

**EPA Superfund
Record of Decision Amendment:**

**MIDWEST MANUFACTURING/NORTH FARM
EPA ID: IAD069625655
OU 01, 02
KELLOGG, IA
09/29/1993**

**DECLARATION
RECORD OF DECISION AMENDMENT
FOR THE MIDWEST MANUFACTURING/NORTH FARM SITE
NORTH FARM OPERABLE UNIT
MIDWEST MANUFACTURING OPERABLE UNIT
JASPER COUNTY KELLOGG, IOWA
SEPTEMBER 1993**

SITE NAME AND LOCATION

Midwest Manufacturing/North Farm Site
North Farm Operable Unit
Midwest Manufacturing Operable Unit
Kellogg, Iowa

STATEMENT OF BASIS AND PURPOSE

This decision document, together with a Record of Decision (ROD) dated September 30, 1988 for the North Farm Operable Unit and a ROD dated September 27, 1990 for the Midwest Manufacturing Operable Unit, presents the selected remedial actions for the North Farm Operable Unit and the Midwest Manufacturing Operable Unit which together comprise the Midwest Manufacturing/North Farm Site, Kellogg, Iowa. These actions were chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Contingency Plan (NCP). These decisions are based on the administrative records for these Operable Units.

The United States Environmental Protection Agency (EPA) is the lead agency for the site, and the Iowa Department of Natural Resources (IDNR) has been designated the support agency. This ROD amendment is being issued by the EPA. The State of Iowa concurs on the amended selected remedies.

DESCRIPTION OF THE AMENDED SELECTED REMEDIES

NORTH FARM OPERABLE UNIT

The major components of the selected remedy, as now amended, include:

SOILS

- Deed restrictions will be implemented to prevent using the disposal area as a vegetable garden which could lead to accidental exposure to hazardous substances. No action would be taken to remove or control the migration of the contaminants at the site.

GROUND WATER

- Deed restrictions will be implemented to prevent the installation of a water supply well which would be used for human consumption. Ground water monitoring will be conducted to verify that the remedy remains protective of human health and the environment and that no future unacceptable exposures to contaminants at this Operable Unit occur.

MIDWEST MANUFACTURING OPERABLE UNIT

The major components of the selected remedy, as now amended, include:

SOILS

- A perimeter fence will be installed to control access to the disposal areas located at the Midwest Manufacturing Operable Unit. Deed restrictions will be placed on the property to prevent any changes in land usage. These restrictions will limit any future exposure to hazardous substances which remain on-site.

GROUND WATER

- No action will be taken to remove and/or otherwise control the migration of the contaminants within the ground water at the Operable Unit. Deed restrictions will be implemented to prevent the installation of a water supply well which would be used for human consumption. A survey of all water supply wells, both public and private within one mile of the plant site, will be conducted prior to initiating the monitoring program. Two new monitoring wells will be installed in locations close to existing public water supply wells. Ground water monitoring will be conducted to verify that the remedy remains protective of human health and the environment and that no future unacceptable exposures to contaminants at this Operable Unit occur.

STATUTORY DETERMINATIONS - MIDWEST MANUFACTURING/NORTH FARM SITE

The selected amended remedy for each Operable Unit is protective of public health, welfare and the environment, complies with federal and state applicable or relevant and appropriate requirements, and is cost-effective. The amended remedy for each Operable Unit does not satisfy the preference for remedies that employ treatment which permanently and significantly reduces the volume, toxicity, or mobility of hazardous materials as a principal element. In addition, the remedy for each Operable Unit does not utilize permanent solutions or alternative treatment technologies (or resource recovery technologies) to the maximum extent practicable.

Because each remedy will result in hazardous substances remaining at the North Farm Operable Unit and at the Midwest Manufacturing Operable Unit above health-based levels, a review of each Operable Unit remedy will be conducted within five years after commencement of these remedial actions to ensure that each specific Operable Unit remedy continues to provide adequate protection of human health and the environment.

AMENDED RECORD OF DECISION

DECISION SUMMARY

MIDWEST MANUFACTURING/NORTH FARM SITE

NORTH FARM OPERABLE UNIT

MIDWEST MANUFACTURING OPERABLE UNIT

KELLOGG, IOWA

Prepared by:

U.S. Environmental Protection Agency

Region VII

Kansas City, Kansas

September 28, 1993

Amended Record of Decision

Decision Summary

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DECISION SUMMARY
RECORD OF DECISION AMENDMENT
MIDWEST MANUFACTURING/NORTH FARM SITE
NORTH FARM OPERABLE UNIT
MIDWEST MANUFACTURING OPERABLE UNIT

I. LOCATION AND DESCRIPTION

The Midwest Manufacturing/North Farm Superfund Site consists of two non-contiguous pieces of property known as the North Farm Operable Unit and the Midwest Manufacturing Operable Unit. The North Farm Operable Unit is located 2 miles north and ½ mile east of Kellogg, Iowa. Kellogg, population 700, is located in Jasper County, which is approximately 42 miles east of Des Moines (See figure 1). The Midwest Manufacturing Operable Unit is owned and operated by Smith Jones, Inc., Midwest Division and is located at 101 High Street in the city of Kellogg, Iowa. The Midwest Manufacturing Operable Unit occupies eight acres within the North Skunk River floodplain (see figure 2).

Smith Jones, Inc. engaged in electroplating and painting operations of manufactured products from 1973 until 1981. The electroplating process involved the use of trichloroethylene (TCE) to clean the product before it was coated with a metal. Cadmium was used as the metal coating prior to 1979, nickel was used until 1980, and from 1980-1981 zinc was used. Prior to 1977, electroplating wastes containing TCE, heavy metals, and paint residue generated from on-site painting operations were disposed directly into the North Skunk River. In 1977, a wastewater treatment system was constructed. Sludges generated from the treatment process were pumped to a storage tank where they were periodically removed and placed into one of two disposal areas. Electroplating operations ceased in June of 1981.

From 1977 to 1978, the sludge resulting from this wastewater treatment process was periodically transported to the North Farm Operable Unit for disposal. The sludge was placed in an unlined trench excavated to a depth of approximately five feet below ground surface. A berm was initially placed around the perimeter of the trench to divert surface water away from the disposed material. The trench was covered with native soils in 1978.

