	<1.0	<0.5	1.3	<1.0	<0.5	<0.5	<0.5
MW16	28-Feb-90	<0.01	<5	3.2	<5	<5	<5	<5	<5	<5	8	<5	<5	<5	<5	<5	<5	<5
MW16	10-May-90	<0.01	<4 0	3.2	<5	<5	<5	<5	<5	<5	9	<5	<5	<5	<5	<5	<5	<5
MW16	29-Aug-90	<0.01	6.2	2.1 J	<5	<5	<5	<5	<5	<5	9	<5	<5	<5	<5	<5	<5	<5
MW16	07-Nov-90	<0 01	<5 0	<1.0	<5	<5	<5	<5	<5	<5	9	<5	<5	<5	<5	<5	<5	<5
MW16	02-Jul-91	R	<6.0	<1.0	<10	<10	<10	<10	1 J	<10	7 J	<10	<10	<10	<10	<10	<10	<10
MW16	11-Aug-92	< 0.010	< 25	<3	<5.0	<5.0	<5.0	<5.0	<5 0	<5.0	2.3	<5.0	<5.0	<5.0	<5 0	<5.0	<5.0	<5.0
MW16	25-Aug-93	< 0.010	<3.0	<1.0	<10	<10	1 J	<10	1	<10	2	<10	<10	<10	<10	<10	<10	<10
MW16	19-Jul-94	< 0.010	< 25	< 12	<0.5	<0.5	< 0 5	< 0.5	1.5	< 0 5	3.5	< 1.0	< 0.50	0.31 J	< 1.0	< 0.50	< 0.50	< 0 50
MW20D	27-Feb-90	<0.01	<5	2.7	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW20D	11-May-90	<0.01	<4.0	<2 0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW20D	30-Aug-90	0.012	<4 0	2.2	<5	<5	<5	<5	< 5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW20D	09-Nov-90	<0.01	<5.0	<1.0	<5	<5	<5	<5	5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW20D	03-Jul-91	R	<10 0	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW20D	11-Aug-92	< 0.010	< 25	<3	<5.0	<5.0	<5.0	<5.0	<5 0	<5 0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW20D	25-Aug-93	< 0 010	<3 0	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW20D	19-Jul-94	< 0.010	< 25	< 6	<0.5	<0.5	<0 5	<0.5	<0.5	<0 5	<0 5	<1.0	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5

NA - Not analyzed

R - Rejected due to matrix interference

J - Estimated

Exceeds Performance Standards

Analytical Results, JDDW Long-Term Ground-Water Monitoring Program

					Organics													
	Sample Date	Hex. Chrome (mg/L)	Copper (ug/l)	Lead (ug/l)	1,1-DCE (ug/L)	1,1-DCA (ug/L)	1,2-DCE (ug/L)	Chloroform (ug/L)	1,1,1-TCA (ug/L)	Carbon Tet (ug/L)	TCE (ug/L)	1,1,2-TCA (ug/L)	Benzene (ug/L)	PCE (ug/L)	1,1,2,2-Tetra (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Xylenes (ug/L)
Performance Standard		0.182	1300	15	7	990	70	6	200	0.3	3	3	1	0.7	0.089	1000	700	10000
MW20S	27-Feb-90	<0.01	<5	2.7	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW20S	11-May-90	<0.01	<4.0	2.6	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW20S	29-Aug-90	<0.01	<4.0	3.1	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW20S	09-Nov-90	<0.01	<5.0	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
MW20S	22-Aug-91	R	7.3	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW20S	12-Aug-92	< 0.010	< 25	<3	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
MW20S	07-Sep-93	< 0.010	<3.0	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
MW20S	19-Jul-94	< 0.010	< 25	< 6	<0.5	<0.5	<0.5	<0.5	0.34 J	<0.5	<0.5	<1.0	<0.5	<0.5	<1.0	<0.5	<0.5	<0.5
PW3	28-Feb-90	<0.01	<5	1.2	<5	2 J	56	<5	1 J	<5	4 J	<5	11	<5	<5	15	33	140
PW3	10-May-90	<0.01	<4.0	<2.0	<25	<25	37	<25	<25	<25	<25	<25	<25	<25	<25	<25	33	150
PW3	28-Aug-90	<0.01	<4.0	<1.0	<10	<10	17	<10	<10	<10	<10	<10	10	<10	<10	10	32	130
PW3	08-Nov-90	<0.01	<5.0	<1.0	<5	<5	9	<5	<5	<5	<5	<5	<5	<5	<5	<5	17	53
PW3	02-Jul-91	R	<6.0	<1.0	<25	3 J	30	<25	3 J	<25	<25	<25	14 J	<25	<25	14 J	63	210
PW3	10-Aug-92	< 0.010	< 25	<3	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12	<12	72	100
PW3	23-Aug-93	< 0.010	<3.0	<1.0	<10	3	10	<10	<10	<10	<10	<10	13	<10	<10	16	71	340
PW3	18-Jul-94	< 0.010	< 25	< 3	<0.5	2.9	<0.5	<0.5	1.8	<0.5	<0.5	<1.0	6.4	<0.5	<1.0	4.9	30	110
PW3	19-Jul-94	NA	NA	NA	<10	6 J	15	<10	3 J	<10	<10	<10	8 J	<10	<10	8 J	51	190
PW4	28-Feb-90	<0.01	<5	<1	<5	<5	<5	<5	3 J	<5	3 J	<5	<5	<5	<5	<5	3 J	7
PW4	10-May-90	<0.01	<4.0	<2.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	5	20
PW4	28-Aug-90	<0.01	4.6	<1.0	<5	<5	<5	<5	6	<5	6	<5	<5	<5	<5	<5	<5	11
PW4	07-Nov-90	<0.01	<5.0	<1.0	<5	<5	<5	<5	<5	<5	5	<5	<5	<5	<5	<5	<5	12
PW4	02-Jul-91	R	<6.0	<1.0	<10	<10	<10	<10	3 J	<10	3 J	<10	3 J	<10	<10	<10	3 J	10
PW4	10-Aug-92	< 0.010	< 25	<3	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	8.4
PW4	23-Aug-93	< 0.010	<3.0	<1.0	<10	1 J	2 J	<10	2 J	<10	5 J	<10	3 J	1 J	<10	<10	8 J	30
PW4	19-Jul-94	< 0.010	< 25	< 6	<0.5	0.48 J	< 0.50	<0.5	1.2	<0.5	2.7	<1.0	0.54	0.62	<1.0	<0.5	3	8.5
PW4 (dup)	19-Jul-94	NA	NA	NA	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	1 J	< 10	< 10	< 10	3 J	12

