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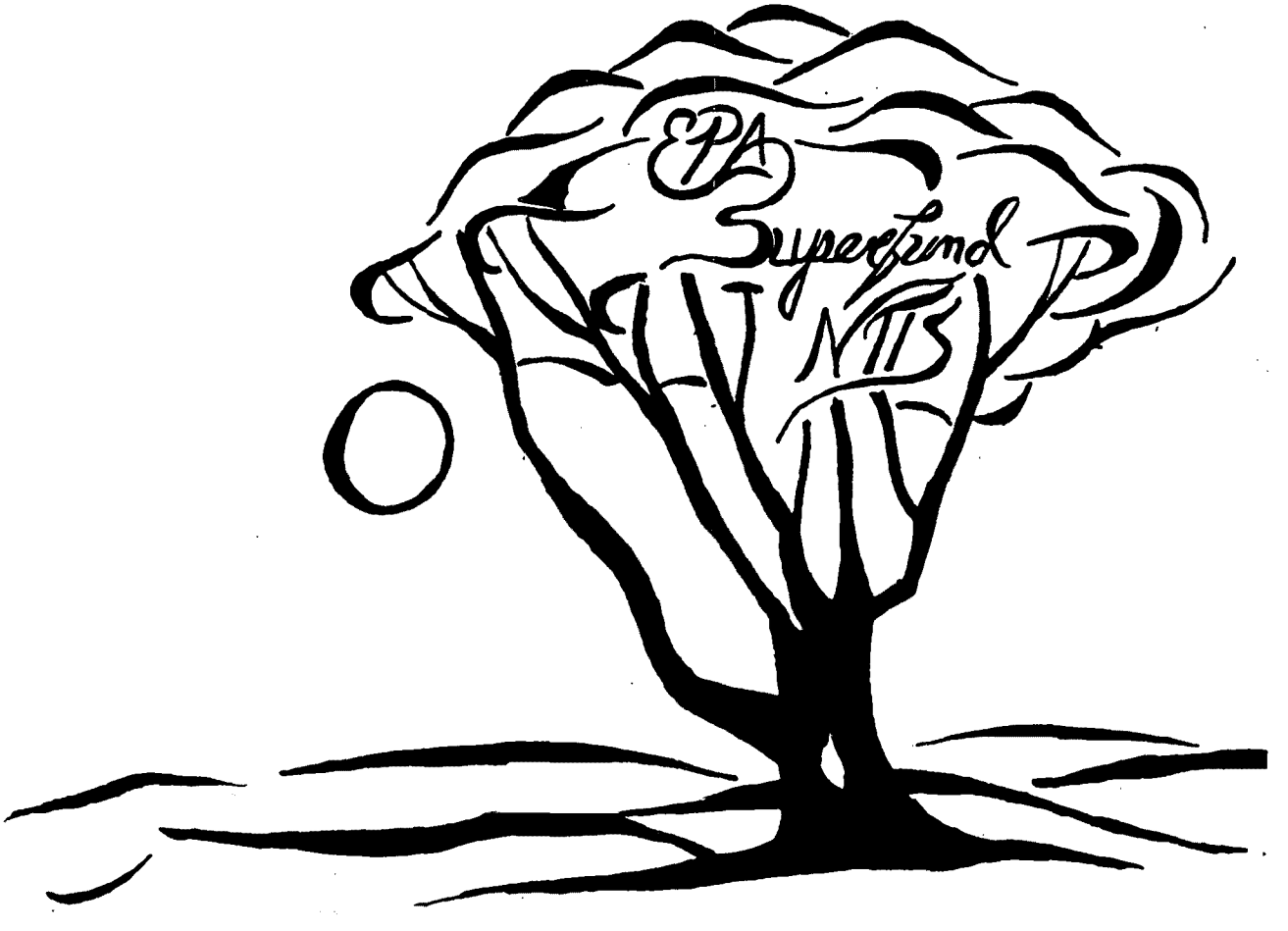
EPA Superfund Record of Decision:

Auto Ion Chemicals, Inc. (O.U. 2), Kalamazoo, MI 9/23/1994



DECLARATION

SELECTED REMEDIAL ALTERNATIVE
FOR THE
AUTO ION SUPERFUND SITE
OPERABLE UNIT 2
KALAMAZOO, MICHIGAN

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Auto Ion site (Operable Unit 2), Kalamazoo, Michigan which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this site.

Assessment of the Site

U.S. EPA has determined that conditions at the Auto Ion site pose no current or potential unacceptable risk to human health or the environment. While the Auto Ion site does exhibit elevated levels of heavy metals and some organics, calculations of potential future risk indicate that the contamination will not likely pose an unacceptable risk to human health or the environment. Accordingly, no active remediation for the groundwater operable unit is necessary to ensure protection of human health and the environment. U.S. EPA will however, establish Alternate Concentration Limits (ACLs) for groundwater, monitor groundwater to ensure that the ACLs are not exceeded, and use instititutional controls to help assure that groundwater beneath the site does not pose a risk to human health or the environment.

Description of the Selected Remedy

The purpose of this remedy is to establish Alternate Concentration Limits (ACLs) for groundwater and institute a groundwater monitoring program that will ensure that groundwater does not pose a risk to human health or the environment. It should be noted that the soil cleanup conducted in 1993 will have a significant impact on groundwater quality due to the fact it removed the vast majority of the source to further groundwater contamination.

The major components of the selected remedy include:

- Institutional controls to limit groundwater use;

- Establishment of Alternate Concentration Limits (ACLs);

- Monitoring of ground water to ensure ACLs are not being exceeded.

- Development of a Remedial Action Plan for groundwater.

Statutory Determinations

The selected remedy is protective of human health and the environment and complies with Section 121(d)(2)(B)(ii) of CERCLA for the establishment of ACLs for groundwater and is cost effective. This remedy does not satisfy the statutory preference for remedies that reduce the toxicity, mobility, or volume through treatment as a principal element because treatment was not found to be practicable.

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

U.S. EPA has determined that its response at this site is complete. Therefore, the site now qualifies for inclusion on the Construction Completion List.

State Concurrence

The State of Michigan does not concur with the selected remedy. The Letter of Non-Concurrence is attached to this ROD.