The disposal trench at the Midwest Manufacturing Operable Unit, located on the main plant property, received the sludges generated by the treatment plant from 1978 until June of 1981. The areas of disposal at the Midwest Manufacturing Operable Unit include the waste disposal trench, the buried waste metal pile and the marsh.

Greater detail concerning the characteristics of each Operable Unit and the prior investigation and remedial alternatives may be found in the administrative records for each Operable Unit.

II. COMMUNITY RELATIONS

The United States Environmental Protection Agency (EPA) is issuing this Record of Decision (ROD) Amendment to meet public participation provisions mandated under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by Superfund Amendments and Reauthorization Act (SARA) of 1986, and Section 300.435 (c)(2)(II) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

The Proposed Plan for this ROD Amendment was made available to the public in the administrative record file located at the Kellogg, Iowa City Hall and the EPA Region VII Office, Kansas City, Kansas. A public notice was published in The Newton Daily News on February 19, 1993, announcing the commencement and length of the public comment period and the availability of the administrative records file at the Kellogg City Hall.

Fact sheets were also mailed to area residents, local officials and the media announcing the availability of the project documents and the public comment period.

EPA offered to hold a public meeting to discuss the Proposed Plan for the Amended ROD if requested. No requests were received.

Comments received during the public comment period are addressed in the Responsiveness Summary.

III. REASONS FOR ISSUING THE ROD AMENDMENT

NORTH FARM OPERABLE UNIT

REASSESSMENT OF SITE RISKS

EPA has reevaluated the site risks posed by the North Farm Operable Unit. This reevaluation included a review of the information contained within the ROD, as well as other information EPA has obtained concerning the North Farm Operable Unit.

Section V of the ROD identified the following site characteristics: Onsite surface soils are contaminated with various levels of heavy metals such as calcium, cadmium and manganese. The contaminated soil within the disposal cell contains various levels of heavy metals such as cadmium, nickel, zinc, sodium, cyanide and calcium. This material failed the EP Toxicity test for cadmium. According to the Public Health Evaluation, cadmium bioaccumulates in mammals, particularly in the kidney and liver. Sub-chronic and chronic exposures to cadmium are associated with a number of noncarcinogenic but toxic effects, including kidney damage in humans and experimental animals. Noncarcinogenic toxic effects may result from incidental ingestion of soil, ground water or other media. EPA considers cadmium a carcinogen only when inhaled. The ground water beneath the site appears to be a perched water table that has no hydraulic continuity with the Bear Creek alluvium. The ground water health based action level for cadmium is 18 micrograms/liter (ug/l) and for manganese is 7700 ug/l.

Cadmium and manganese were identified as chemicals of concern for the ground water media. Cadmium and cyanide were identified as chemicals of concern for the contaminated soil media. Table 1 presents the site information regarding the levels of contaminants present in the soils and ground water and the health based action level for these contaminants per exposure pathway. No carcinogens are present at the North Farm Operable Unit, therefore only noncarcinogenic risks are evaluated. The health based action level is the contaminant concentration level above which adverse health effects may be experienced by persons exposed to the contaminant. Under current land-use conditions at the North Farm Operable Unit, there are no complete exposure pathways by which human receptors could be exposed to site contaminants. The site is relatively isolated. The nearest residence is one mile away. Of the chemicals, only cadmium may be of concern under future-use scenarios. All others are considered insignificant.

The exposure scenarios considered for possible future land-use conditions are:

1. Ingestion of ground water;
2. Direct contact with (incidental ingestion of) surface soils; and
3. Ingestion of contaminated vegetables.

Average and plausible maximum exposure scenarios were developed for each of these pathways. The exposure point concentrations of cadmium were estimated for the potentially exposed populations. Human health risks were assessed based on these estimates of exposure and a quantitative description of cadmium's toxicity.

The 1988 ROD concluded the following "It is determined that no action needs to be taken to protect ground water with respect to cadmium." Cadmium received a hazard index score equal to one, which indicates that it represents a marginal risk to humans who may ingest cadmium contaminated water. The health based action level for cadmium in water is 18 ug/l. This is 1 ug/l less than the highest total concentration level found at the site. Only one ground water sample from the monitoring wells was found to contain cadmium. The ground water sample containing cadmium was not filtered prior to analysis, so the analytical results represent the total cadmium present. None of the filtered ground water samples, which represent the dissolved cadmium concentration, exceeded the action level. Monitoring wells are typically of a different type of construction than wells constructed for drinking water. Monitoring wells usually produce a greater amount of sediment mixed with water than is the case for a drinking water well. Inorganic contaminants have a tendency to attach themselves to the sediment. This causes the contaminant concentration measured in an unfiltered (total) sample to be greater than that of a filtered sample. Therefore, the unfiltered contaminant concentration measured in a drinking

water well would be similar to that measured in a filtered sample collected from a monitoring well. Cadmium, therefore, would not represent a potential human health threat at its current concentration level.

The ground water at the North Farm Operable Unit lacks any connection to other off-site ground water zones. A drinking water well located in this water table would only produce from 0 to 1 gallon per minute (gpm). This amount is significantly below most residential needs. EPA's remedies require the collection of ground water samples from the monitoring wells present at the North Farm Operable Unit. EPA will use the information gained from the ground water monitoring program to detect any changes in the levels of contaminants present in the water table at this site.

Table 2 is a summary of non-carcinogenic risk for human exposure to cadmium at the North Farm Operable Unit. "CDI:RfD" is the chronic daily intakes or the Reference Dose for the individual compound in units of milligrams per kilogram of body weight per day (mg/kg/day). The "average case" is based upon geometric mean concentrations of contaminants used together with the most likely exposure conditions. The "plausible maximum case" is based upon the highest concentrations of contaminants used together with high estimates for the exposure conditions. For the "plausible maximum case," one exposure route presents a risk greater than 1 (> 1), that is the route for ingestion of vegetables grown in the contaminated soils. Ingestion of ground water contaminated with cadmium present at a concentration of 19 ug/l has a risk equal to 1. As a "plausible maximum case," these exposure routes are considered remote. Deed restrictions limiting land use can prevent all future exposure scenarios evaluated. No one is currently growing vegetables in the disposal cell at the North Farm Operable Unit nor is anyone drinking the water at the site. Monitoring of the quality of the ground water at the site will enable EPA to determine if EPA's selected remedy is protective of human health and the environment.