NA - Not analyzed

R - Rejected due to matrix interference

J - Estimated

Exceeds Performance Standards

Analytical Results, JDDW Long-Term Ground-Water Monitoring Program

					Organics													
	Sample Date	Hex. Chrome (mg/L)	Copper (ug/l)	Lead (ug/l)	1,1-DCE (ug/L)	1,1-DCA (ug/L)	1,2-DCE (ug/L)	Chloroform (ug/L)	1,1,1-TCA (ug/L)	Carbon Tet (ug/L)	TCE (ug/L)	1,1,2-TCA (ug/L)	Benzene (ug/L)	PCE (ug/L)	1,1,2,2-Tetra (ug/L)	Toluene (ug/L)	Ethylbenzene (ug/L)	Xylenes (ug/L)
Performance Standard		0.182	1300	15	7	990	70	6	200	0.3	3	3	1	0.7	0.089	1000	700	10000
PW5	28-Feb-90	<0.01	<5	5.6	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
PW5	10-May-90	<0.01	<4.0	7.2	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	75	54	320
PW5	28-Aug-90	<0.01	6.2	8.6	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	40	39	180
PW5	09-Nov-90	<0.01	<5.0	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	23	22	100
PW5	01-Jul-91	R	<10.0	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
PW5	10-Aug-92	< 0.010	< 25	<3.0	<8 5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	<8.5	55	49	250
PW5	24-Aug-93	< 0.010	3.3	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	21	27	217
PW5	18-Jul-94	< 0.010	< 25	<3	<0.5	<0.5	<0 5	<0.5	<0.5	<0.5	<0.5	<1 0	<0.5	<0 5	<1.0	<0.5	<0.5	<0.5
PW7	28-Feb-90	<0.01	<5	1.7	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
PW7	23-May-90	<0.01	4.2	<2.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
PW7	28-Aug-90	<0.01	5.7	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
PW7	07-Nov-90	<0.01	8.2	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
PW7	02-Jul-91	R	<6.0	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
PW7	10-Aug-92	< 0.010	< 25	<3.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
PW7	23-Aug-93	< 0.010	<3.0	<1.0	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
PW7	18-Jul-94	< 0.010	< 25	<3.0	<0.5	<0 5	<0.5	<0.5	0.34 J	<0.5	0.32 J	<1.0	<0 5	<0 5	<1.0	<0.5	<0.5	<0.5
SBW3	28-Feb-90	0.017	<5	<1	<5	<5	<5	<5	13	<5	3 J	<5	<5	1 J	<5	<5	<5	<5
SBW3	09-May-90	0.040	<4.0	<2.0	<5	8	<5	<5	34	<5	5	<5	<5	<5	<5	<5	<5	<5
SBW3	30-Aug-90	0.070	6.2	<1.0	<5	<5	<5	<5	15	<5	<5	<5	<5	<5	<5	<5	<5	<5
SBW3	07-Nov-90	0.030	<5.0	<1.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
SBW3	04-Jul-91	0.058	11	<1.0	<10	2 J	<10	<10	13	<10	3 J	<10	<10	6 J	<10	<10	<10	<10
SBW3	11-Aug-92	0.042	<25	<3	<5	<5	<5	<5	5.8	<5	2	<5	<5	8	<5	<5	<5	<5
SBW3	25-Aug-93	0.030	4.5	<1 0	<10	<10	<10	<10	2 J	<10	1 J	<10	<10	1 J	<10	<10	<10	<10
SBW3	19-Jul-94	0 037	<25	<6	<0.5	<0.5	<0.5	0.26 J	1.2	<0.5	0.49 J	<1.0	<0.5	0.43 J	<1.0	<0.5	<0.5	<0.5