Valdas V. Adamkus — Date

Valdas V. Adamkus
Regional Administrator

TABLE OF CONTENTS

	Page
A. Site Location	1
B. Site History	1
C. Highlights of Community Participation	4
D. Summary of Current Site Condition	4
E. Summary of Site Risks	6
F. Scope of the Remedy	9
G. Description of Alternatives	9
H. Summary of Comparative Analysis of Alternatives	11
I. The Selected Remedy	14
J. Statutory Determinations	15
K. Summary	18

Glossary

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

A. SITE LOCATION AND DESCRIPTION

The Auto-Ion site is located at 74 Mills Street in a commercial/industrial district of northeast Kalamazoo. The site covers approximately 1.5 acres and is located along the north bank of the Kalamazoo River.

B. SITE HISTORY

The City of Kalamazoo operated a coal burning electrical generating station on the site between 1914 and 1956. The Auto Ion Chemical Company purchased the property in 1964 and operated a waste treatment facility for electroplating wastes. Waste treatment operations included cyanide destruction and precipitation of heavy metals with the disposal of heavy metal sludges in an on-site lagoon. During these operations, poor waste handling practices resulted in multiple spills onto the surface soil at the site as well as illegal discharges to the Kalamazoo River and city sewers. Due to the poor waste handling practices, the State of Michigan refused to renew Auto Ion's license to operate in 1973. The facility was then abandoned by the Auto Ion Co.

In 1982, U.S. EPA proposed the Auto Ion site for inclusion on the National Priorities List (NPL), and in 1983, the Auto Ion site was officially placed on the NPL and designated a Superfund site.

In 1985, U.S. EPA entered into an agreement with the Potentially Responsible Parties (PRPs) for the Auto Ion site to conduct a removal action at the abandoned facility. The removal action consisted of containerizing and off-site disposing of hazardous materials (i.e., plating wastes) left at the site. In 1986, the building was razed by the City of Kalamazoo.

Pursuant to a June 18, 1986, Administrative Order by Consent between U.S. EPA and a group of 23 PRPs, a Remedial Investigation/Feasibility Study (RI/FS) was conducted by the PRPs in 1987 and placed in the Administrative Record on August 7, 1989. The RI included the collection of soil, sediment, groundwater and surface water samples from the site and the adjacent Kalamazoo River. The RI Report, released in December of 1988, describes the nature and extent of organic and inorganic contamination found at the Auto Ion site. Following issuance of the RI Report, U.S. EPA determined that the most prudent way to address contamination at this site was to first remove the soil in the unsaturated zone because it was acting as a source of further groundwater contamination and then address the groundwater contamination as a separate operable unit.

FIRST OPERABLE UNIT RECORD OF DECISION:

The First Operable Unit Record of Decision (ROD) of excavation and off-site disposal of contaminated soil in the unsaturated zone was signed on September 27, 1989. The State of

Michigan concurred with this remedy.

This initial operable unit addressed the source of further groundwater contamination. The remedy selected addressed the principal threats at the site by removing and off-site disposing of all soils contaminated above site-specific cleanup standards located in the unsaturated zone. According to the ROD, all excavated soils were to be disposed of at a Resource Conservation and Recovery Act (RCRA) landfill and where appropriate, the soil was to be stabilized before land disposal. Areas of excavation on-site were to be backfilled with clean soils.

The FS Report for Operable Unit I evaluated several alternatives which would appropriately address the risks posed by the contaminated soil. Six alternatives were developed and evaluated in detail: 1) no action, 2) stabilization/capping, 3) vadose zone excavation/disposal, 4) selected vadose zone excavation/disposal, 5) vadose zone excavation/stabilization/disposal, 6) selected vadose zone excavation/stabilization/disposal. The six alternatives were evaluated against the nine criteria as detailed in Section H of this ROD. Based on the consideration of the requirements of CERCLA, the detailed analysis of alternatives in the FS Report, and public comments, U.S. EPA, with the concurrance of MDNR, determined that Alternative 6: selected vadose zone excavation/stabilization/disposal was the most appropriate remedy for the first operable unit at the Auto Ion site. U.S. EPA's approval of the FS Report for the first operable unit satisfied the requirement of completing the RI/FS for this operable unit.

FIRST OPERABLE UNIT REMEDIAL ACTION:

Following issuance of the First Operable Unit ROD, U.S. EPA and 42 PRPs entered into a Consent Decree signed May 15, 1990, to conduct a Remedial Design and Remedial Action (RA/RD) for the First Operable Unit. The design report was completed by the PRPs and was amended and approved by U.S. EPA on March 16, 1993.

On-site remedial activities began on April 19, 1993. Soil was excavated in the vadose zone that was contaminated with organics and inorganics above the site-specific cleanup standards calculated for the Auto Ion site. The site-specific cleanup standards were established at a carcinogenic risk level of 10^{-6} or the average background level, which ever was higher. All soil contaminated with RCRA designated F006 metals (i.e., electroplating waste) were disposed of at Envirosafe Services of Ohio, Inc., a RCRA subtitle C facility in Oregon, Ohio. All other contaminated soil was disposed of at either Forest Lawn Landfill, in Three Oaks, Michigan or, the Browning-Ferris Industries C & C Landfill in Marshall, Michigan, both are RCRA subtitle D facilities. Excavation and off-site disposal of the former Auto Ion basement floor and the demolition debris inside the former basement was conducted. A total of 11,850 tons of non-hazardous soil/debris were removed from the site and 12,393 tons of hazardous (RCRA-F006) soil/debris were removed for a combined total of 23,243 tons. A silty/clay and sand soil mixture was used to backfill all excavation areas on-site and a layer of topsoil and seed were then applied. A final inspection was conducted by U.S. EPA, U.S. Army Corps of Engineers, MDNR, and the PRPs' consultant on November 5, 1993. U.S.

EPA approved the PRPs' final RA Report for operable unit 1 on August 3, 1994. U.S. EPA approval of this document satisfied the requirements of completing the RD/RA for the first operable unit.

DEMONSTRATION OF QA/QC FROM THE CLEANUP ACTIVITIES (OU 1):

The remedial action conducted for the first operable unit complied with all U.S. EPA quality assurance and quality control (QA/QC) procedures and protocol. Only U.S. EPA analytical methods were used. The QA/QC program utilized throughout the remediation activities for the first operable unit was complied with adequately. This program enabled U.S. EPA to determine that all analytical results are accurate enough to assure satisfactory execution of the remedial action consistent with the first operable unit ROD.