As stated in the 1988 ROD, EPA has concluded that the site, in its present conditions, poses no current risk to human health and the environment. However, certain future risks do exist if no action is taken. Future risks can be prevented by using institutional controls which would prohibit certain future land use, such as vegetable gardening, and prevent the installation of a water supply well.

Exposures to Wildlife

Section 6.7.4 of the Remedial Investigation (RI) Report assessed the site risks to wildlife and concluded the following: "Terrestrial and avian species foraging at the site may be exposed to contaminants in the soil. Most animals, though, especially avian species, forage over a large range area relative to the size of this site. Thus, it is very unlikely that significant adverse effects at either a population or an individual level will occur."

APPLICABLE OR RELEVANT AND APPROPRIATE ENVIRONMENTAL REGULATIONS (ARARS)

In 1988, a variety of federal environmental laws were reviewed as to legal applicability or relevance and appropriateness to the remedial alternatives under consideration. Requirements under the Resource Conservation and Recovery Act (RCRA), as amended, and the Hazardous and Solid Waste Amendments (HSWA) of 1984 were found to be potentially applicable or relevant and appropriate to these remedial alternatives. Review of various State environmental laws and regulations, including those pertaining to solid and hazardous waste management, indicate that the Federal environmental laws are at least as or are more stringent than State Law.

RCRA, as amended by HSWA of 1984, regulates the generation, transportation, treatment, storage and disposal of defined hazardous waste. In the 1988 ROD for the North Farm Operable Unit, the remedy selected for the contaminated soils onsite was excavation and treatment with off-site disposal. This activity would have involved the generation of hazardous waste and thus, RCRA was designated as an ARAR. However, the amended remedy will result in the contaminated soils remaining undisturbed at the subsite; therefore, no generation of hazardous waste will occur and RCRA will no longer be an ARAR.

There are no federal or state ARARs for the selected remedies, institutional controls.

OTHER CONSIDERATIONS

Iowa Code Section 455B.426 identifies and lists sites where the disposal of a "hazardous waste" or "hazardous substance" occurred at the site either illegally or prior to regulation under Chapter 455B. The state of Iowa has notified EPA that the North Farm Operable Unit is listed on the "Registry of Hazardous Waste or Hazardous Substance Disposal Sites and Hazardous Waste Remedial Fund" Annual Report - 1992. According to the State, site use cannot change due to this listing.

MIDWEST MANUFACTURING OPERABLE UNIT

REASSESSMENT OF SITE RISK

EPA has reevaluated the site risks posed by the Midwest Manufacturing Operable Unit by reviewing the information contained within the ROD, as well as other information EPA has obtained during pre-design activities conducted at the Midwest Manufacturing Operable Unit.

EPA reviewed Appendix 8 of the RI Report, Baseline Risk, and Section VIII of the 1990 ROD to review the risks at the Midwest Manufacturing Operable Unit. The following is the summary of this review.

A list of chemicals present at the site was compiled. Chemicals were eliminated from the risk assessment if they were not detected in environmental samples, were detected infrequently, were common laboratory contaminants or if they were chemicals that were essential nutrients (and therefore relatively non-toxic). After exclusion of such chemicals, twenty-six chemicals were selected as contaminants of potential concern. These chemicals are presented in Table 5.

An exposure assessment analyzes two factors that affect the quantification of risks: potentially exposed populations and exposure pathways. In general, Superfund Exposure Assessments consider both current and future exposure scenarios.

Current human populations that potentially may be exposed on the Midwest Manufacturing Plant Site are occupational workers of the Smith Jones plant and trespassers. There are no off-site populations that would potentially be exposed to the contaminants of concern. Results of the risk assessment determined that the site, in its current conditions, poses no unacceptable health risk.

Currently, the Smith Jones property is zoned for industrial use and a county ordinance prohibits residential construction on a floodplain. Therefore, it was assumed that any future development would be industrial in nature and future onsite populations would be engaged in similar occupational activities as current ones. Future occupational workers could be exposed via contaminated drinking water if a well was drilled onsite. Future offsite residential populations are assumed to be the same statistically as current populations. These populations could be exposed to contaminated drinking water if a drinking water well were installed into a plume that originated from the site.

Ten exposure pathways were selected for further quantitative evaluation from a list of 27 exposure pathways presented in the Risk Assessment report. These ten were selected because they were thought to present the highest potential for adverse health effects resulting from site exposures.

Current routes with the highest exposure routes were all related to contaminated soils and wastes. No ground water exposure routes were evaluated since this route is not complete. The baseline risk assessment report did not identify any current human health risks posed by the site.

For the evaluation of the future potential exposure routes, seven future potential exposure routes were evaluated in the Risk Assessment report. Exposure scenarios are listed in Table 3 with the individuals exposed, routes and media identified.

Table 4 is a summary of the carcinogenic risk posed by the site. Only future risks were found to be of concern. Onsite workers may experience a slight increase in excess cancer risk from

contact with contaminants arsenic, beryllium and vinyl chloride in soil and a greater risk (a one in one thousand) from ingestion of the same contaminants in the ground water, if an onsite water supply well was installed onsite and provided contaminated water for consumption. The presence of both arsenic and beryllium in the ground water is not a result of plant activities since these contaminants were present both on-site and off-site and therefore, are considered to be naturally occurring.

Vinyl chloride was present in 4 out of 26 ground water samples, twice in one well at a level of approximately 40 ug/l. The Maximum Contaminant Level (MCL)[1] for vinyl chloride is 2 ug/l. The only potential exposure route of concern is that of the ingestion of contaminated ground water.

Future site risks can be prevented through the use of "institutional controls" such as deed restrictions which would limit land use and development and would prevent the installation of a water supply well [2] and access restrictions which would prevent access to the waste disposal areas and prevent the exposure of the trespasser to the hazardous wastes which remain on-site. A perimeter fence would prevent dermal exposure to any soil contaminants. A ground water monitoring program, for any supply wells, either public or private, within a one mile radius of the site, will be used to determine the presence of any contaminants within the area water supply.

Table 5 lists the twenty-six chemicals which were selected as contaminants of potential concern of which three, arsenic, beryllium and vinyl chloride were determined to be indicative of on-site contamination. Populations that maybe potentially exposed to on-site contaminants are occupational workers of the Smith Jones plant and site trespassers. There is no current offsite exposure. The levels of contamination present at the site are not expected to cause adverse health effects.

