



Superfund Record of Decision:

**Michigan Disposal Service,
MI**

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16. Abstract (Limit: 200 words) The 68-acre Michigan Disposal Service Landfill site is an inactive municipal landfill in Kalamazoo, Kalamazoo County, Michigan. Land use in the area is predominantly industrial, commercial, and residential. The eastern border of the site lies within a wetland and the 100-year floodplain of nearby Davis Creek. From 1925 to 1961, the site was owned and operated by private parties as a municipal landfill. Forty-seven acres of the total site was used as a landfill. In 1961, the city of Kalamazoo purchased the property and began accepting wastes from residences, businesses, and local industries. The majority of these wastes were incinerated onsite, with onsite disposal of the ash. From 1968 to 1981, the site was licensed to accept only inert wastes, and incineration ceased due to new air pollution regulations. In 1981, the site was sold, and subsequently, was operated as a licensed landfill. During the mid-1980's, the State conducted investigations as part of a landfill extension request. These onsite studies documented that wastes leaching from the landfill had contaminated onsite soil, sediment, and ground water. To continue landfill operations, the owners were ordered to install a collection system to intercept leachate prior to entry into Davis Creek to prevent contamination of the creek. This (See Attached Page)				
17. Document Analysis a. Descriptors Record of Decision - Michigan Disposal Service, MI First Remedial Action - Final Contaminated Media: soil, sediment, debris, gw, sw Key Contaminants: VOCs (benzene), other organics (PCBs), metals (arsenic, chromium, lead) b. Identifiers/Open-Ended Terms c. COSATI Field/Group				
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EPA/ROD/R05-91/171
Michigan Disposal Service, MI
First Remedial Action - Final

Abstract (Continued)

Record of Decision (ROD) addresses onsite contaminated soil, sediment, ground water, and surface water, as a final remedy. The primary contaminants of concern affecting the soil, sediment, debris, ground water, and surface water are VOCs including benzene; other organics including PCBs; and metals including arsenic, chromium, and lead.

The selected remedial action for this site includes installing a clay cap and revegetating the landfill contents; installing a leachate collection system and a gas venting system for the landfill; pumping and pretreating ground water onsite, as required, followed by offsite discharge of the ground water/leachate to a publicly owned treatment works (POTW); monitoring all media; and implementing institutional controls, and site access restrictions including fencing. The estimated present worth cost for this remedial action is \$8,269,500, which includes an annual O&M of \$253,800 for 20 years.

PERFORMANCE STANDARDS OR GOALS: Ground water cleanup goals are based on SDWA and State standards. Chemical-specific goals for ground water include benzene 1 ug/l (State), arsenic 0.02 ug/l (State), and lead 5 ug/l (State).

United States Environmental Protection Agency

Record of Decision

**Michigan Disposal Service
(Cork Street) Landfill Site
Kalamazoo, Michigan**

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**Declaration
Selected Remedial Alternative
for the
Michigan Disposal Service (Cork Street)
Landfill Site
Kalamazoo, Michigan**

Site Name and Location

Michigan Disposal Service (Cork Street) Landfill
2800 East Cork Street
Kalamazoo, Michigan 49007

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Michigan Disposal Landfill Site, in Kalamazoo, Michigan, which was chosen in accordance with the requirements of 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 Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for this Site. The information supporting this remedial action decision is contained in the administrative record for this Site.

Assessment of the Site

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The selected remedy is the final remedy for the Site. The remedy addresses the threats posed by low level threat wastes and contaminated ground water at the Site. Low level threat wastes are defined as those source materials that generally can be reliably managed with little likelihood of migration and that present a low risk in the event of exposure. They include source materials that exhibit low mobility in the environment or are above protective levels but are not considered to be significantly above protective levels for toxic compounds.

The remedy employs engineering controls to contain the landfilled waste (low level threat wastes) on-site. The remedy also employs

treatment of contaminated ground water. The landfill does not have a threat that can be classified as a principal threat.

The major components of the selected remedy include the following:


- Ground water extraction followed by treatment of the extracted contaminated water at the POTW. If necessary, extracted water will be treated on-site to meet POTW pretreatment standards before being sent to the POTW;
- Deed restrictions to control the use of the land and the ground water;
- Containment of the landfill contents using a clay cap with a vegetated soil layer which complies with RCRA Subtitle D and Act 641 closure requirements. The cap will consist of (from top to bottom) four inches of top soil with vegetation, a layer of soil for frost protection and drainage, clean fill to develop the required grades, and a 2-foot thick clay layer; and
- Installing fencing and warning signs to restrict access

Declaration of Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. The remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies, to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Due to the large volume of landfilled waste that would need to be treated, treatment of this low level threat waste is considered impracticable. However, the remedy selected employs treatment of contaminated ground water which is considered a principal element of the remedy. The remedy employs engineering controls which will be protective of human health and the environment to address the low level threat posed by the landfilled waste and employs treatment to return contaminated ground water to beneficial uses.

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



Valdas W. Adamkus
Regional Administrator

9/25/91

Date

STATE OF MICHIGAN



NATURAL RESOURCES COMMISSION

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~~DELORETTA RECTOR, Director~~

Roland Harmes, Director

September 20, 1991

Mr. Valdas Adamkus, Regional Administrator
U.S. Environmental Protection Agency
Region V, SRA-14
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Adamkus:

The Michigan Department of Natural Resources (MDNR), on behalf of the State of Michigan, has reviewed the proposed Record of Decision (ROD) which we received on July 31, 1991, for the Michigan Disposal Service (Cork Street Landfill) Superfund site in Kalamazoo County, Kalamazoo, Michigan. The remedy in the proposed ROD consists of groundwater extraction and leachate collection with treatment and discharge to the city of Kalamazoo publicly-owned treatment works (POTW), closure and containment of the landfill, including installation of a gas venting system, monitoring of groundwater wells, fencing and institutional controls.

The MDNR concurs with the selection of groundwater extraction to prevent discharge of contaminated groundwater to Davis Creek, with treatment by the city of Kalamazoo POTW. Substantive pretreatment standards must be met prior to the contaminated groundwater being discharged to the POTW, which may require a pretreatment system. The legally applicable or relative and appropriate requirements (ARARs) for groundwater cleanup are Type B levels established using the rules of the Michigan Environmental Response Act (1982 P.A. 307, as amended).

The MDNR agrees with the selection of containment of the landfill contents, using clean fill to bring the site to the appropriate drainage grade and then capping. However, an alternative which considers regrading of the existing landfill to reduce the amount of clean fill needed should be evaluated. This would greatly reduce remedial implementation costs. The containment alternative selected will require ceasing the disposal of Type III and inert wastes at the Cork Street Landfill, which is not licensed under Michigan's Solid Waste Management Act (1978 P.A. 641, as amended) (Act 641).

Specifically, the effect of the "new" Type III and inert landfilling operation on the underlying aquifer can not be distinguished from the effect of the "old" landfill, which is suspected to be the original source of the groundwater contamination. The City of Kalamazoo and the MDNR have recently discussed whether there are any conditions under which some Type III waste could be disposed of at the site. No agreements have been reached and may not be, but the issue is being explored.

Although the MDNR does agree with the containment alternative selected, the MDNR can not concur with the technical design of the closure cap described. A cap design which meets only the minimum requirements of Act 641 is not fully protective of human health and the environment at the Cork Street Landfill site. As described in our response to the proposed plan, dated September 9, 1991, a composite cap consisting of a two foot clay layer, flexible membrane liner, frost protective layer, and vegetative soil layer should be constructed at this site. The MDNR can not support the proposed cap design which excludes a flexible membrane liner (FML) as an essential component. The addition of an FML would help provide protection to the underlying aquifer from further contamination in that cap integrity and impermeability would be greatly enhanced. This is especially important when considering that this landfill has no bottom or side impermeable liners, thus allowing any infiltration through the cap to eventually leach contaminants to the groundwater. The MDNR believes that, in order for the containment alternative to be effective, an FML should be included in the cap design.

The additional protective and vegetative soil layers provide endurance to the cap by protecting the impermeable layer from being adversely affected by environmental conditions. The protective layer has several important functions, including providing a lateral drainage layer for infiltrating precipitation; providing protection of the clay layer and FML from damage due to erosion, the effects of freeze-thaw cycles, penetration by roots, burrowing animals and other sources; providing stabilization of the vegetative soil layer; and assisting in the establishment and support of vegetative cover. These layers enhance the long-term effectiveness of the cap and reduce operation and maintenance costs.