MONITORING RESULTS FOR OPERABLE UNIT 1:

During all stages of the first operable unit remedial action, the PRPs' consultant, with oversight by U.S. EPA, conducted confirmatory sampling to ensure that the remedial action objectives were met. The results showed that the cleanup levels were achieved. Documentation of the complete results and accuracy of the confirmatory sampling program is contained in the Auto Ion Operable Unit 1 Remedial Action Report.

SUMMARY OF OPERATION AND MAINTENANCE FOR OPERABLE UNIT 1:

The site remains fenced and "no trespassing" signs have been posted on the perimter of the site. Final grading and seeding of the site was completed in November 1993. Site inspections will be conducted by the PRPs every 60 days, or more frequently, if needed to ensure the integrity of the fencing, signage and the vegetative cover.

SECOND OPERABLE UNIT:

The RI Report issued in December 1988, describes the results of the RI conducted in 1987 which covered both the first and second operable units. A Sediment Toxicity Evaluation was conducted by the PRPs in October 1992 to determine what, if any, impact to biota was occuring in the Kalamazoo River as a result of groundwater discharges from the Auto Ion site to the river. The FS Report for the second operable unit was completed by the PRPs and was modified and approved by U.S. EPA on March 4, 1994. The FS Report evaluated several alternatives which would appropriately address the groundwater contamination situtation at Auto Ion. Four alternatives were developed and evaluated in detail: 1) no action, 2) natural attenuation/institutional controls, 3) groundwater containment/treatment, 4) groundwater extraction/treatment. The four alternatives were evaluated against the nine criteria as detailed in Section H of this ROD. Based on the requirements of CERCLA, the detailed analysis of alternatives in the FS Report, and public comments, U.S. EPA has determined that Alternative 2: natural attenuation/institutional controls is the most appropriate remedy for the second operable unit at the Auto Ion site. On August 4, 1994, U.S. EPA

modified and approved the PRPs' phase 1 work plan for the installation of monitoring wells. U.S. EPA's approval of this document satisfied the requirement of completing the RI/FS for this operable unit. Work began on aquifer characterization for well installation on August 15, 1994.

SUMMARY OF OPERATION AND MAINTENACE FOR OPERABLE UNIT 2:

Operation and Maintenance for groundwater at this site will involve routine monitoring to ensure that levels remain below established ACLs. Institutional controls will also be established at the site to further assure that groundwater beneath the Auto Ion site is not used as a source for drinking water in the future.

SUMMARY OF FIVE-YEAR REVIEW STATUS FOR OPERABLE UNIT 2:

As part of this second operable unit ROD, a Five-year Review of the site through routine groundwater monitoring, as deemed prudent by U.S. EPA, in consultation with MDNR, is required.
The reason for including the Five-year Review in this ROD is that groundwater contaminants will remain at levels in excess of some Federal and State regulatory limits.

PROTECTIVENESS:

With the inclusion of the requirements of this ROD, all the completion requirements for this site will be met as specified in OSWER Directive 9320.2-3A. Confirmatory sampling of soil has verified that the ROD cleanup objectives for soil have been achieved. Establishment of ACLs, institutional controls, and routine groundwater monitoring, will meet the objectives of the ROD for groundwater by providing assurance that groundwater beneath the site does not pose any threats to human health and the environment.

C. COMMUNITY PARTICIPATION

The Responsiveness Summary in Section L discusses the involvement of the community during the RI/FS and remedy selection process and shows that the public participation requirements of CERCLA Sections 113(k)(2)(i-v) and 117 of CERCLA have been met at this site. The decision is based on the Administrative Record.

D. SUMMARY OF CURRENT SITE CONDITIONS

The Auto Ion site is currently a vacant fenced parcel of land on the north bank of the Kalamazoo River (see Figure A). Topography is relatively flat and vegetation consists of a grass cover and a row of mature trees along the river's edge. Most of the site lies within the 100-year floodplain for the Kalamazoo River.