Tables 6 and 7 present a summary of the sub-chronic noncarcinogenic health hazards associated with the Midwest Manufacturing Operable Unit and a summary of the chronic non-carcinogenic health hazards associated with the Midwest Manufacturing Operable Unit, respectively.

Exposures to Wildlife

Section IX of the 1990 ROD stated the following: "An ecological assessment was conducted to determine if there are any adverse effects occurring or likely to occur in aquatic organisms, populations or communities exposed to contaminants originating from the site. Three river sediment samples were collected at an upstream and at a downstream location from the site, for a total of six sediment samples. Analysis of these samples did not indicate the presence of metals at concentrations that would pose an adverse threat to aquatic organisms. This conclusion is further supported by the results obtained from analysis of two biological samples collected from an upstream and a downstream location from the site. Analysis of these two samples indicated that there was no uptake of metals by these organisms.

No federal or state critical habitats, endangered wildlife or natural resources are potentially threatened or damaged as a result of past waste disposal practices conducted at the site."

NEW SITE DATA

In December, 1991, EPA conducted a pump test. The information gained from this test indicated that the aquifer is less permeable than previous data indicated. This lack of aquifer permeability lengthens the ground water remediation time from 25 years to 35 years which, in turn, increases the overall cost of the extraction and treatment component of the 1990 ROD. EPA's preliminary design also included an increase in the number of extraction wells from 5 to 8 as necessary for site remediation.

1 The Maximum Contaminant Level or MCL is the level at which a contaminant can be present within the ground water without causing adverse effects.

2 Deed restrictions which limit land use are sometimes referred to as "use restrictions."

APPLICABLE OR RELEVANT AND APPROPRIATE ENVIRONMENTAL REGULATIONS (ARARS)

In 1990, a variety of federal environmental laws were reviewed as to legal applicability or relevance and appropriateness to the remedial alternatives under consideration. Requirements under RCRA, as amended, and HSWA of 1984 were found to be potentially applicable or relevant and appropriate to the hazardous sludge present at the site. The State of Iowa provided a list of its statutes that may be applicable or relevant and appropriate to this site. Chapter 133 of the Iowa Administrative Code was one statute identified which provided more stringent requirements than the federal law.

RCRA, as amended by HSWA of 1984, regulates the generation, transportation, treatment, storage and disposal of defined hazardous waste. In the 1990 ROD for the Midwest Manufacturing Operable Unit, the remedy selected for the contaminated soils onsite was installation of a landfill cap of the waste disposal area and extraction and treatment of the contaminated ground water. These activities would have involved the generation of hazardous waste and thus, RCRA was designated as an ARAR. However, the amended remedy will result in the contaminated soils and ground water remaining undisturbed at the subsite; therefore, no generation of hazardous waste will occur and RCRA will no longer be an ARAR.

For the contamination present in the ground water, in 1990, the state of Iowa determined that "active" cleanup, that is extraction of the contaminated ground water with treatment to meet MCLs was necessary to meet the criteria of Chapter 133. In 1993, the State of Iowa expressed to EPA its position regarding Chapter 133 of Iowa's Code that "passive cleanup" satisfies the state's ARAR. "Passive cleanup" entails leaving the contamination in the ground water and allowing natural processes to remediate the site. This is also referred to as "natural attenuation." The selected amended remedial alternative would meet this state ARAR.

OTHER CONSIDERATIONS

Iowa Code Section 455B.426 identifies and lists sites where the disposal of a "hazardous waste" or "hazardous substance" occurred at the site either illegally or prior to regulation under Chapter 455B. The state of Iowa has notified EPA that the Midwest Manufacturing Operable Unit is listed on the "Registry of Hazardous Waste or Hazardous Substance Disposal Sites and Hazardous Waste Remedial Fund" Annual Report - 1992. According to the State, site use cannot change due to this listing.

IV. DESCRIPTION OF ORIGINAL REMEDIES AND AMENDED REMEDIES

NORTH FARM OPERABLE UNIT

The ROD for the North Farm Operable Unit addresses the contaminated soils present within the disposal cell. The original ROD requires excavation of the contaminated soils within and around the disposal cell that contains cadmium concentration levels exceeding a health based action level of 13 milligrams per kilogram (mg/kg). The excavated soil would then be treated using stabilization technology to the point where that the leachate contaminant concentrations no longer exceed established criteria. After treatment, the excavated soil would be disposed into a permitted RCRA Subtitle C disposal facility. The excavated area must be backfilled and graded with clean soil to support a vegetative cover. This remedy represents RCRA's Landfill Clean Closure Option as defined in 40 CFR Part 264, Subpart N, and therefore, requires no long-term monitoring or deed restrictions. The 1988 ROD estimated the cost for the total project to be \$220,185. In 1993, total project costs are now estimated at approximately \$403,000. Increase design costs (from approximately \$51,000 to approximately \$160,000) contributed the largest share of the increased costs. Also, cost for the transportation and disposal of the waste significantly increased.

The response action now being selected for the North Farm Operable Unit is what was described as the "No Action" alternative in the 1988 ROD, with the addition of ground water monitoring and deed restrictions. Under this remedy, no specific response action would be taken to remove the contaminants at the site or control their migration from the site. Deed restrictions, placed on the property, would prevent the installation of a water supply well and the use of the disposal cell area as a vegetable garden. The deed would also state that hazardous substances remain at this site. Project costs are estimated to be \$27,100 (\$10,400 for the first year [sample 3

ground water wells quarterly] plus costs for deed restrictions. \$15,300 Present Worth estimate for years 1-4 with semi-annual sampling events, collection and analysis costs for each water sample were estimated to be \$665 per sample with a 30% contingency at an 8% interest rate. Cost for deed restrictions are estimated to be \$1,454.

EPA's response action will include the collection of ground water samples from the three existing ground water monitoring wells at the North Farm Operable Unit. Analytical results from these ground water samples will be evaluated to aid EPA in verifying that no unacceptable exposures are occurring. During the first year of monitoring, ground water samples will be collected quarterly and analyzed for both total and dissolved metals. Once four consecutive quarters of data are available, EPA will evaluate the information and determine the need to collect further samples. This evaluation will focus on the levels of cadmium, zinc and nickel present in both the dissolved and total samples. EPA will reduce the frequency of sampling if the data indicates that the contamination present does not exceed drinking water standards for cadmium, zinc and nickel^[3]. If the analytical results indicate that contamination is migrating from the North Farm Operable Unit, the sampling program will be expanded to determine the rate and extent of migration and the response action at the North Farm Operable Unit will be reevaluated. Because this remedy will result in hazardous substances remaining on-site above drinking water standards, a review will be conducted to ensure that this remedy continues to provide adequate protection of human health and the environment within five (5) years after commencement of the remedial action.