The MDNR concurs with the proposal that additional studies on the nature and extent of groundwater contamination must be conducted prior to the Remedial Design phase of the project. Remedial Investigation data is insufficient to properly design and place the extraction well and monitoring systems. It is the MDNR's position that any additional studies be conducted as expeditiously as possible to avoid undue delay in implementing the remedial alternative selected.

The MDNR also concurs with the Statutory Determination Summary, with the following exception. The state has previously identified the Water Resources Commission Act (WRCA) (1929 P.A. 245, as amended), MCL 323.6(a) and the associated Part 22 Administrative Rules, MAC R.323.2201 et seq. as ARARs for this site. It remains our position that the WRCA and the associated Part 22 Rules are ARARs for the remedial action for this site because hazardous substances in the aquifer beneath the site are migrating to degrade previously uncontaminated groundwater. It is the MDNR's judgement that the selected remedial action for this site will provide for attainment of all ARARs, including the WRCA and the Part 22 Rules, by preventing further discharges of injurious substances into the groundwater outside of the containment area, and by remedying the existing groundwater contamination.

Mr. Valdas Adamkus

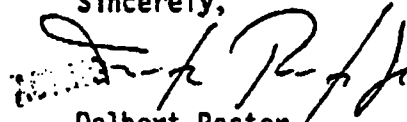
-3-

September 20, 1991

The MDNR concurs with the access restrictions presented in the ROD, which include fencing and signs, deed restrictions, and groundwater use restrictions.

We look forward to working with you on the implementation of this ROD. We also hope to come to a mutual understanding with the U.S. Environmental Protection Agency regarding the technical design components of the closure cap. If you or your staff have any questions, please contact Mr. Dennis Eagle, MDNR Project Manager, at 517-373-8195, or you may contact me directly.

Sincerely,



Delbert Rector
Deputy Director
517-373-7917

cc: Mr. Jonas Dikinis, EPA
Ms. Mary Pat Tyson, EPA
Mr. Timothy Prendiville, EPA
Mr. Robert Reichel, Department of Attorney General
Mr. John Craig, MDNR
Mr. Alan Howard, MDNR
Mr. William Bradford, MDNR
Mr. Peter Ollila, MDNR/Cork Street Landfill File

Decision Summary for the Record of Decision

1. Site Name, Location, and Description

The Michigan Disposal Landfill Site is located at 2800 East Cork Street in the City of Kalamazoo, Kalamazoo County, Michigan. Figure 1 is a site location plan and figures 2 and 3 are diagrams of the Site.

The Site consists of approximately 68 acres, 47 of which had been used up until 1968 as a municipal landfill. It is bounded on the south by Interstate 94, on the west by Conrail Railroad, on the north by Cork Street and the Lakeside Refinery Co., and on the east by Davis Creek and the Grand Trunk Railroad. In the vicinity of the Site, Davis Creek is not used recreationally with its most important function being drainage. Although the majority of the Site is fenced, the Site is accessible from the east and the south. The immediate area surrounding the property is industrial with the general area being used as mixed industrial, commercial and residential, and being served by the City water supply. The single aquifer below the Site is a Class II aquifer, flowing to the northeast, which is presently being used in the area surrounding the Site and could potentially be used in the area of concern. Two municipal well stations, 13 and 18, are located 4,000 feet southeast and 1,300 feet west-southwest of the Site, respectively. Station 18 is used only during peak demand periods (three to four months a year) and Station 13 is used mainly as a supply for fire protection. Pump tests performed on these pumping stations have demonstrated that the quality of water being collected by those wells is not currently being affected by the Site. The nearest residences are approximately one-quarter of a mile from the Site. The eastern border of the property, along Davis Creek, is located in the 100 year flood plain. A wetland is also present along Davis Creek (see figure 4).

The Site is relatively flat except for approximately 26 acres which are currently being used as a Type III landfill, creating an elevated topography in the southern portion of the property. Under Michigan's Solid Waste Management Act of 1978 (Act 641), Type III means, "... an on-land disposal facility designed and operated to accommodate large volumes of certain solid waste having minimal potential for groundwater contamination." The type of waste going to these facilities is required to undergo annual testing. Type II is defined as, "...on-land disposal facility designed and operated to accommodate general types of solid waste, including, but not limited to, garbage and rubbish, but excluding hazardous waste."