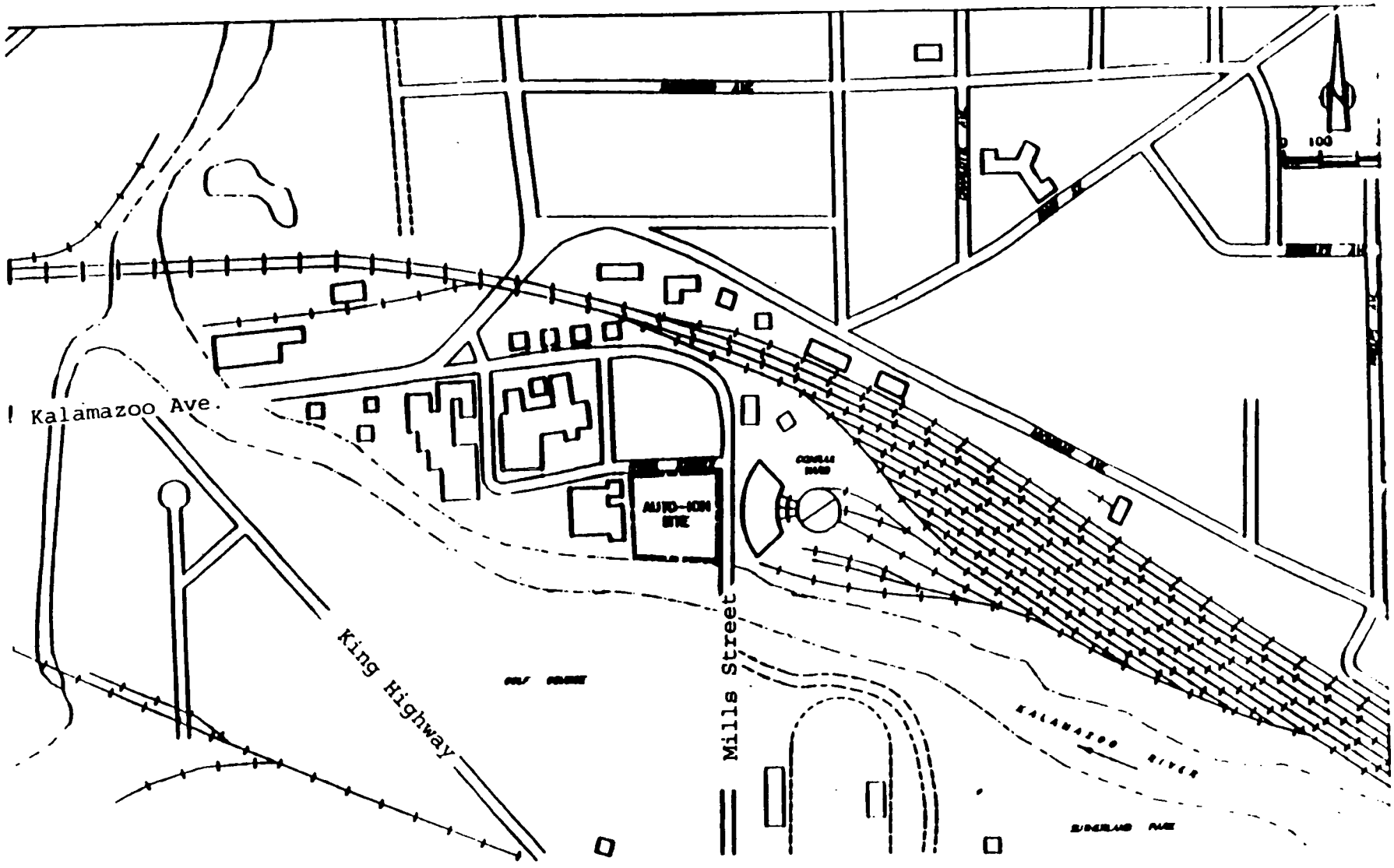


FIGURE A

SITE AREA PLAN
AUTO-ION SITE
Kalamazoo, Michigan

The nearest residences are located approximately 500 feet north of the site. There are approximately 2,300 people living within a 1/2-mile radius of the site. The drinking water supply for all residents in Kalamazoo is provided through a municipal system which utilizes groundwater wells located outside of the area of influence of the Auto Ion site. There are several businesses located within a 500 foot radius of the site, including the Conrail facility on Auto Ion's eastern border and the former Production Painting Company on the site's western border. Both of these facilities are listed on Michigan's Act 307 list of sites of environmental contamination. The stretch of river in front of the Auto Ion site is also a portion of the Kalamazoo River/Allied Paper Superfund site.

GEOLOGY:

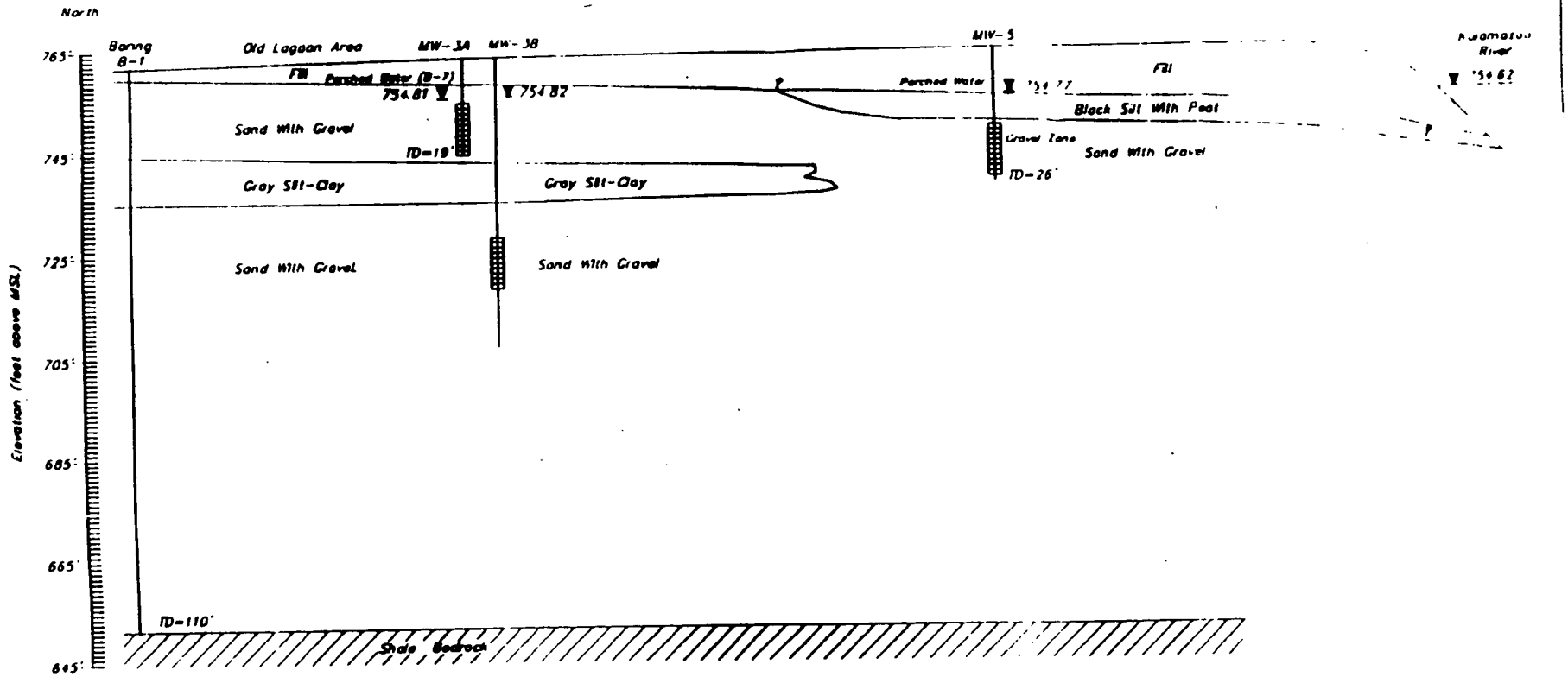
Site geology consists primarily of an unconsolidated glacial deposit of sand with varying amounts of gravel (see Figure B). This unconsolidated deposit is approximately 110 feet deep and overlies a shale bedrock. There are also two layers of low permeability deposits within the unconsolidated deposit. One is a 1-4 foot thick black organic deposit containing varying amounts of silt, clay and peat, and the other is a 5-7 foot thick layer of gray clay present at about 16 to 18 feet below grade in the northwest quarter of the site. Groundwater beneath the site typically flows laterally in a southward direction toward and into the Kalamazoo River. The water table is generally found at approximately 10 feet below grade. Under high surface water conditions on the Kalamazoo River, groundwater flow can reverse itself and flow northward under the site away from the river. This condition is common along the edges of rivers, but usually is a temporary seasonal condition that does not extend very far away from the river's edge. Groundwater flow velocity is relatively slow, averaging approximately 3 feet per month. Groundwater is the source of drinking water for the City of Kalamazoo. The nearest active well field is located approximately 1.5 miles north/northeast of the Auto Ion site and is in the opposite direction of typical groundwater flow.