MIDWEST MANUFACTURING OPERABLE UNIT

The original ROD for the Midwest Manufacturing Operable Unit addresses the contaminated ground water and the contaminated soils in the disposal trench area. The original selected remedy provides for ground water treatment and capping of the waste disposal cell in accordance with the RCRA landfill closure and post-closure requirements as described in 40 C.F.R. 264 Subparts G and N. The design life of the cap is estimated to be 30 years. Postclosure care requirements would include maintenance of the final cover and maintenance of the ground water monitoring system. The total project cost increased considerably from the 1990 ROD estimate of \$488,844 to a current estimate of \$1,091,531. Increased design costs (from approximately \$89,000 to approximately \$249,000) contributed the largest percentage share of the increased costs, Operation and Maintenance costs increased from an estimated \$200,000 to an estimated \$460,000, and construction costs increased from an estimated \$200,000 to an estimated \$310,000.

The remedy now being selected for the Midwest Manufacturing Operable Unit is described as Alternative #1 "No Action with Ground Water Monitoring" in the ROD of September 1990 with the addition of a perimeter fence to limit access to the disposal areas at the plant site. No specific response action will be taken to remove and/or otherwise control the migration of the contaminants at the Operable Unit. Institutional and engineering controls, such as deed restrictions and perimeter fencing will be implemented. Deed restrictions will prevent the installation of a ground water supply well thereby preventing the use of the contaminated on-site ground water. A long-term ground water monitoring program will be implemented. A private water well survey will be conducted to identify all private water supply wells within one mile of the site. Any private water wells identified through this survey will be included in the ground water monitoring program.

Two new monitoring wells will be installed, one off-site to the west of the property between the site and the city water supply Well No. 2, and one in the northeast corner of the property between the site and city water supply Well No. 1 (see figure 3). These two wells, in conjunction with four of the existing monitoring wells in the southern portion of the site, the three public supply wells and any private water supply wells identified within the one mile radius of the site, will be sampled quarterly to track long-term changes in the contaminant concentrations in ground water. Water samples will be analyzed for volatile organics and both total and dissolved metals. The water samples from these wells will allow EPA to identify any

3 The May 1993 drinking water standards and health advisories for the contamination at the North Farm site are: cadmium 5 ug/l; nickel 100 ug/l and zinc 500 ug/l. Cadmium and nickel are MCLs. Zinc is a secondary maximum contaminant level, which means that it is for aesthetics.

tendency for contaminant migration towards the city water supply wells, and will monitor the concentration of contaminants in on-site ground water. Samples from the public supply system and any private supply wells will provide information concerning the quality of the existing water supply.

After the collection and evaluation of the analytical results of the first round of ground water samples, EPA may require the sampling of additional existing monitoring wells. Once the ground water data base contains four consecutive quarters of data, EPA will determine the sampling strategy for the next year. If data obtained from a ground water monitoring well indicates that the ground water meets or does not exceed MCLs for the chemicals of concern at the Midwest Manufacturing Operable Unit for two consecutive sampling events, the monitoring well will then be sampled on an annual basis. Once the water from a monitoring well meets the MCLs for two years, the well will no longer be sampled. Water supply wells will be sampled quarterly for the first two years. EPA and the State of Iowa will determine the long-term sampling frequency for all water supply wells.

Public access is somewhat restricted at the site perimeter. There is evidence that the public can enter the site from the Holmdahl park area and has used the area to ride all terrain vehicles and other vehicles south of the plant site bordering the North Skunk river. A perimeter fence must be installed to prevent public access to any of the disposal areas which contain sludge from the past disposal activities. EPA has estimated the cost of fencing to be \$20 per foot, including design costs. EPA estimates that up to 400 feet of fencing is needed and the cost of the fencing should be approximately \$11,000 with a 30% contingency added. Maintenance of the perimeter fence is estimated to be less than \$100/year.

Project costs for the implementation of the original remedy have increased to \$1,091,531, (up from 1990 ROD estimate of \$488,844). The cost of the amended remedy is estimated at \$118,530 (Alternative 1 in ROD issued September, 1990 plus monitoring of city supply wells quarterly for the first year which is 36 water samples at \$665/sample or \$31,100 with a 30% contingency). Design, engineering and construction costs are estimated to be approximately \$47,000. Total present value of the monitoring costs for years 2-5 of the project are estimated to be \$40,400 estimated at an 8% interest rate. Fencing costs are estimated to be approximately \$11,000. Cost of deed restrictions is estimated to be \$1454.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted to ensure that this remedy continues to provide adequate protection of human health and the environment within five (5) years after commencement of the remedial action.

V. COMPARATIVE ANALYSIS OF THE ORIGINAL AND AMENDED REMEDIES

The NCP sets forth nine evaluation criteria which serve as a basis for comparing the remedial alternatives for final actions. The nine criteria are divided into three categories: Threshold Criteria, Primary Balancing Criteria, and Modifying Criteria. If any remedial alternatives identified during the Feasibility Study do not meet the Threshold Criteria (Criteria 1 and 2), EPA will not consider them as possible final remedies. If the alternatives satisfy the Threshold Criteria, they then are evaluated against the next five criteria, called the Primary Balancing Criteria. These criteria are used to compare the remedial alternatives against each other in terms of effectiveness, implementability, and cost. The final two criteria, state acceptance and community acceptance, are called Modifying Criteria. The alternatives are compared against the Modifying Criteria after the state and the community have reviewed and commented on the Proposed Plan and the other alternatives considered by EPA.

NORTH FARM OPERABLE UNIT

The following is a discussion of the nine criteria used by EPA for remedy selection.

A. Threshold Criteria:

1. Overall Protection of Human Health and the Environment

EPA assesses the degree to which the alternatives would eliminate, reduce, or control threats to public health and the environment through removal, containment, and/or institutional controls. An alternative is normally considered to be protective of human health if the excess cancer risk is reduced to less than 1 in 1,000,000 (10^{-6}) and risks do not pose noncarcinogenic health risks {Hazardous Index (HI) <1}.^[4] The contamination at the North Farm Operable Unit poses no current risks to human health or the environment. Future risks can be controlled by institutional controls, that is, deed restrictions which will be placed on the property to prevent the installation of a ground water well and any vegetable gardening in the disposal cell. Monitoring of the quality of the ground water will assist EPA in determining if this action continues to be protective of human health and the environment.