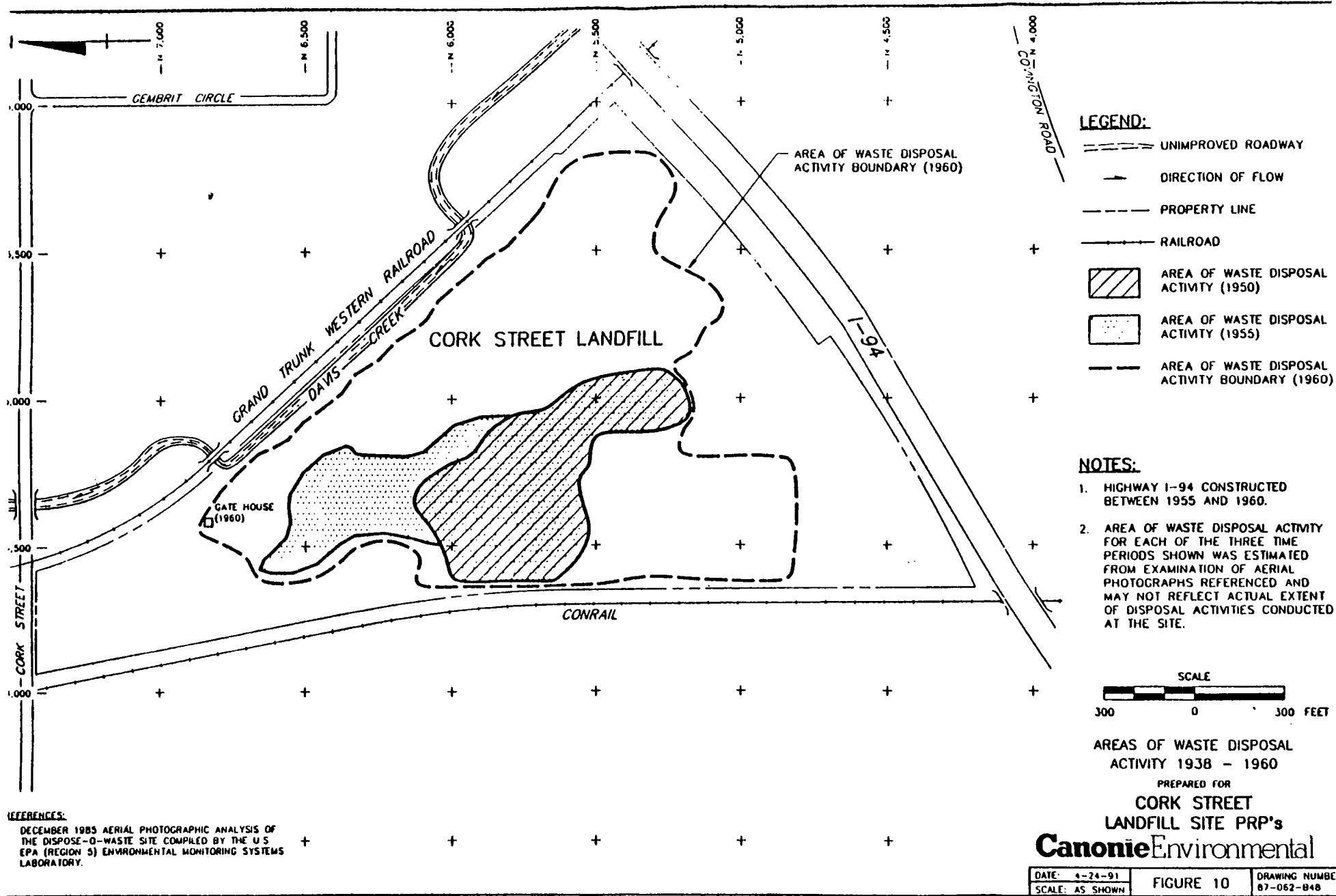


FIGURE 2

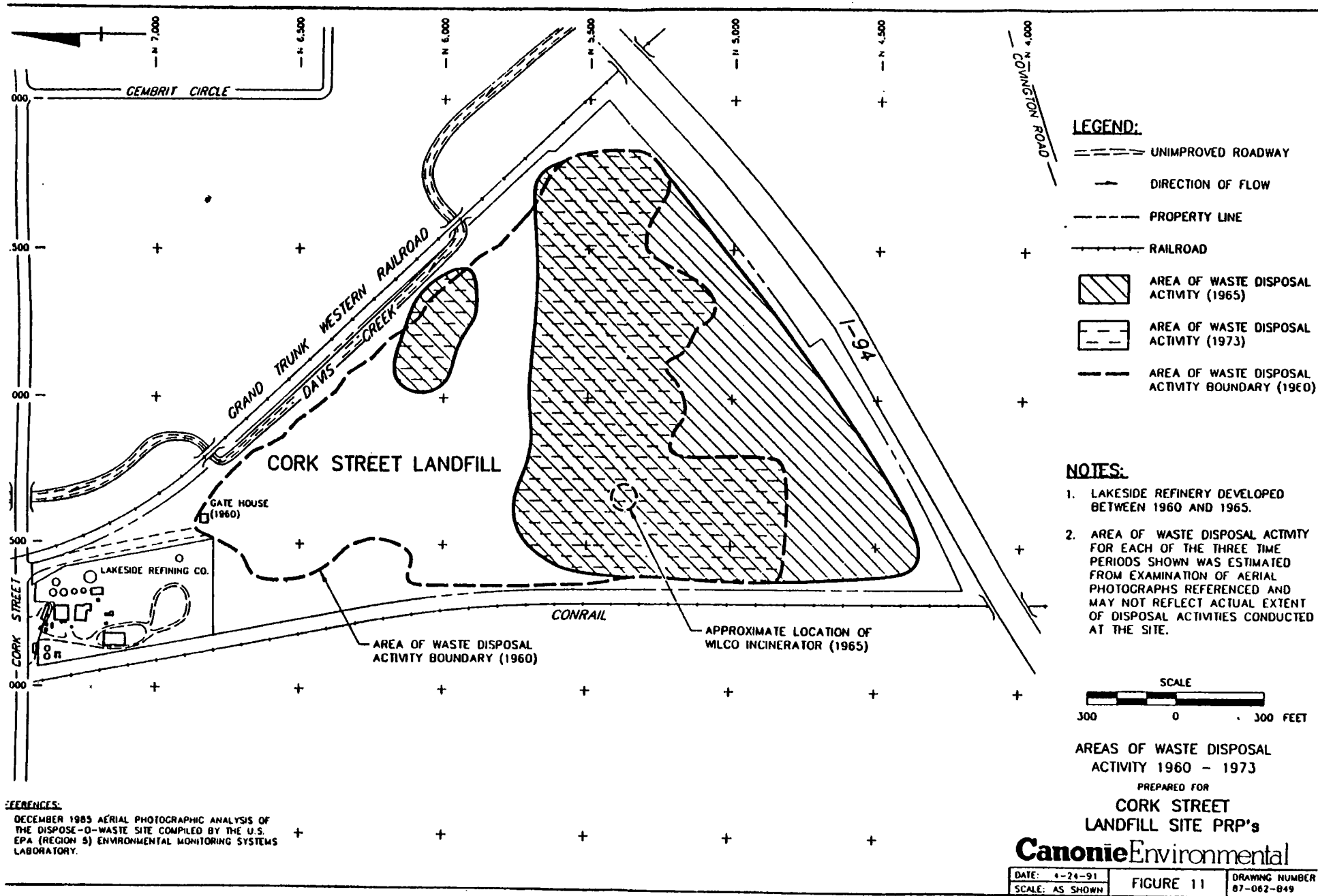


FIGURE 3

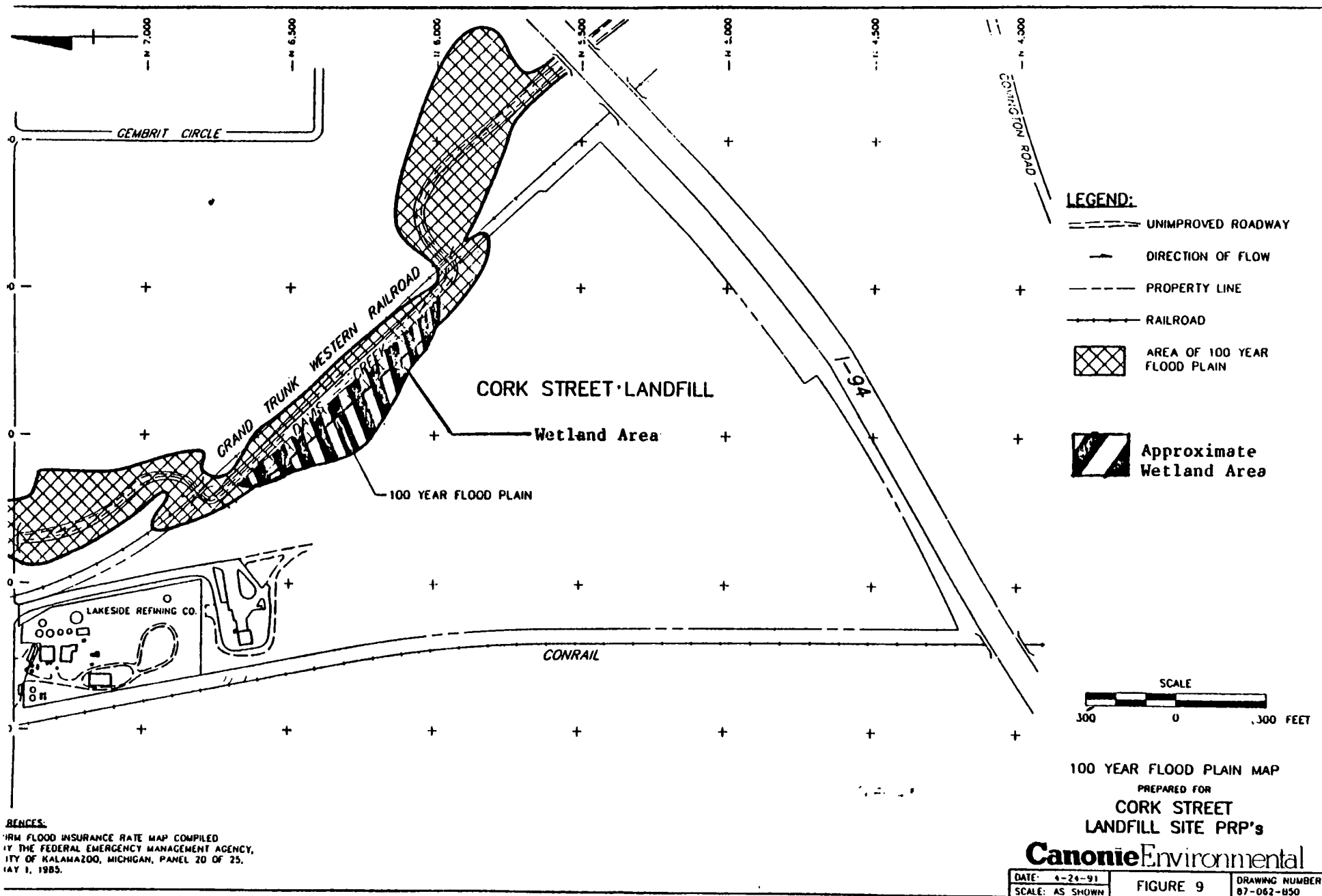


Figure 4

2. Site History and Enforcement Activities

Between the period of 1925 to 1961 the property was owned and operated by private parties as a general refuse municipal landfill. Attempts to identify viable owners and operators from that period were unsuccessful. In 1961 the City of Kalamazoo bought the property and began accepting wastes from local residents, businesses and industries. A tee-pee shaped incinerator, called a Wilco burner, was used to incinerate a majority of the waste with the ash being deposited on Site. In 1968 the Site became licensed by the state to receive only inert waste, and incineration ceased at the Site to comply with new air pollution regulations. Also, at that time, the landfill closed for public use. However, the City continued to dispose of its own inert waste there until 1981.

During the period of 1979 to 1981 the facility operated without a license. The State had determined that a license for this operation was unnecessary because the refuse being disposed of in the landfill was predominantly street sweepings, leaves and demolition debris. Figure 3 shows the approximate waste management area boundaries.