HYDROLOGY:

The Kalamazoo River, in the area of the Auto Ion site, is approximately 5 feet deep and 110 feet wide. The average flow rate is approximately 850 cubic feet per second. At this rate, it takes approximately 3 to 4 minutes for the river to traverse the 250 foot frontage of the Auto Ion site. The Kalamazoo River is a gaining stream and it flows in a northwesterly direction after passing the site and empties into Lake Michigan approximately 80 miles downstream at Saugatuck, Michigan. The Kalamazoo River is used for recreational purposes (i.e., fishing, canoeing).

ENVIRONMENTAL SAMPLING:

Groundwater samples were collected from six on-site monitoring wells, and one off-site background well, on three different dates all before the soil cleanup was conducted in 1993. The first samples were collected in November of 1987, the second in March of 1988 and the



LEGEND

Monitoring Well
Water Level Elevation (3/25/88)
Screen

Horizontal Scale 1" = 15'
Vertical Scale 1" = 20'

FIGURE B

NORTH-SOUTH CROSS SECTION
WESTERN PORTION OF SITE
AUTO ION SITE
KALAMAZOO, MICHIGAN

MS68403

last in December of 1990. Site related inorganics and organics were detected in these wells. A number of these contaminants exceed Maximum Contaminant Levels (MCLs) and/or Michigan Act 307 Type-C levels. The majority of site-related contaminant levels decreased between each sampling event. This contaminated groundwater discharges into the Kalamazoo River. The rate of discharge is relatively slow due to the low water table gradient. On average, 5.04 gallons of groundwater discharge into the river per each complete passage of the river. The average dilution ratio of surface water to groundwater is approximately 70,000 to 1.

Sediment samples from the river were collected and analyzed on two separate occasions. The first set of samples, collected during the RI, were collected at twenty-two different locations upstream, adjacent to the site, 1/2 mile downstream and 1 mile downstream of the site. Analysis of these samples indicated that some site-related organics and inorganics were detected at levels above upstream levels. Sediment samples were also collected from locations upstream, adjacent to and immediately downstream of the Auto Ion site in October of 1992 during the sediment toxicity evaluation. Some site-related organics and inorganics were detected in excess of upstream samples. Surface water samples from the Kalamazoo River were collected on three separate occasions. Once in October 1987, again in November 1991 and then during the sediment toxicity evaluation in October 1992. Several site-related inorganics were detected at levels in samples downstream of the site in excess of levels upstream during the 1987 sampling event. The 1991 samples did not show any increase in contaminant levels between upstream and downstream samples except for silver which was detected near the detection limit. Some site-related organics and inorganics were detected in excess of upstream samples during the 1992 sampling event.

E. SUMMARY OF SITE RISKS - (See Glossary for definitions of terms used in this section)

Based on analytical data collected during the RI, a baseline risk assessment was performed using site related contaminants. The baseline risk assessment assumes no corrective action will take place and that no site-use restrictions or institutional controls such as ground water use restrictions or construction restrictions will be imposed. The risk assessment determines actual or potential carcinogenic risks and/or toxic effects the chemical contaminants at the site pose under current and future land use assumptions using a four step process. The four step process includes: contaminant identification, health effects assessment, exposure assessment and risk assessment.

1. Contaminant Identification

The levels of contamination found in groundwater at the site can be found in Section 3.4 of the RI or Section 1.2.4 of the FS. Indicator parameters or chemicals of potential concern were selected based on their toxicities, level of concentration and wide spread occurrence. The chemicals of potential concern are listed in Table 1.

TABLE 1

CHEMICALS OF CONCERN
AUTO ION SITE

INORGANICS	ORGANICS
Arsenic	Bis(2-ethylhexyl)-phthalate
Nickel	Trichloroethylene
Barium	1,2-Dichloroethane
Copper	Vinyl Chloride
Lead	
Cadmium	
Mercury	
Cyanide	
Chromium III	
Chromium VI	
Silver	

2. Human Health Effects

The health effects for the contaminants of concern may be found in Section 6.6 of the Baseline Risk Assessment.

3. Exposure Assessment

The baseline risk assessment examined the risk to human health from the ingestion of groundwater. This evaluation was requested by U.S. EPA to determine any potential risk in the unlikely event that groundwater beneath the site were to be used as a drinking water source. The results of this evaluation are listed below under 4a and 4b.

4. Risk Characterization (See Glossary for definition of terms used in this section)

For each potential human receptor, site-specific contaminants from the ingestion of groundwater route of exposure were evaluated. Both non-carcinogenic health effects and carcinogenic risks were estimated.

a. Non-Carcinogenic Health Risks

The hazard index for humans ingesting groundwater beneath the site over a lifetime (i.e., 70 years) exceed the acceptable hazard index of 1.0. For potential use of the groundwater under the site, the hazard index value is 15.

b. Carcinogenic Health Risks

The potential excess lifetime cancer risk posed by the ingestion of contaminated groundwater beneath the site exceeds the acceptable risk range of 1×10^{-4} to 1×10^{-6}. The estimated excess cancer risk to humans ingesting groundwater from beneath the Auto Ion site over a lifetime (i.e., 70 years) is approximately 1.2×10^{-3}.

5. Groundwater Use Scenario:

Although the baseline risk assessment indicates that there is a potential risk to human health as a result of drinking groundwater from beneath the Auto Ion site, it must be noted that this scenario is highly unlikely for the following reasons:

a. The drinking water source for the City of Kalamazoo is supplied by groundwater wells outside the influence of the Auto Ion site. In a January 24, 1994 letter, the City of Kalamazoo documented its intention to U.S. EPA to avoid the installation of any new wells in the vicinity of the site.

b. The County of Kalamazoo must evaluate a set of criteria before permitting any new wells. Included in this criteria is a review of any potential sources of contamination that could potentially contaminate a well. In the case of the Auto Ion site, there is documented groundwater contamination beneath the site and there are two Michigan Act 307 sites adjacent to Auto Ion. These facts clearly indicate that the site area is a poor candidate for the installation of new drinking water wells.

c. Michigan Act 399 prohibits the development of drinking water wells within the 100-year floodplain for any rivers of the State. Much of the Auto Ion site sits within the 100-year floodplain for the Kalamazoo River.

d. Sodium levels in the area of the Auto Ion site are well above U.S. EPA health based criteria for drinking water. This may be a result of the use of road-salt in the area. Even absent the facts listed above, groundwater would likely be unfit for potable use due to these excessive sodium levels.