2. Compliance with all Applicable or Relevant and Appropriate State and Federal Environmental Regulations

EPA assesses whether the remedial alternatives being evaluated would comply with all applicable or relevant and appropriate requirements, called ARARs, established by the state and federal government. The 1988 ROD identified RCRA as relevant and appropriate for the soils removed from the North Farm Operable Unit. The amended ROD leaves all soils in place, therefore, RCRA is not applicable to this action.

There are no federal or state ARARs for the selected remedy, institutional controls. No chemical-specific, action-specific or location-specific ARARs were identified for the implementation of the selected amended alternative.

B. Primary Balancing Criteria:

1. Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once clean up goals have been met. Institutional controls, in the form of deed restrictions, would prevent exposure to contaminants present at the North Farm Operable Unit. These restrictions will apply to this property regardless of any subsequent change in ownership, thereby offering long-term effectiveness and permanence of the selected amended remedy. EPA has no evidence that the levels of contamination at the site pose a current risk to either human health or the environment. The amended remedy is as protective as the original remedy since any future exposure to hazardous substances will be prevented by its implementation. The amended remedy for the North Farm Operable Unit is preferable to EPA.

Since contamination will remain on-site, EPA will conduct a 5-year review of this amended remedy to determine if it continues to be protective of human health and the environment and remains effective in the long-term.

The selected amended remedy does not utilize permanent solutions or alternative treatment technologies.

⁴ The Hazardous Index rating does not exceed 1.

2. Reduction of Toxicity, Mobility, or Volume Through Treatment

Section 121(b) of CERCLA states that remedial actions involving treatment, which permanently and significantly reduce the volume, mobility or toxicity of hazardous materials, are to be preferred over those not involving such treatment. This evaluation criteria relates to the ability of a remedial alternative to control or eliminate risks caused by the mobility, toxicity or volume of a hazardous waste. The proposed remedy would have limited impact on the toxicity, volume or mobility of the hazardous substances at the North Farm Operable Unit since no treatment would be employed.

Information gained by EPA from the ground water monitoring program will be used to evaluate the mobility of contaminants at the site. The toxicity and volume of the contaminants will decrease due to natural attenuation processes. Natural attenuation will achieve the same reductions as the original remedy, only it will take longer to achieve these reductions. The rate of reduction due to natural attenuation processes will be evaluated during the ground water monitoring program. The originally selected remedy is the only remedy which considers treatment.

3. Short-Term Effectiveness

Short-term effectiveness evaluates the length of time needed to implement each segment of the alternatives. EPA considers the risks that a particular activity may pose to site workers, nearby residents, or the local environment. Short-term effectiveness involves the period of time needed to achieve protection and considers any adverse impacts on human health and the environment that may be posed during the construction and implementation period until clean up goals are achieved.

As the amended remedy requires no construction or excavation activities, the amended remedy would be more effective in the short term than the previously selected remedy. The previously selected remedy employing excavation, solidification and disposal would disturb the contaminated soils which could potentially affect site workers. Worker exposure could potentially occur through direct contact, ingestion or inhalation of contaminated soil particles. Therefore, the amended remedy is more effective in the short-term than the previously selected remedy.

4. Implementability

EPA considers how difficult the alternative is to construct and operate, how other government agencies and EPA will coordinate monitoring programs and the availability of goods and services and personnel needed to implement and manage the alternative. Implementability addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.

Both the original and selected remedies are readily implementable. The amended remedy (institutional controls including deed restrictions, land use restrictions and ground water monitoring), is more easily implemented than the original remedy (excavation, solidification and disposal). In addition, the amended remedy requires no additional construction activities and, as such, it can be implemented within a short timeframe.

5. Cost

EPA considers capital costs, operation and maintenance costs, and present worth, which is the cost of the activities that will take place until the remedial action is completed. Capital costs apply to activities such as construction, land and site development, and disposal of waste materials. Annual operation and maintenance costs are spent on activities such as ongoing operation of equipment, insurance and periodic site reviews.

CERCLA requires that the EPA select a cost-effective alternative that protects human health and the environment and meets other requirements of the law. EPA has determined that the selected remedy is as protective and is more cost effective than the original remedy for the North Farm Operable Unit. Project costs are estimated to be less; specifically, \$403,000 for the original remedy versus \$27,100 (\$10,400 for the first year [sample 3 ground water wells quarterly] plus costs for deed restrictions). \$15,300 is the Present Worth estimate for years 1-4 with semi-annual sampling events, with each water sample collection and analysis cost estimated to be

\$665 per sample with a 30% contingency included at an 8% interest rate. Costs for deed restrictions are estimated to be \$1,454.

C. Modifying Criteria:

1. State Acceptance

The State of Iowa, through the IDNR, is supportive of the amended remedy for the North Farm Operable Unit. The State of Iowa prefers the amended remedy to the originally selected remedy.

2. Community Acceptance

EPA held a public comment period to allow the community to comment on the preferred alternative as set forth in the Proposed Plan and the other alternatives considered. Community response addresses the concerns of the public regarding acceptance of a particular remedy. EPA has responded to public comments received for consideration in the attached responsiveness summary. The community was opposed to the original remedy for the North Farm Operable Unit. Community response indicated that the public did not perceive the contamination at the North Farm Operable Unit as presenting any significant threat to human health or the environment.

In comparing the originally developed and selected North Farm Operable Unit remedy with the amended remedy, EPA has determined that the original and amended remedy meet the threshold criteria: overall protection of human health and the environment and compliance with state and federal requirements.

The selected amended remedy for the North Farm Operable Unit presents the better balance of tradeoffs, with respect to the primary balancing criteria, in particular with respect to cost, implementability, and short-term effectiveness. While this amended remedy does not meet the statutory preference for reduction of toxicity, mobility or volume through treatment, EPA's reevaluation of the risks at the site has lead EPA to determine that the levels of hazardous substances remaining at the site do not warrant active treatment. For the modifying criteria of state and community acceptance, the amended alternative is preferred by both the state of Iowa and the community of Kellogg. In the tradeoff and balancing of all nine criteria, the proposed remedy is EPA's selected remedy.