In March of 1981 the City sold the property to Dispos-O-Waste, now known as Michigan Disposal Service Corporation (MDS). This sale was contingent upon MDS being able to get an operating license to use the land as a Type III landfill. This landfill would operate directly on top of the old municipal landfill and would accept waste, defined, by the state, as having low potential to cause groundwater contamination. A construction permit, allowing MDS to prepare the Site to accept waste, was issued by the MDNR in July of 1982. This permit contained the following stipulations:

- 1) An acceptable monitoring program to distinguish the Type III leachate from the Type II facility must be developed and submitted to the Resource Recovery Division for review and approval.
- 2) A groundwater monitoring and collection program pursuant to 299.4305, Rule 305(3), must be developed and submitted to the Resource Recovery Division for review and approval. Base line water quality data must be established prior to license application;
- 3) The source and supportive physical data for the final cover must be identified and submitted to the Resource Recovery Division for review and approval pursuant to R299.4304, Rule 304(3)(c), and Rule 305(10);
- 4) All areas which have received refuse from the previous landfilling activities and are currently at the final grades proposed must have final cover (pursuant to R299.4305, Rule 305(10), in place at the time of license application;

5) Any construction activities within 500 feet of Davis Creek or within the contiguous wetland area must be conducted strictly in accordance with the Inland Lakes and Stream Act and Wetlands Protection Act, respectively. In the event permits are necessary for the above stated acts, they must be obtained prior to the commencement of construction; and

6) A clearance must be obtained from the Michigan Department of Public Health pursuant to Act 399 of 1976, the Safe Drinking Water Act, R325.10812, Rule 812, prior to the construction of the facility.

The Michigan Department of Natural Resources (MDNR) issued an operating license to MDS in June of 1983, for one, five acre cell (cell #1) with the following stipulations included:

1) Any leachate breakouts shall be properly contained, gathered up with associated soils and disposed of in a proper manner;

2) Because the anticipated work includes filling adjacent to the highly travelled expressway, precautions will be taken to eliminate illegal access and disposal from off-site sources;

3) The landfill operator will monitor for and remove unacceptable wastes from the site; and

4) An extension to the letter of credit, and acceptable replacement letter of credit or other acceptable financial assurance shall be provided by May 15, 1984.

Three years later the license was renewed and expanded to include an additional five acre cell (cell #2).

The Site was proposed for the National Priorities List (NPL) in June of 1987 with an HRS score of 37.93. The City of Kalamazoo, MDS and the U.S. EPA entered into a Consent Order (EPA Docket No. V-W-87-C-035) for the City and MDS to perform the Remedial Investigation and Feasibility Study (RI/FS) on December 3, 1987, and the Site was finalized on the NPL in February of 1990.

In August of 1987, MDS submitted an application to license an additional 16 acres (cells 3 & 4). This application was denied by the MDNR in November of 1988 and a Director's Cease and Desist Order was issued at the same time. These were issued on the basis that MDS had failed to meet the requirements of the stipulations in the original permit and licenses issued for the landfill. In December of 1988 MDS filed a complaint in the Kalamazoo County Court against the MDNR for denying the application and, also, sought injunctive relief from the Cease and Desist Order. The judge issued an injunction allowing continued filling at the Site and ordered that a collection system, called a trench drain, be installed to

intercept the leachate prior to its entering Davis Creek. The trench drain has been installed and is operating. Cells 1 & 2 have been closed with a clay cap and cell 3 will be capped during the summer of 1991. Cell 4 is currently being filled with Type III waste. Operations have also taken place in cells not covered under the denied license application. The case is still pending in the county court.

3. Highlights of Community Participation

The RI/FS Report and the Proposed Plan for the Michigan Disposal Site were released to the public for comment on July 11, 1991. These two documents were made available to the public in both the administrative record maintained at the United States Environmental Protection Agency (U.S. EPA) Docket Room in Region V and at the Kalamazoo Public Library. The documents were also made available at the public information repositories maintained at the Kalamazoo Public Library and the Kalamazoo Nature Center. The notice of availability for these two documents was published in the Kalamazoo Gazette newspaper on July 8, 1991. A public comment period on the documents was held from July 11, 1991 to September 8, 1991. In addition, a public meeting was held on July 17, 1991. At this meeting, representatives from U.S. EPA and the MDNR answered questions about problems at the Site and the remedial alternatives under consideration. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this ROD. The provisions of Sections 113(k)(2)(B)(i)-(v) and 117 of the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), as amended have been satisfied.

4. Scope and Role of Operable Unit or Response Action Within Site Strategy

This Record of Decision (ROD) addresses the final remedy for the Site. The threats posed by this Site to human health and the environment are: landfilled waste, which is the source material for the leachate, the leachate, and contaminated ground water.

The landfilled waste is the source material for contamination from the Site. This waste is classified as a low level threat waste. Low level threat waste is defined as those source materials that generally can be reliably managed with little likelihood of migration and that present a low risk in the event of exposure. They include source materials that exhibit low mobility in the environment or are above protective levels but are not considered to be significantly above protective levels for toxic compounds. Leachate contained within the landfilled waste is also considered a low level threat waste. Leachate in ground water is classified as contaminated ground water.

Leachate and contaminated ground water will be treated. The landfilled waste will be contained "on-site". Treatment of the landfill's contents was determined to be inappropriate, because the size of the landfill and the absence of known "on-site" hot spots (areas of concentrated hazardous substances within the landfill) that represent major sources of contamination preclude a remedy in which landfilled waste could be excavated and treated efficiently and cost effectively.

5. Summary of Site Characteristics

Pursuant to the authorities under the CERCLA, as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), an RI and FS were conducted at the Site.

Figure 5 shows the sampling locations. During the RI/FS the following conditions were observed at the Michigan Disposal Landfill Site:

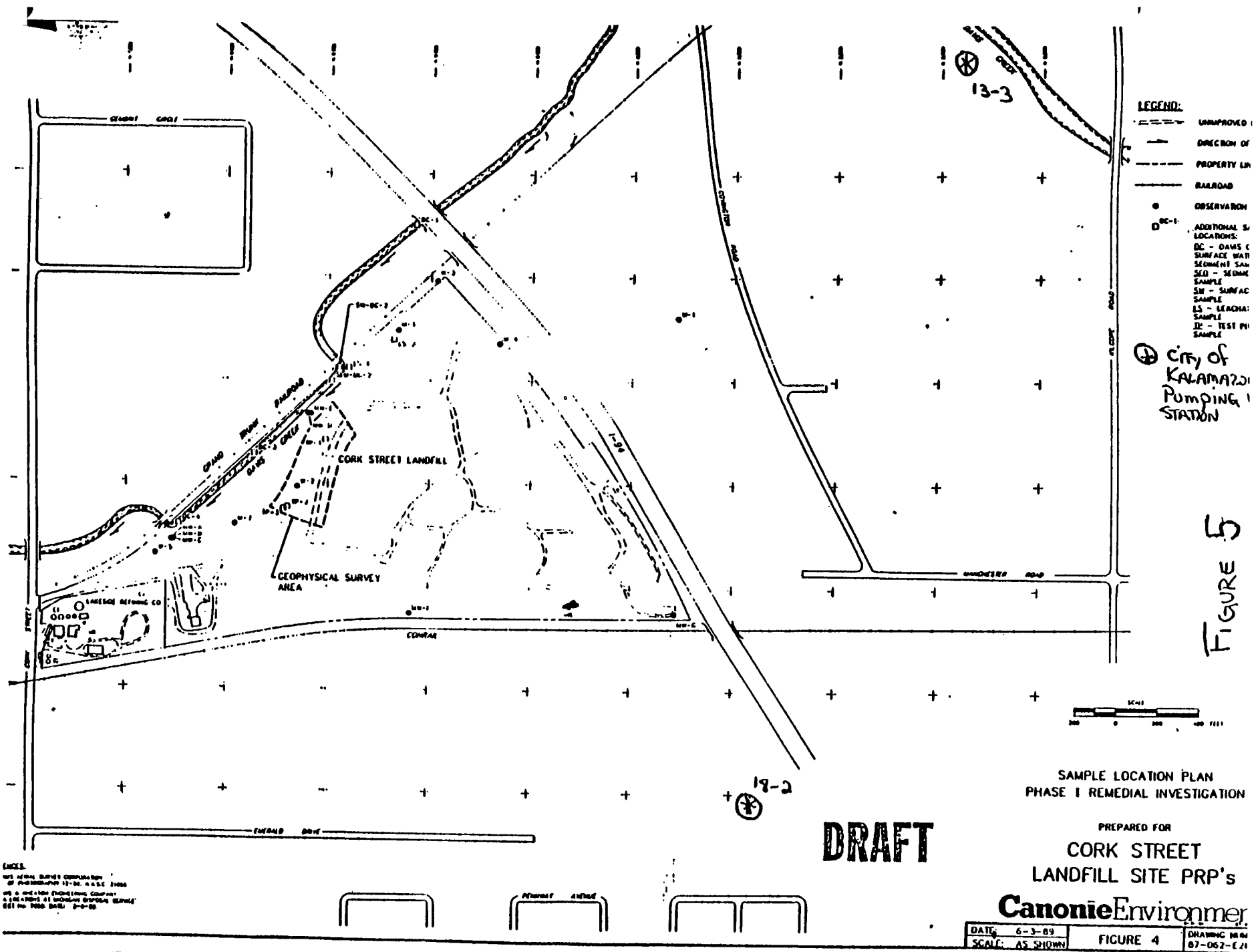
1. Topography and Drainage

The topography of the Site is relatively flat with a maximum relief of approximately 70 feet, due primarily to recent and continued filling with paper mill sludge, construction debris, and other inert materials. The ground surface of the Site is characterized by numerous "piles" of landfilled materials or stockpiles of inert waste such as concrete and steel. The Site drainage is mainly to the northeast to Davis Creek; however, the far west portion of the Site drains to a small depression along the Conrail tracks where it infiltrates into the soil underlying the Site. The extreme south portion of the Site and part of the I-94 right-of-way drain to a topographic low area on the south margin of the Site, where water either evaporates or infiltrates.

2. Hydrogeology

a. Local Hydrogeology

The Site is underlain by interbedded glacial outwash and till. The glacial drift thickness in the vicinity of the Site is approximately 150 feet, beneath which lies the Coldwater Shale unit. The outwash is mainly composed of fine sand with some gravel and/or cobbles, while the till is clay-rich. The glacial outwash/till unit is considered a single drift aquifer. The regional ground water flow in the aquifer is to the north towards the Kalamazoo River at a gradient of approximately 0.015, and the aquifer has a maximum average linear velocity of 399 ft/year.



b. Site Hydrogeology

Two shallow hydrogeologic units are present beneath the Site: a brown silty fine sand and an underlying gray silty clay. The native soils are locally overlain by 0 to 26 feet of fill material and refuse. These materials have been covered mainly with sandy fill and other inert material to various thicknesses. Pump tests performed on two municipal well pumping stations upgradient from the Site show that there is some connection between the shallow water bearing unit and the deep water bearing unit. In addition, soil borings from a previous study have shown that the shallow clay layer is absent at certain points on the Site. The top of the water table is located approximately between 3 to 12 feet below the surface of landfilled waste while a portion of the waste is sitting in the shallow ground water. The connection with the ground water creates a conduit for contaminants to leach into the ground water.

Two additional, deeper hydrogeologic units are present beneath the Site: a system of fine to coarse sands and gravels with occasional clay lenses and the Coldwater Shale unit. No data is available on these units. The ground water flow in the shallow aquifer at the Site is estimated to be northeast towards Davis Creek at a gradient of 0.11 to 0.17. In the southwestern portion of the Site, the gradient in the shallow aquifer is flatter but becomes steeper again near Davis Creek, indicating that groundwater is discharging to and upward into the creek.

3. Contamination

a. Ground Water

Wells on the eastern border of the Site have shown contamination from volatile organic chemicals (VOCs), semi-volatile organic chemicals (SVOCs), and metals in the shallow aquifer. Benzene, lead, and arsenic were found above Federal Drinking Water Standards Maximum Contaminant Levels (MCLs).

Table 1 lists the chemicals above Michigan's Act 307 Type A or B criteria. Michigan Act 307 Rules contain clean-up criteria which include three different methods by which clean-up levels can be determined. The levels are Type A, Type B, and Type C. The methodology for Type A clean-up is based on background levels or method detection limits for chemicals of concern. The methodology for Type B clean-up uses standardized risk assumptions and exposure assumptions to determine clean-up levels which will be protective of human health and the environment and the use of the involved resource. R. 299.5709 and R. 299.5711 provide thorough explanation on how to apply the Type B clean-up to the chemicals of concern and calculate the clean-up levels for a site. The methodology for Type C clean-up considers the actual conditions of a site; the uses, present and future, of a site; a site specific risk assessment; and

Table 1
Contaminants Detected Above Act 307 Standards

Medium	Contaminant Detected	Max. Conc. (ppb)	307 Standard (ppb)
Test Pit Soils	Methylene Chloride	110	100
	Benzo(a)anthracene	330	100
	Benzo(a)pyrene	330	100
	Benzo(k)fluoranthene	770	100
	Bis(2-ethylhexyl)phthalate	4,100	40
	Chrysene	420	100
	Indeno-(1,2,3-c,d)-pyrene	120	100
	Naphthalene	30,000	800
	2-methylnaphthalene	7,400	1,200
	PCB-1254	6,200	1,000
	Arsenic	12,000	0.4
	Lead	316,000	9,700*
	Zinc	786,000	20,000
	Mercury	250	<100*
Soil Borings	Benzo(a)anthracene	340	100
	Benzo(a)pyrene	310	100
	Benzo(k)fluoranthene	580	100
	Bis(2-ethylhexyl)phthalate	330	40
	Chrysene	400	100
	Indeno(1,2,3-c,d)pyrene	190	100
	Arsenic	20,000	0.4
	Aluminum	6,190	1,000
	Lead	87,000	9,700*
	Mercury	250	<100*
	Nickel	15,000	2,000
Ground Water	Benzene	150	1.0
	1,4 dichlorobenzene	4.0	1.0

Table 1
Contaminants Detected Above Act 307 Standards

Medium	Contaminant Detected	Max. Conc. (ppb)	307 Standard (ppb)
Ground Water	Methylene chloride	10	5.0
	Bis(2-ethylhexyl)phthalate	29	2.0
	Arsenic	65	0.02
	Zinc	9,870	80
	Lead	268	5.0
Sediments	Benzo(a)anthracene	4,800	100
	Benzo(a)pyrene	3,700	100
	Benzo(k)fluoranthene	7,600	100
	Bis(2-ethylhexyl)phthalate	720	40
	Chrysene	4,700	100
	Dibenz(a,h)anthracene	770	100
	Fluoranthene	9,900	6,000
	Indeno(1,2,3-c,d)pyrene	1,500	100
	Pyrene	7,200	4000
	Arsenic	6,900	0.4
	Lead	60,700	9,700*
Leachate	1,4 dichlorobenzene	2.0	1.0
	Naphthalene	190	30

Local background for lead, mercury and zinc - Established using Table 18 of Cork Street RI report, West KL Avenue soil boring data.

cost effectiveness analysis. R. 299.5717 provides a thorough explanation of how to apply the Type C clean-up to the chemicals of concern.

Sufficient data is not available to conclude if Davis Creek acts as a hydraulic barrier, or if contaminants travel further east beyond the creek. Because no samples were taken below the shallow clay layer, it is not known if the contaminants have migrated beneath the shallow clay layer. Additional studies will be required to fill these data gaps. Pumping tests performed on two municipal water supply stations, Station 13 and Station 18, located approximately 4,000 and 1,400 feet upgradient of the Site, have shown that those wells are not presently capable of reversing the flow of ground water at the Site so as to threaten the quality of water drawn from those wells. This, along with annual monitoring results of the stations by the City of Kalamazoo, has shown that the municipal water supply is not presently threatened by the Site. Figure 5 shows the approximate locations of the pumping station wells.

b. Soils

Analytical results from soil and test pit samples show that the landfill contents (approximately 1.8 million cubic yards of waste) are the source of contamination. Soil samples were taken from a background location and the Site. The results show that VOCs, SVOCs, PCBs and metals are at elevated levels in the soils; however, limited sampling of the landfilled waste and soils found no localized areas of high contamination. Table 1 summarizes the contaminants found in the soils and test pits at concentrations above Michigan's Act 307 criteria. Eight VOCs were detected in the subsurface soils at the landfill, ranging in concentration from 0.001 mg/kg to 0.110 mg/kg. Twenty-six SVOCs were detected in the soils of the landfill, ranging in concentration from 0.040 mg/kg to 30 mg/kg. PCBs were observed in soils from two test pits at concentrations ranging from 0.22 mg/kg to 6.2 mg/kg.

c. Leachate

Leachate samples taken from test pits 2 and 3 found several contaminants leaching from the landfill contents. Four contaminants were found to exceed their MCLs; chromium (53.8 ppb), iron (84,000 ppb), manganese (1,400 ppb) and mercury (4.2 ppb). Leachate seeps formerly observed on the southeastern border of the Site, and discharging to the creek are now being collected in a trench drain installed by MDS, however, other outbreaks have been observed on the west and northeastern portions of the property. The most recent sampling performed by the MDNR on leachate coming from the Type III waste has shown no significant contamination, however, those sampling results may be questionable due to sampling conditions.

d. Surface Water and Sediments

Samples of surface water and sediments were taken from four locations in Davis Creek; one upstream and three downstream. The only contaminant found in the surface water above federal ambient water quality criteria was manganese with its highest concentration being 97.5 ppb.