6. Environmental Risks

A sediment toxicity evaluation was conducted in the Kalamazoo River, proximal to the Auto Ion site in October 1992. The purpose of this investigation was to evaluate the aquatic sediments and its indigenous fauna for potential impact of contaminants originating from the Auto Ion site through groundwater seepage.

River sediments were collected and characterized/analyzed for physical, chemical and biological components. In addition, toxicity evaluations were carried out by employing two aquatic organisms. The results of this study are as follows:

a. The macroinvertebrate community indigenous to the Kalamazoo River in the area of the Auto Ion site is quite diverse, abundant and is typical of this type of habitat.

b. The best water quality, evaluated from the use of the Shannon-Weaver function and the Hilsenhoff Biotic Index, is adjacent to the Auto Ion property.

c. Sediment toxicity evaluation carried out with Hyalella and Chironomus showed no statistically significant ($p = 0.05$) effect in survival for either species compared to the control. However, a statistically significant ($p = 0.05$) effect was observed in reduced weight for both species at one location adjacent to the site, which was partially attributed to upriver contamination rather than groundwater effects from the Auto Ion site alone.

The sediment toxicity results confirmed the contention that the area "logically" to be impacted by groundwater from Auto Ion did not elicit an adverse effect in either species. It was therefore concluded from the interpretation of physical, chemical and biological data that no adverse effect is demonstrated from the Auto Ion site on the indigenous fauna of the Kalamazoo River.

F. RATIONALE FOR ACTION AND SCOPE OF THE SELECTED REMEDY

This ROD addresses the final remedy for the Auto Ion site. The only possible threat remaining at the site is the contaminated groundwater. The selected remedial alternative will address the only possible remaining threat at the site. The source to further groundwater contamination was eliminated by the soil remediation conducted in 1993.

G. DESCRIPTION OF ALTERNATIVES

Alternative 1 - No Action

- Estimated Cost: $0

- Estimated Years to Attainment of Cleanup Goals (assume either Michigan Act 307 Type C cleanup levels or EPA Maximum Contaminant Levels "MCLs"): 50 to 60 years

This alternative involves no cleanup action for contaminated groundwater at the site. This alternative would allow contaminated groundwater to naturally attenuate and improve over time. The inclusion of the no-action alternative is required by CERCLA and the NCP to give U.S. EPA a basis for comparison with other alternatives.

Alternative 2 - Natural Attenuation/Institutional Controls

· Estimated Cost: $565,000

· Estimated Years to Attainment of Cleanup Goals (assume either Michigan Act 307 Type C cleanup levels or EPA's MCLs): 50 to 60 years

This alternative involves the continued periodic monitoring of groundwater at the site while it is allowed to naturally attenuate. It also includes institutional controls (i.e., deed restrictions) to help assure that groundwater at the site is not used for drinking water purposes. Alternate Concentration Limits (ACLs), which are site specific chemical concentrations allowable in groundwater, would be established. ACLs are established by developing baseline groundwater quality levels for groundwater at the site and then employing a statistical analytical method to determine what level of contamination would cause a statistically significant impact to the Kalamazoo River. If future groundwater sampling confirms a statistically significant increase in the concentrations of the contaminants, U.S. EPA would then make a decision regarding the need to implement a subsequent active remediation of groundwater (e.g., pump and treat the groundwater).

Alternative 3 - Groundwater Containment via Low Flow Extraction/Metals Treatment/Filtration/Discharge to POTW.

· Estimated Cost: $5,650,000

· Estimated Years to Attainment of Cleanup Goals (assume either Michigan Act 307 Type C cleanup levels or EPA's MCLs): 50 to 60 years

This alternative is both a containment and treatment alternative which involves pumping groundwater at a rate to depress the water table (5 to 20 gpm). This would prevent groundwater movement off-site into the Kalamazoo River. The collected groundwater would possibly require pre-treatment on-site to remove some of the heavy metals before it could be discharged to the City's sewer system.

Alternative 4 - High Flow Groundwater Extraction/Metals Treatment/Filtration/Discharge to a POTW

· Estimated Cost: $7,070,000

· Estimated Years to Attainment of Cleanup Goals (assume Michigan Act 307 Type-C cleanup levels or EPA's MCLs): 50 to 60 years

This alternative is similar to Alternative 3 except that this alternative involves a faster pumping rate to more vigorously restore the aquifer (10 to 30 gpm). This alternative would capture all impacted groundwater on-site using a combination of extraction wells, subsurface drains, and/or hanging walls. The collected groundwater would possibly require pre-treatment on-site to remove some of the heavy metals before it could be discharged to the City's sewer system.

H. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The relative performance of each remedial alternative was evaluated in the FS and below using the nine criteria set forth in the NCP at 40 C.F.R. §300.430. An alternative providing the "best balance" of trade-offs with respect to the nine criteria is determined from this evaluation.

Threshold Criteria

The following two threshold criteria, overall protection of human health and the environment, and compliance with Applicable or Relevant and Appropriate Requirements (ARARs) or invoking a CERCLA waiver are criteria that must be met in order for an alternative to be selected.

1. Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether a remedy eliminates, reduces, or controls threats to human health and to the environment.

Due to institutional controls and state law, as well as the fact groundwater beneath the Auto Ion site is not likely to be used as a source for drinking water, an actual risk to human health via ingestion of groundwater does not exist. The sediment toxicity evaluation for this site demonstrated that the discharge of contaminated groundwater to the Kalamazoo River is not having a detrimental impact on aquatic life in the river. Continued natural attenuation of groundwater remains as protective of both human health and the environment as are the two active groundwater alternatives. Therefore, all four alternatives are protective of human health and the environment. However, Alternative 1 does not provide for any monitoring of groundwater and therefore it would not be possible to determine if there were excessive levels of contamination entering the river at some point in the future. Also, Alternative 1 does not provide for institutional controls which will ensure groundwater is not used as a drinking water source. Therefore, while this alternative is still protective, it does not provide information on the level of protectiveness over time.