MIDWEST MANUFACTURING OPERABLE UNIT

The following is a discussion of the nine criteria used by EPA for remedy selection.

A. Threshold Criteria:

1. Overall Protection of Human Health and the Environment

EPA assesses the degree to which the alternatives would eliminate, reduce, or control threats to public health and the environment through removal, containment, and/or institutional controls. An alternative is normally considered to be protective of human health if the excess cancer risk is reduced to less than 1 in 1,000,000 (10⁻⁶) and risks do not pose noncarcinogenic health risks (HI <1).^[5]

The contamination at the Midwest Manufacturing Operable Unit poses no current risks to human health or the environment. Future risks can be controlled by institutional controls, that is deed restrictions to prevent the installation of a water supply well, and engineering controls, specifically, the installation of a secure perimeter fence to prevent access to contaminated soils. Monitoring of the quality of the ground water will assist EPA in determining if this action continues to be protective of human health and the environment.

5 The Hazardous Index rating does not exceed 1.

2. Compliance with all Applicable or Relevant and Appropriate State and Federal Environmental Regulations

EPA assesses whether the remedial alternatives being evaluated would comply with all applicable or relevant and appropriate requirements, called ARARs, established by the state and federal government. The 1990 ROD identified RCRA as relevant and appropriate for the contaminated soils present at the Midwest Manufacturing Operable Unit. The amended ROD leaves all soils in place, therefore, RCRA is not applicable to this action. The original ROD identified the Clean Water Act (CWA) as an ARAR for the ground water extraction and treatment system. The amended remedy leaves all ground water in place, therefore the requirements of the CWA are not ARARS. The original ROD identified Chapter 133 of the Iowa Code as an ARAR and determined that "active" cleanup was necessary to meet this ARAR. The state of Iowa has indicated that "passive" cleanup or natural attenuation will meet the requirements of Chapter 133.

The selected amended remedy would comply with all federal and state ARARs.

B. Primary Balancing Criteria:

1. Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once clean up goals have been met. EPA has no evidence that the levels of contamination at the site affect either human health or the environment, therefore, the amended remedy is as protective of human health and the environment as the original remedy. Since contamination will remain on-site, EPA will conduct a 5 year review of this amended remedy to determine if it remains effective in the long-term.

2. Reduction of Toxicity, Mobility, or Volume Through Treatment

Section 121(b) of CERCLA states that remedial actions involving treatment, which permanently and significantly reduce the volume, mobility or toxicity of hazardous materials, are to be preferred over those not involving such treatment. This evaluation criteria relates to the ability of a remedial alternative to control or eliminate risks caused by the mobility, toxicity or volume of hazardous material. The proposed remedy would have limited impact on the toxicity, volume or mobility of the hazardous substances at the Midwest Manufacturing Operable Unit since no treatment would be employed.

Information gained by EPA from the ground water monitoring effort will be used to evaluate the migration of contamination from the site. The toxicity and volume of the contaminants will remain at the same level or will be reduced due to natural attenuation. Natural attenuation will achieve the same reductions as the original remedy, only it will take longer to achieve these reductions. The rate of reduction due to natural attenuation processes will be evaluated during the ground water monitoring program. Information from the RI indicates that the contaminants remain on-site and are not migrating off-site. The originally selected remedy is the only remedy which considers treatment.

3. Short-Term Effectiveness

Short-term effectiveness evaluates the length of time needed to implement each segment of the alternatives. EPA considers the risks that conducting a particular activity may pose to site workers, nearby residents, or the local environment. Short-term effectiveness involves the period of time needed to achieve protection and considers any adverse impacts on human health and the environment that may be posed during the construction and implementation period until clean up goals are achieved.

The amended remedy would have short term risks during the installation of the fence and any additional monitoring well(s) needed. These elevated levels of risks will be limited and can be addressed by the Health and Safety Plan for all on-site workers involved in the field work. The previously selected remedy employing installation of a cap and the ground water extraction and treatment system would disturb the contaminated soils which could potentially affect site workers. Worker exposure could potentially occur through direct contact, ingestion or inhalation of contaminated soil particles. Therefore, the amended remedy is more effective in the short-term than the previously selected remedy.

4. Implementability

EPA considers how difficult the alternative is to construct and operate, how other government agencies and EPA will coordinate monitoring programs and the availability of goods and services and personnel needed to implement and manage the alternative. Implementability addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.

Both the original and selected remedy are readily implementable. The amended remedy (institutional controls including deed and access restrictions, fencing and ground water monitoring), is more easily implemented than the original remedy (capping of disposal cell area with ground water extraction and treatment). In addition, the amended remedy involves limited construction activities and, as such, it can be implemented within a shorter timeframe.

5. Cost

EPA considers capital costs, operation and maintenance costs, and present worth, which is the cost of the activities that will take place until the remedial action is completed. Capital costs apply to activities such as construction, land and site development, and disposal of waste materials. Annual operation and maintenance costs are spent on activities such as ongoing operation of equipment, insurance and periodic site reviews.

CERCLA requires that the EPA select a cost-effective alternative that protects human health and the environment and meets other requirements of the law. EPA has determined that the selected remedy is as protective as and is more cost effective than the original remedy for the Midwest Manufacturing Farm Operable Unit. In a comparison based upon current costs, the cost of the ground water extraction and treatment system has risen due to the low-yielding aquifer and the subsequent increase in the number of extraction wells the system would require.

Project costs for the implementation of the original remedy increased to \$1,091,531, (up from 1990 ROD estimate of \$488,844). The amended remedy is estimated at \$118,530 (Alternative 1 in ROD issued September, 1990 plus monitoring of city supply wells (see figure 3) quarterly for the first year which is 36 water samples at \$665/sample or \$31,100 with a 30%contingency). Design, engineering and construction costs are estimated to be approximately \$47,000. Total present value of the monitoring costs for years 2-5 of the project are estimated to be \$40,400 estimated at 8% interest. Fencing costs are estimated to be approximately \$11,000 based upon a cost of \$20 per linear foot (including design cost) with a 30% contingency. Deed restrictions are estimated to be \$1454.