Three volatile compounds were detected in the sediments, ranging in concentrations from 1 ppb to 53 ppb. Semivolatiles in the sediments ranged from 40 ppb to 9,990 ppb with 19 total SVOCs detected. Fourteen inorganic compounds were also detected with concentrations ranging from 1,800 ppb to 40,900 ppm. The presence of the SVOCs may be attributed to the Site, run-off from I-94 or an oil spill to the creek (in 1979) upstream of the Site. Many inorganics were detected at higher concentrations upstream than downstream. Those detected at higher concentrations downstream were aluminum, calcium, copper, iron, manganese, sodium, and vanadium. Some SVOCs were also detected at higher concentrations upstream.

With the possibility of other factors influencing the condition of the sediments, it is not possible at this time to establish a connection between the Site and the conditions of the creek. However, with only one chemical found above federal standards in the surface water, it appears that the Site is not having a significant effect on the surface water at the Site.

6. Summary of Site Risks

-Human Health Risks

Pursuant to the NCP a baseline risk assessment was conducted by MDS and the City for the Michigan Disposal Site as part of the Remedial Investigation. Unacceptable risks to human health have been identified for the ingestion of ground water.

A baseline risk assessment was performed using analytical data generated during the RI. The baseline RA assumes no corrective action will take place and that no site-use restrictions or institutional controls such as fencing, ground water use restrictions or construction restrictions will be imposed. However, for the future Site scenarios, present action at the Site and current plans for development are considered. Currently, the Site is being filled with waste and portions are being capped with two feet of clay. Because the Site is an active landfill it was assumed that the Site will be capped in the future. The future residential scenario was considered unreasonable because the Site had been planned to be developed as an industrial park after closure of the currently operating landfill, and the area surrounding the Site is used industrially and commercially. Potential exposure pathways considered for the Site under current and nonrestricted future site development scenarios were:

- 1) Direct contact with impacted soils on-site, including ingestion and absorption, by a trespasser under current conditions;

2) Direct contact, including ingestion and absorption, with impacted test pit soils by a trespasser (children of ages 6-11);

3) Exposure to surface water and/or sediment, including direct contact and inhalation by a potential receptor wading in the creek;

4) Direct contact, including ingestion and absorption, with impacted leachate on-site by a trespasser under current as well as future nonrestricted conditions;

5) Ingestion of impacted ground water and inhalation of volatilized organics from household use of impacted ground water in the future from drinking water supply wells located on the landfill.

A smaller group of contaminants than actually detected at the Site was selected to focus the baseline risk assessment. The chemicals selected were chosen because they were considered most likely to contribute most of the risk associated with the Site, based upon a concentration-toxicity screen which took into consideration the concentration of contaminant found at the Site and the contaminants toxicity. Tables 2 thru 7 list the contaminants of concern chosen for each of the media at the Site.

For each exposure pathway evaluated, carcinogenic and noncarcinogenic health risks were characterized for the reasonable maximum exposure risk scenario, for current Site conditions, and for future Site development. Table 8 lists the exposure assumptions used for each of the pathways evaluated.

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 lifetime 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.

Potential concern for non-carcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. Any Hazard Index value greater than 1.0 suggests that a non-carcinogen potentially presents an unacceptable health risk.

Table 2
Ground Water Contaminants of Concern

Contaminants of Concern	Frequency of Detection	Range of Detected Concentrations (ppb)	Arithmetic Mean (ppb)
Benzene	6/30	1.0 - 150.0	7.0
Arsenic	23/30	2.7 - 65.4	18.0
Barium	30/30	31.6 - 382.0	155.2
Beryllium	1/30	10.0 - 10.0	0.8
Cadmium	1/30	9.2 - 9.2	2.3
Chromium	4/30	6.3 - 9.8	3.1
Manganese	30/30	3.8 - 3,000	466.5

Table 3
Soil Contaminants of Concern

Contaminants of Concern	Frequency of Detection	Range of Detected Concentrations (ppb)	Arithmetic Mean (ppb)
Arsenic	6/6	1,100 - 20,000	5,333
Barium	6/6	16,000 - 126,000	46,166
Chromium	6/6	5,800 - 15,000	9,300
Manganese	6/6	171,000 - 292,000	219,833

Table 4
Surface Water Contaminants of Concern

Contaminants of Concern	Frequency of Detection	Range of Detected Concentrations (ppb)	Arithmetic Mean (ppb)
Arsenic	2/4	4.4 - 8.1	3.7
Barium	4/4	49.6 - 50.5	50.1
Manganese	4/4	96.1 - 97.5	97.0

Table 5
Sediments Contaminants of Concern

Contaminants of Concern	Frequency of Detection	Range of Detected Concentrations (ppb)	Arithmetic Mean (ppb)
Arsenic	4/4	2,700 - 6,900	5,400
Cadmium	1/4	3,900 - 3,900	1,347
Chromium	4/4	5,800 - 12,000	8,775
Manganese	4/4	115,000 - 365,000	234,000
Benzo(a)anthracene	4/4	390 - 4,800	1,795
Benzo(b)fluoranthene	4/4	430 - 7,600	2,858
Benzo(k)fluoranthene	4/4	270 - 7,600	2,818
Benzo(g,h,i)perylene	4/4	380 - 3,700	1,475
Chrysene	4/4	480 - 4,700	1,798
Dibenzo(a,h)anthracene	4/4	42.0 - 770	303

Table 6
Leachate Contaminants of Concern

Contaminants of Concern	Frequency of Detection	Range of Detected Concentrations (ppb)	Arithmetic Mean (ppb)
PCB-1254	1/3	12.0 - 12.0	4.3
Antimony	1/3	43.8 - 43.8	29.0
Arsenic	3/3	15.2 - 34.8	26.2
Barium	3/3	165 - 286	210
Chromium	2/3	6.7 - 53.8	21.2
Manganese	3/3	757 - 1,400	1,030

Table 7
Test Pit Contaminants of Concern

Contaminants of Concern	Frequency of Detection	Range of Detected Concentrations (ppb)	Arithmetic Mean (ppb)
PCB-1254	5/7	220 - 6,200	1,298
Arsenic	6/7	3,800 - 12,000	7,121
Barium	7/7	63,500 - 506,000	227,971
Beryllium	5/7	490 - 7,200	2,185
Chromium	7/7	9,900 - 77,200	29,929
Manganese	7/7	302,000 - 4,790,000	1,838,300