2. Compliance with Applicable or Relevant and Appropriate Requirements

This criterion evaluates whether an alternative meets ARARs set forth in federal, or more stringent state, environmental standards pertaining to the site or proposed actions or invoking a CERCLA waiver.

Because the No Action alternative does not involve conducting any remedial action at the site, no ARARs analysis is necessary for Alternative 1. Alternatives 2, 3, and 4 are expected to be in compliance with ARARs. Alternative 2 does not evaluate the same ARARs as does Alternatives 3 and 4 because the establishment of ACLs under Section 121(d)(2)(B)(ii) of CERCLA waives other Federal and State ARARs relating to groundwater quality.

Primary Balancing Criteria

3. Long-Term Effectiveness and Permanence

This criterion refers to expected residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time once clean up levels have been met.

Alternatives 1 and 2 will be effective in the long-term because risk evaluations have determined that continued natural attenuation of groundwater poses no risk to human health and the environment. However, because Alternative 1 does not include groundwater monitoring or institutional controls, it does not provide long-term effectiveness to the same degree as Alternative 2. Alternatives 3 and 4 would also be effective in the long-term because they involve a complete cessation of groundwater discharges to the river and provide for treatment of the contaminated groundwater.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion evaluates treatment technology performance in the reduction of chemical toxicity, mobility, or volume. This criterion addresses the statutory preference for selecting remedial actions which include, as a principal element, treatment that permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants.

Alternatives 1 and 2 do not include treatment as an element of each remedy and therefore they do not meet this criteria. Alternatives 3 and 4 do provide treatment of the contaminated groundwater before discharge to a POTW and therefore, both of these alternatives do meet this criteria.

5. Short-Term Effectiveness

Short-term effectiveness considers the time to reach cleanup objectives and the risks an alternative may pose to site workers, the community, and the environment during remedy implementation until cleanup goals are achieved.

The estimated time to reach cleanup objectives for all alternatives is approximately 50 to 60 years. The slow desorption rate for some metals bound to clay/silt particles controls this rate of decrease for contaminant levels in the aquifer. Use of an active pump and treat system will remove contaminants more rapidly in the early period of the cleanup. However, with time, the rate of contaminant reduction will decrease and the time to reach the low cleanup levels, established by Michigan Act 307 or U.S. EPA's MCLs, will be approximately the same as calculated for allowing groundwater to naturally attenuate.

There are no risks to workers, the community or the environment under Alternative 1 because there would be no contact with contaminated groundwater. The only expected contact with contaminated groundwater under Alternatives 2, 3 and 4 is for workers who install monitoring wells, purge wells and other extraction devices and then sample the wells. Any hazards related to this work can be addressed by adherence to a health and safety plan. No impact to the environment is expected for any of the alternatives.

6. Implementability

This criterion addresses the technical and administrative feasibility of implementing an alternative, and the availability of various services and materials required for its implementation.

All the alternatives are implementable and can be readily constructed with technology and materials presently available. Alternatives 3 and 4 have a disadvantage in that a large volume of river water would likely be included in the extracted groundwater due to the site's location next to the Kalamazoo River. This would reduce the number of pore volumes removed from the impacted groundwater. For every gallon of river water extracted, one less gallon of impacted groundwater would be extracted and treated.

7. Cost

This criterion compares the capital, O&M, and present worth costs of implementing the alternatives at the site. Table 2 shows the Cost Summary.

TABLE 2

COST SUMMARY
AUTO ION SITE
OPERABLE UNIT 2

	Capital Costs	O & M Costs	Present Worth
Alternative 1:	$0	$0	$0
Alternative 2:	$210,000	$21,700	$565,000
Alternative 3:	$635,000	$391,000	$5,650,000
Alternative 4:	$456,000	$514,000	$7,070,000

Modifying Criteria

8. State Acceptance

The State of Michigan is not in agreement with the selection of Alternative 2 for remediation of groundwater at the Auto Ion site and has provided U.S. EPA with a letter of non-concurrence. Comments from MDNR are also included in the Responsiveness Summary.

9. Community Acceptance

Comments have been submitted by the community, local government officials, and potentially responsible parties (PRPs). Comments and responses to those comments are described in the Responsiveness Summary.

I. THE SELECTED REMEDY

Based upon considerations of the requirements of CERCLA, the NCP and balancing of the nine criteria, the U.S. EPA has determined that Alternative 2 is the most appropriate remedy for the site. The components of the selected remedy are described below.

Establishment of Alternate Concentration Limits (ACLs) - The selected remedy will develop ACLs consistent with Resource Conservation and Recovery Act (RCRA) guidance. The ACLs will then be used as action levels for monitoring groundwater discharging from the site into the Kalamazoo River.

Groundwater Monitoring - To establish ACLs, baseline groundwater levels will be determined through sampling of monitoring wells for 4 consecutive quarters over a 1 year period. The frequency, timing, and protocol for sampling will be developed after ROD signature with the objective of gathering representative data of groundwater quality and its variation over a 1 year period. A statistical test which accounts for the variation of the data shall be employed to measure compliance, and shall be equivalent to, or the same as, the method outlined in 40 CFR Part 264.97(h).

The monitoring wells used to determine and subsequently verify groundwater quality will be located within the area of known groundwater contamination in the direction of groundwater flow. The number of monitoring wells designated for sampling as well as the frequency of sampling and the parameters sampled will be determined after ROD signature. Following establishment of the ACLs, groundwater will be sampled routinely to determine if any ACLs are being exceeded in groundwater. The frequency and duration of sampling and the parameters sampled will be determined after ROD signature.

Institutional Controls - Institutional controls (i.e., deed restrictions) will be implemented to limit the use of groundwater beneath the site.

Remedial Action Plan - In the event an ACL is exceeded at the 95% confidence level for a period to be determined after ROD signature, then a Remedial Action Plan (RAP) shall be implemented to address the ACL exceedance. The RAP will be developed after ROD signature and will consist of pre-determined response actions to address ACL exceedances. The RAP shall be designed to confirm an exceedance and, if determined to be necessary by U.S. EPA, a remedy will be selected to mitigate an impact to the Kalamazoo River. Examples of potential responses include, but are not limited to, confirmational sampling, increased sampling frequency, determination of impact to the Kalamazoo River through surface water, sediment and biota sampling, or installation of a groundwater extraction system.