NA - Not analyzed

R - Rejected due to matrix interference

J - Estimated

Exceeds Performance Standards

APPENDIX F

Performance Standard Calculations

1,1-Dichloroethane

$$C(mg/L) = \frac{THI \times BW \times AT \times 365\ days/year}{EF \times ED \times [(\frac{1}{RfD_i} \times K \times IR_a) + (\frac{1}{RfD_o} \times IR_w)]}$$

Parameters	Definition	Default Value
C	Chemical Concentration in water mg/L	-
THI	Target Hazard Index (unitless)	1
RfD_o	Oral Reference Dose (mg/kg-day)	1.0×10^{-1} mg/kg-day
RfD_i	Inhalation Reference Dose (mg/kg-day)	1.4×10^{-1} mg/kg-day
BW	Adult Body Weight (kg)	70 kg
AT	Averaging Time (yr)	30 yr
EF	Exposure Frequency (days/yr)	350 days/yr
ED	Exposure Duration (yr)	30 yr
IR_a	Daily Indoor Inhalation Rate (m^3/day)	15 m^3/day
IR_w	Ingestion Rate (L/day)	2 L/day
K	Volatilization Factor (L/m^3)	0.5 L/m^3

$$C(mg/L) = \frac{73}{\frac{7.5}{0.14} + \frac{2}{0.1}} = 0.99\ mg/L$$

Source: Risk Assessment Guidance for Superfund, Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals), p. 22.

1,1,2,2-Tetrachloroethane

$$C(mg/L) = \frac{TR \times BW \times AT \times 365\ days/year}{EF \times ED \times [(SF_i \times K \times IR_a) + (SF_o \times IR_w)]}$$

Parameters	Definition	Default Value
C	Chemical Concentration in water mg/L	-
TR	Target Excess Individual Lifetime Cancer Risk (unitless)	10^{-6}
SF_o	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	2.0×10^{-1} $mg/kg\text{-}day^{-1}$
SF_i	Inhalation Slope Factor $(mg/kg\text{-}day)^{-1}$	2.0×10^{-1} $mg/kg\text{-}day^{-1}$
BW	Adult Body Weight (kg)	70 kg
AT	Averaging Time (yr)	70 yr
EF	Exposure Frequency (days/yr)	350 days/yr
ED	Exposure Duration (yr)	30 yr
IR_a	Daily Indoor Inhalation Rate (m^3/day)	15 m^3/day
IR_w	Ingestion Rate (L/day)	2 L/day
K	Volatilization Factor (L/m^3)	0.5 L/m^3

$$C(mg/L) = \frac{1.7 \times 10^{-4}}{(7.5 \times 0.2) + (2 \times 0.2)} = 8.95 \times 10^{-5}\ mg/L$$

Source: Risk Assessment Guidance for Superfund, Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals), p. 23.

Hexavalent Chromium

$$C(mg/L) = \frac{THI \times BW \times AT \times 365\ days/year}{EF \times ED \times [(\frac{1}{RfD_i} \times K \times IR_a) + (\frac{1}{RfD_o} \times IR_w)]}$$

Parameters	Definition	Default Value
C	Chemical Concentration in water mg/L	-
THI	Target Hazard Index (unitless)	1
RfD_o	Oral Reference Dose (mg/kg-day)	5.0×10^3 mg/kg-day
RfD_i	Inhalation Reference Dose (mg/kg-day)	none
BW	Adult Body Weight (kg)	70 kg
AT	Averaging Time (yr)	30 yr
EF	Exposure Frequency (days/yr)	350 days/yr
ED	Exposure Duration (yr)	30 yr
IR_a	Daily Indoor Inhalation Rate (m^3/day)	15 m^3/day
IR_w	Ingestion Rate (L/day)	2 L/day
K	Volatilization Factor (L/m^3)	0.5 L/m^3

$$C(mg/L) = \frac{73}{(\frac{2}{0.005})} = 0.182\ mg/L$$

Source: Risk Assessment Guidance for Superfund, Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals), p. 22.