Cost estimates for each water sample collected and analyzed in support of this ROD Amendment are derived from Appendix I of the Feasibility Study for the Midwest Operable Unit, Midwest Manufacturing/North Farm Superfund site, Kellogg, Iowa dated August 23, 1990. A 30% contingency was added to these costs. 8% interest was used for present value for all future costs.

C. Modifying Criteria:

1. State Acceptance

The State of Iowa, through the IDNR, is supportive of the amended remedy for the Midwest Manufacturing Operable Unit. The State of Iowa prefers the amended remedy to the originally selected remedy.

2. Community Acceptance

EPA held a public comment period to allow the community to comment on the preferred alternative as set forth in the Proposed Plan and the other alternatives considered. EPA's responses to these comments are included in the Responsiveness Summary section of this document.

Community response addresses the concerns of the public regarding acceptance of a particular remedy. EPA offered the community an opportunity to comment on the Proposed Plan for the Midwest Manufacturing Operable Unit. The community was opposed to the original remedy for the Midwest Manufacturing Operable Unit. Community response indicated that the public did not perceive the Midwest Manufacturing Operable Unit as presenting any significant threat to human

health or the environment.

In comparing the originally developed and selected Midwest Manufacturing Operable Unit remedy with the amended remedy, EPA has determined that the original and amended remedy meet the threshold criteria: overall protection of human health and the environment and compliance with state and federal requirements..

The selected amended remedy for the Midwest Manufacturing Operable Unit presents the better balance of tradeoffs, with respect to the primary balancing criteria, in particular with respect to costs, implementability, and short-term effectiveness. While this amended remedy does not meet the statutory preference for reduction of toxicity, mobility or volume through treatment, EPA's reevaluation of the risks at the site has lead EPA to determine that the levels of hazardous substances remaining at the site do not warrant active treatment. For the modifying criteria of state and community acceptance, the amended remedy is preferred. In the tradeoff and balancing of all nine criteria, the proposed remedy is EPA's selected remedy.

VI. STATUTORY DETERMINATIONS

NORTH FARM OPERABLE UNIT

GROUND WATER

Since the selected amended remedy and the original remedy are identical with respect to ground water, no new statutory determinations are made herein.

SOILS

The EPA has determined, and the State of Iowa concurs, that the selected amended remedy herein satisfies the statutory requirements specified in CERCLA Section 121 which state that the selected remedy must protect human health and the environment and comply with applicable or relevant and appropriate federal and state requirements. The amended remedy meets the statute's further preference that the remedy be cost-effective, utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. While this amended remedy not meet the statute preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity or mobility of hazardous substances as a principal element, in the balance and tradeoff's, EPA finds it to be the preferred remedy.

MIDWEST MANUFACTURING OPERABLE UNIT

GROUND WATER

The EPA has determined, and the State of Iowa concurs, that the selected amended remedy herein satisfies the statutory requirements specified in CERCLA Section 121 which state that the selected remedy must protect human health and the environment and comply with applicable or relevant and appropriate federal and state requirements. The amended remedy meets the statute's further preference that the remedy be cost-effective, utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. While this amended remedy not meet the statute preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity or mobility of hazardous substances as a principal element, in the balance and tradeoff's, EPA finds it to be the preferred remedy.

SOILS

The EPA has determined, and the State of Iowa concurs, that the selected amended remedy herein satisfies the statutory requirements specified in CERCLA Section 121 which state that the selected remedy must protect human health and the environment and comply with applicable or relevant and appropriate federal and state requirements. The amended remedy meets the statute's further preference that the remedy be cost-effective, utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. While this amended remedy not meet the statute preference for remedies that employ

treatment that permanently and significantly reduce the volume, toxicity or mobility of hazardous substances as a principal element, in the balance and tradeoff's, EPA finds it to be the preferred remedy.

**RESPONSIVENESS SUMMARY
RECORD OF DECISION AMENDMENT
MIDWEST MANUFACTURING/NORTH FARM SITE
NORTH FARM OPERABLE UNIT
MIDWEST MANUFACTURING OPERABLE UNIT**

In accordance with CERCLA Section 117, a public comment period was held from February 18, 1993 to March 19, 1993, to allow interested parties to comment on EPA's proposed plan for the Record of Decision Amendment for the North Farm Operable Unit and the Midwest Manufacturing Operable Unit at the Midwest Manufacturing/North Farm site, Kellogg, Iowa.

EPA offered to hold a public meeting if requested. No requests for such a meeting were received.

EPA received a total of three written comments on the proposed plan; however, only one of those was received during the public comment period. The Iowa Department of Natural Resources (IDNR) requested that EPA modify the ground water monitoring program proposed for each operable unit based upon the information collected. EPA has modified the monitoring program in the following manner: On a yearly basis, EPA and the State of Iowa will review the analytical results from the public and private supply wells and from the monitoring wells to determine if any modifications to the monitoring program are needed for the upcoming year. EPA and the State will review the location of the wells tested and the quantity and identity of the contaminants present. If the review indicates that the contamination is migrating in the direction of the public or private supply wells or off-site, additional monitoring well locations may be sampled or a more frequent sampling effort may be implemented to verify the movement of the contaminants or the threat posed to either the public water supply or a private water supply. If the ground water samples are found to be at or below the MCLs for the chemicals of concern at each of the operable units, then the sampling frequency will be reduced. All public and private supply wells within one mile of the Midwest Manufacturing Operable Unit will be tested quarterly for the first two years of remediation.

TABLE 1

CONTAMINANTS OF CONCERN/HEALTH RISK

GROUND WATER

Contaminant	Dissolved Concentration Level	Total Concentration Level	Hazard Index	Exposure Pathway	Health Based Action Level (ug/l)
Cadmium	ND(5 ug/l)	19 ug/l	=1	Ingestion	18
Manganese	82-140 ug/l	520-2100 ug/l	<1	Ingestion	7700

WASTE MATERIAL/CONTAMINATED SOIL

Level Contaminant (mg/kg)	Concentration Detected	Background Concentration	Hazard Index	Exposure Pathway	
Cadmium	0.67-830 mg/kg	0.67 mg/kg	>1	Ingestion of vegetables grown in contaminated soil	13
Cyanide	ND(0.030)-1.2 mg/kg	0.058 mg/kg	<1	Ingestion of vegetables grown in contaminated soil	N/A

NOTES: N/A = Not Applicable
 mg/kg = milligrams per kilogram
 ug/l = micrograms per liter
 ND = not detected at levels within ()