J. STATUTORY DETERMINATIONS

U.S. EPA's primary responsibility at Superfund Sites is to undertake remedial actions that protect human health and the environment. Section 121 of CERCLA has established several additional statutory requirements and preferences. These include the requirement that the selected remedy, when completed, must comply with all applicable, relevant and appropriate requirements ("ARARs") imposed by Federal and State environmental laws, unless the invocation of a waiver is justified. The selected remedy must also provide overall effectiveness appropriate to its costs, and use permanent solutions and alternative treatment technologies, or resource recovery technologies, to the maximum extent practicable. Finally, the statute establishes a preference for remedies which employ treatment that significantly reduces the toxicity, mobility or volume of contaminants.

1. Protection of Human Health and the Environment

Due to the fact that there is a very low potential that groundwater beneath the site would be used as a drinking water source, it is not practicable to restore groundwater to beneficial use as a drinking water source. The discharging groundwater also has no detectable impact on the Kalamazoo River. The major source of further groundwater contamination was eliminated in 1993 during the cleanup of soils in the vadose zone at the site. This is expected to result in a significant decrease in the levels of contamination in groundwater in the future, particularly after one pore volume of groundwater has moved out of the site (estimated to take 5 years). For these reasons, allowing groundwater to continue to naturally attenuate would be protective of human health and the environment. The establishment of ACLs for groundwater, which includes routine monitoring, would assure that the levels of contamination in groundwater do not pose a risk to the Kalamazoo River in the future. In the event groundwater monitoring indicates a statistically significant increase above ACLs, U.S. EPA will select a remedy from the RAP to address any potential impacts.

2. Compliance with ARARs

The selected alternative will, in accordance with Section 121(d)(2)(B) of CERCLA, establish ACLs in lieu of compliance with other potential Federal and State water quality criteria ARARs. Compliance with all other ARARs will be required. Section 300.430(e)(2)(i)(E) of the NCP further explains that "If, however, a situtation fulfills the CERCLA statutory criteria for ACLs, including a finding that active restoration of the groundwater to MCLs or non-zero MCLGs is deemed not to be practicable, documentation of these conditions for the ACL is sufficient and additional documentation of a waiver of the MCL or MCLG is not necessary.

3. Cost Effectiveness

Cost effectiveness compares the effectiveness of an alternative in proportion to its cost of providing environmental benefits. Table 3 lists the costs associated with the implementation of the selected remedy.

TABLE 4

Total estimated costs for the selected remedy at the Auto Ion site (Operable Unit 2):

Alternative	Total Capital Cost	Total O&M, 30 Yr.	Total Present Worth
2	$210,000	$21,700	$355,000

The selected remedy for this site is cost effective because it provides the greatest overall effectiveness proportionate to its costs when compared to the other alternatives evaluated, the net present worth being $565,000. The selected remedy results in a reduction of contamination in groundwater in approximately the same length of time as Alternatives 3 and 4 while remaining equally protective of human health and the environment.

4. Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost-effective manner at this site. Of those alternatives that are protective of human health and the environment and that comply with ARARs, U.S. EPA has determined that the selected remedy provides the best balance in terms of long-term effectiveness and permanence, reduction of toxicity, mobility, or volume of contaminants, short term effectiveness, implementability, and cost, taking into consideration State and community acceptance.

The institution of ACLs, ground water monitoring, and restriction of groundwater use through implementation of institutional controls, will provide the most permanent solution practical, proportionate to the cost.

5. Preference for Treatment as a Principal Element

Based on current information, U.S. EPA believes that the selected remedy is protective of human health and the environment and utilizes permanent solutions to the maximum extent possible. The remedy, however, does not satisfy the statutory preference for treatment of the hazardous substances present at the site as a principal element because such treatment was not found to be practical or cost effective.

K. SUMMARY

The selected remedy will satisfy the statutory requirements established in Section 121 of CERCLA, as amended by SARA, to protect human health and the environment, will comply with ARARs (by means of complying with ACLs established consistent with CERCLA), will provide overall effectiveness appropriate to its costs, and will use permanent solutions to the maximum extent practicable.

Treatment is not a component of the selected remedy because an attempt to treat the hazardous substances present at the site in groundwater would not provide a sufficiently significant additional decrease in risk presented by the site to justify the increased cost of implementing such treatment.

GLOSSARY

Applicable or Relevant and Appropriate Requirements.

Section 121 (d) of CERCLA requires that remedial actions meet legally applicable or relevant and appropriate requirements (ARARs) of other environmental laws. Legally "applicable" requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site. "Relevant and appropriate" requirements are those requirements that, while not legally applicable to the remedial action, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the remedial action.

Non-promulgated advisories or guidance documents issued by federal or state governments ("to-be-considered or TBCs") do not have the status of ARARs; however, where no applicable or relevant and appropriate requirements exist, or for some reason may not be sufficiently protective, non-promulgated advisories or guidance documents may be considered in determining the necessary level of clean up for protection of human health and the environment.

Baseline Risk Assessment

The baseline risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these releases. The baseline risk assessment assumes no corrective action will take place and no site-use restrictions or institutional controls such as fencing, ground water use restrictions or construction restrictions will be imposed. There are four steps in the baseline risk assessment process: data collection and analysis; exposure assessment; toxicity assessment; and risk characterization.

Cancer Potency Factors (CPFs)

Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays.

Excess Lifetime Cancer Risks

Excess lifetime cancer risks are the sum of all excess cancer lifetime risks for all contaminants for a given scenario. Excess Lifetime Cancer Risks are determined by multiplying the intake level by the cancer potency factor for each contaminant of concern and summing across all relevant chemicals and pathways. These risks are probabilities that are generally expressed in scientific notation (e.g. 1 X 10^{-6}). An excess lifetime cancer risk of 1 x 10^{-6} indicates that a person's chance of contracting cancer as a result of site related exposure averaged over a 70-year lifetime may be increased by as much as 1 in one million.

Hazard Index (HI)

The Hazard Index (HI), an expression of non-carcinogenic toxic effects, measures whether a person is being exposed to adverse levels of non-carcinogens. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across multiple media. The HI for non-carcinogenic health risks is the sum of all contaminants for a given scenario. Any Hazard Index value greater than 1.0 suggests that a non-carcinogen potentially presents an unacceptable health risk.

Reference Doses (RfDs)

Reference doses (RfDs) have been developed by U.S. EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting non-carcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of average daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse non-carcinogenic effects to occur.