TABLE 8

Exposure Pathway	Exposure Population	Exposure Frequency	Exposure Rate	Exposure Duration	Relative Absorption Factors(a)		
					Volatile Organics	Semivolatile Organics	Inorganics
<u>Ground Water (Future Site Development)</u>							
Ingestion	70-kg Adults	Daily	2 liters/day (b)	70 Years	100%	100%	100%
<u>Source Areas (Current Site Conditions)</u>							
Ingestion - Test Pits	30-kg Children (Age 6 - 11)	30/year (d)	100 mg/event (e)	5 Years	100%	50%	50%
	70-kg Children (Age 12 - 18)	30/year (d)	100 mg/event (e)	7 Years	100%	50%	50%
	Weighted Average (c)	53 kg	30/year (d)	100 mg/event (e)	12 Years	100%	50%
Absorption - Test Pits	30-kg Children (Age 6 - 11)	30/year (d)	900 mg/event (f)	5 Years	10%	1%	1%
	70-kg Children (Age 12 - 18)	30/year (d)	900 mg/event (f)	7 Years	10%	1%	1%
	Weighted Average (c)	53 kg	30/year (d)	900 mg/event (f)	12 Years	10%	1%
Ingestion - Leachate	30-kg Children (Age 6 - 11)	7/year	130 cc/event (g)	5 Years	100%	100%	100%
	70-kg Children (Age 12 - 18)	7/year	130 cc/event (g)	60 Years	100%	100%	100%
	Weighted Average (c)	67 kg	7/year	130 cc/event (g)	65 Years	100%	100%
Absorption - Leachate	30-kg Children (Age 6 - 11)	7/year	4,368 cc/event(h)	5 Years	100%	100%	100%
	70-kg Children (Age 12 - 18)	7/year	4,368 cc/event(h)	60 Years	100%	100%	100%
	Weighted Average (c)	67 kg	7/year	4,368 cc/event(h)	65 Years	100%	100%
<u>Soils (Current Site Conditions)</u>							
Ingestion	30-kg Children (Age 6 - 11)	30/year (d)	100 mg/event (e)	5 Years	100%	50%	50%
	70-kg Children (Age 12 - 18)	30/year (d)	100 mg/event (e)	7 Years	100%	50%	50%
	Weighted Average (c)	53 kg	30/year (d)	100 mg/event (e)	12 Years	100%	50%
Absorption	30-kg Children (Age 6 - 11)	30/year (d)	900 mg/event (f)	5 Years	10%	1%	1%
	70-kg Children (Age 12 - 18)	30/year (d)	900 mg/event (f)	7 Years	10%	1%	1%
	Weighted Average (c)	53 kg	30/year (d)	900 mg/event (f)	12 Years	10%	1%
<u>Surface Water (Current Site Conditions)</u>							
Ingestion	30-kg Children (Age 6 - 11)	7/year	130 cc/event (g)	5 Years	100%	100%	100%
	70-kg Adults (Age 11 - 70)	7/year	130 cc/event (g)	60 Years	100%	100%	100%
	Weighted Average (c)	67 kg	7/year	130 cc/event (g)	65 Years	100%	100%
Absorption	30-kg Children (Age 6 - 11)	7/year	4,368 cc/event(h)	5 Years	100%	100%	100%
	70-kg Adults (Age 11 - 70)	7/year	4,368 cc/event(h)	60 Years	100%	100%	100%
	Weighted Average (c)	67 kg	7/year	4,368 cc/event(h)	65 Years	100%	100%

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TABLE 8
(Continued)

Exposure Pathway	Exposure Population	Exposure Frequency	Exposure Rate	Exposure Duration	Relative Absorption Factors(a)		
					Volatile Organics	Semivolatile Organics	Inorganics
<u>Sediment (Current Site Conditions)</u>							
Ingestion	30-kg Children (Age 6 - 11)	7/year	100 mg/event (e)	5 Years	100%	50%	50%
	70-kg Adults (Age 11 - 70)	7/year	100 mg/event (e)	60 Years	100%	50%	50%
	Weighted Average (c)	67 kg	7/year	100 mg/event (e)	65 Years	100%	50%
Absorption	30-kg Children (Age 6 - 11)	7/year	800 mg/event (f)	5 Years	10%	1%	1%
	70-kg Adults (Age 11 - 70)	7/year	800 mg/event (f)	60 Years	10%	1%	1%
	Weighted Average (c)	67 kg	7/year	800 mg/event (f)	65 Years	10%	1%

Notes:

- (a) Values for soil exposure are specified for use in Michigan Department of Natural Resources Act 307 R.299.5711.
- (b) Value represents 90th percentile adult drinking water rate, as specified in U.S. EPA's Risk Assessment Guidance for Superfund.
- (c) Weighted average used only for estimation of carcinogenic risks.
- (d) Assumes weekly visits to the site from April through October.
- (e) Value specified in U.S. EPA's Risk Assessment Guidance for Superfund for age groups greater than six years old.
- (f) Value specified for use in Michigan Department of Natural Resources Act 307 R.299.5711.
- (g) Based on 50 ml/hour ingestion rate and 2.6-hour exposure time, which are specified in U.S. EPA's Risk Assessment Guidance for Superfund for ingestion while swimming.
- (h) Based on water dermal permeability constant of 0.00064 cm/hour (which was assumed when no chemical-specific dermal permeability constant was available), 2.6 hours of exposure per event, and 2,000 square centimeter skin area (hands, forearms, feet, and lower legs of child or hands and feet of adult).

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Tables 9 and 10 list the total Hazard Indices for the pathways considered. As the tables indicate, none of the indices for the different scenarios exceed 1.0.

Cancer potency factors (CPFs) have been developed by U.S. 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 $(\text{mg/kg-day})^{-1}$, 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 to which animal-to-human extrapolation and uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans).

Excess Lifetime Cancer Risks are determined by multiplying the intake level with the cancer potency factor for each contaminant of concern. These risks are probabilities that are generally expressed in scientific notation (e.g. 1×10^{-6} or $1\text{E-}6$). An excess lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site. The U.S. EPA generally attempts to reduce the excess lifetime cancer risk posed by a Superfund sites to a range of 1×10^{-4} to 1×10^{-6} (1 in 10,000 to 1 in 1 million), with an emphasis on the lower end of the scale (1×10^{-6}).

Tables 9 and 10 indicate the Excess Lifetime Cancer Risks for different scenarios. As the table shows, the excess lifetime cancer risk for the future site development scenario of ingestion of ground water exceeds the acceptable risk range of 1×10^{-4} to 1×10^{-6} .

-Environmental Risks

In addition to human health risks, the risks to the environment were also considered during the remedial investigation. A wildlife survey produced no evidence of threatened or endangered species inhabiting the Site. Analysis of earthworm samples from the Site detected no bioaccumulation of metals in those organisms. It is estimated that the greatest risks posed by the Site are to the aquatic life in the surface water in the vicinity to the Site and the wildlife and plant life in the wetlands on-site. Leachate and contaminated ground water flow into the wetlands and eventually into Davis Creek. As long as these liquids continue to be produced by the Site, they will be a source of contamination in the creek and wetlands.

Risk Summary

The potential excess lifetime cancer risk posed by the Site, 1×10^{-3} , exceeds the acceptable risk range of 1×10^{-4} to 1×10^{-6} .

Table 9
Summary of Risk Estimates
Current Conditions

Exposure Scenario	Excess Cancer Risk		Noncarcinogenic Risk (Hazard Index)	
	Reasonable Maximum Exposure Case	Chemicals Contributing Most to Risk	Reasonable Maximum Exposure Case	Chemicals Contributing Most to Risk
Ingestion of Soils	2×10^{-7}	Arsenic	3×10^{-3}	Arsenic
Absorbtion of Soils	4×10^{-8}	Arsenic	4×10^{-4}	Arsenic
Ingestion of Sediments	4×10^{-6}	PAHs	6×10^{-4}	Arsenic, Cadmium
Absorbtion of Sediments	8×10^{-7}	PAHs	1×10^{-4}	Arsenic, Cadmium
Ingestion of Surface Water	4×10^{-8}	Arsenic	7×10^{-4}	Arsenic
Absorbtion of Surface Water	1×10^{-8}	Arsenic	2×10^{-5}	Arsenic
Ingestion of Test Pit Soils	7×10^{-7}	PCB-1254	5×10^{-3}	Manganese
Absorbtion of Test Pit Soils	1×10^{-7}	PCB-1254	1×10^{-3}	Manganese
Ingestion of Leachate	5×10^{-6}	PCB-1254, Arsenic	1×10^{-2}	Antimony, Arsenic
Absorbtion of Leachate	2×10^{-7}	PCB-1254, Arsenic	5×10^{-4}	Antimony, Arsenic

Table 10
Summary of Risk Estimates
Future Site Development

Exposure Scenario	Excess Cancer Risk		Noncarcinogenic Risk (Hazard Index)	
	Reasonable Maximum Exposure Case	Chemicals Contributing Most to Risk	Reasonable Maximum Exposure Case	Chemicals Contributing Most to Risk
Ingestion of Ground Water	1×10^{-3}	Arsenic	1.0	Arsenic, Cadmium
Ingestion of Sediments	4×10^{-6}	PAHs	6×10^{-4}	Arsenic, Cadmium
Absorbtion of Sediments	8×10^{-7}	PAHs	1×10^{-4}	Arsenic, Cadmium
Ingestion of Surface Water	4×10^{-7}	Arsenic	7×10^{-4}	Arsenic
Absorbtion of Surface Water	1×10^{-8}	Arsenic	2×10^{-5}	Arsenic
Ingestion of Leachate	5×10^{-6}	PCB-1254, Arsenic	1×10^{-2}	Antimony, Arsenic
Absorbtion of Leachate	2×10^{-7}	PCB-1254, Arsenic	5×10^{-4}	Antimony, Arsenic

principally from the future use of contaminated ground water, with arsenic contributing most to the risk. This represents unacceptable potential risks to human health.

The hazard indices for humans interacting with the Site do not exceed the acceptable hazard index of 1.0, indicating that non-carcinogens do not present an unacceptable risk to human health.

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementation of the response action selected by this ROD may present an imminent and substantial endangerment to public health, welfare, or the environment, primarily through use of contaminated ground water. The Site also poses risks to non-human receptors from contaminants released from the Site into surface waters and the wetlands

7. Environmental Standards Not Met at the Site

In addition to posing unacceptable risks to receptors, the MDS Landfill Site does not meet certain applicable or relevant and appropriate Federal or State environmental requirements (ARARs) at this time.

a. Cap

The existing landfill cap does not meet the requirements of Michigan State Solid Waste Rules promulgated under Michigan Act 641, which provides current State landfill closure regulations. These regulations are relevant and appropriate for the old municipal landfilled waste because they were placed prior to the promulgation of Act 641. However, Act 641 is applicable for the new Type III landfill which has been regulated under that law. Because there is no evidence of hazardous waste being deposited in the landfill a hazardous waste cap is not applicable or relevant and appropriate for this landfill.

b. Clean-up Standards

U.S. EPA's ground-water clean-up policy is to attain Maximum Contaminant Levels (MCLs) under the Federal Safe Drinking Water Act (SDWA); however, if clean-up to MCLs causes the residual risk levels to exceed the 1×10^{-4} to 1×10^{-6} risk range, then, according to Section 300.430(e)(2)(i)(B) through (D), the Agency may consider applying risk-based clean-up levels to reach the goal of protection (1×10^{-6} excess lifetime cancer risk).

Michigan Act 307 Rules contain clean-up criteria which include three different methods by which clean-up levels can be determined. The levels are Type A, Type B, and Type C. The methodology for Type A clean-up is based on background levels or method detection limits for chemicals of concern. The methodology for Type B clean-up uses standardized risk assumptions and exposure assumptions to determine clean-up levels which will be protective of human health and the environment and the use of the involved resource. R. 299.5709 and R. 299.5711 provide thorough explanation on how to apply the Type B clean-up to the chemicals of concern and calculate the clean-up levels for a site. The methodology for Type C clean-up considers the actual conditions of a site; the uses, present and future, of a site; a site specific

risk assessment; and cost effectiveness analysis. R. 299.5717 provides a thorough explanation of how to apply the Type C clean-up to the chemicals of concern.

Michigan Act 307, Type B clean-up criteria provide for the calculation of risk-based clean-up standards at the 1×10^{-6} excess lifetime cancer risk level for each carcinogenic compound. These standards are usually more stringent than the corresponding MCLs or non-zero Maximum Concentration Limit Goals (MCLGs). The U.S. EPA has determined that Michigan Act 307, Type B criteria are protective and are applicable or relevant and appropriate to the Michigan Disposal Landfill Site.

Table 11 lists the representative chemicals found in the contaminated ground water plume and the corresponding Federal and State preliminary ground-water clean-up criteria which the U.S. EPA believes to be adequately protective of human health and the environment. Table 12 lists the Ground Water Remediation Standards for the Michigan Disposal Landfill Site.

8. Rationale for Further Action

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementation of the response action selected by this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment. Therefore, based on the findings in the RI report and the discussion above, a Feasibility Study (FS) was performed to focus the development of alternatives to address the threats at the Site. The FS report documents the evaluation of the magnitude of site risks, site-specific applicable or relevant and appropriate requirements, and the requirements of CERCLA and the NCP in the derivation of remedial alternatives for the Michigan Disposal Landfill Site.

9. Description of Alternatives

The alternatives passing through the screening process and considered for the detailed analysis in the FS were:

Common Elements. Except for the "No Action", all of the alternatives considered for the Site include institutional controls such as land and ground water use restrictions (pursuant to Michigan Act 307), notice to future property owners of contamination at the Site, restriction of on-site activities such as excavation, construction of a fence around the Site, and environmental monitoring.

REMEDIAL ALTERNATIVES-- Management of Migration Alternatives

Alternative MM-1: No Action

The NCP requires that the "no action" alternative be evaluated at every site to establish a baseline for comparison of the effectiveness of the remedial alternatives. Under this alternative, no active measures would be taken at the Site. This alternative does include a review every five years to determine the need for additional action. Risk levels will remain as stated

Table 11
Comparison of Federal and State Ground Water Remediation Standard
(ppb)

Contaminant	Safe Drinking Water Act Maximum Contaminant Level (MCL)	MI Act 307 Type B
Benzene	5.0	1.0
1,4 dichlorobenzene	70	1.0
Methylene Chloride	NE	5.0
Bis(2-ethylhexyl)phthalate	NE	2.0
Arsenic	50.0	0.02
Lead	5.0 (T)	5.0
Zinc	NE	80

(T) To-be-considered

NE Not Established

Table 12
Ground Water Remediation Standards
Michigan Disposal Landfill Site

Contaminant	Standard* (ppb)	Point of Compliance	Basis of Goal	Excess Cancer Risk Level**
Benzene	1.0	Landfill Final Cover Boundry	Michigan Act 307 Type B Criteria	1x10 ⁻⁶
1,4 dichlorobenzene	1.0			
Methylene Chloride	5.0			
Bis(2-ethylhexyl)phthalate	2.0			
Arsenic	0.02			
Lead	5.0			
Zinc	80			

* Where the Federal or State remediation standard established for a contaminant is lower than the method detection limit for that contaminant, the method detection limit will be used as the remediation standard for the site.

** Chemical Specific Reasonable Maximum Exposure Risk, measured as individual incremental lifetime excess risk, to be attained at the conclusion of the response action.

in the baseline risk assessment summarized above and describe in the RI report.

Alternative MM-3: Ground Water Extraction, On-site Treatment and Discharge to Davis Creek

Contaminated ground water would be collected and treated until each contaminant meets the cleanup standards. The cleanup standards are the Michigan Act 307, Type B cleanup criteria, listed in Table 12. The extraction and treatment system would consist of a row of extraction wells along the eastern boundary of the Site.

The extracted ground water and leachate would be treated on-site in a multi-step treatment process. The treatment processes would include precipitation, flocculation, and filtration to remove the inorganics and carbon adsorption to remove the organics. Treated water would then be discharged to Davis Creek after meeting the substantive requirements of a National Pollutant Discharge Elimination System (NPDES) permit. The spent carbon and sludge generated by the treatment facility would be disposed of in compliance with the RCRA land disposal restrictions at a licensed facility off-site. The ground water treatment system could operate indefinitely because contaminants would continue to leach from the waste into the ground water, but it is estimated that it will take up to 20 years, pumping at 45 gallons per minute, to reach the cleanup levels at the landfill boundary. Monitoring of the ground water would be continued once the cleanup standards are met to assure stable contaminant concentrations have been achieved.

It is estimated that this alternative will have a capital cost, an O&M cost and a present worth of \$1,273,000, \$671,000 and \$7,600,000, respectively.

Alternative MM-4: Ground Water Extraction and Discharge to the POTW for Treatment

Contaminated groundwater and leachate would be collected and discharged to the City of Kalamazoo's Publicly Owned Treatment Works (POTW) where it would ultimately be treated and disposed. The extraction system would consist of a row of extraction wells along the eastern boundary of the Site, as in Alternative MM-3, with discharge to the POTW via an on-site sewer system. The City of Kalamazoo's POTW treatment system includes treatment to remove organic compounds, however, incidental removal of low level inorganics also is effected. A pretreatment standard set by the POTW is applicable to all the waste streams discharged to the POTW. The standards set maximum levels of chemicals allowed in the waste stream being discharged. Table 13 lists the City of Kalamazoo POTW's pretreatment standards. Standards may need to be set for contaminants not listed in the table. At this point it is anticipated that concentrations will not exceed the POTW standards. If, however, the discharge limits are not met, a pretreatment step would be added prior to discharge of the water to the POTW.

Table 13
City of Kalamazoo Pretreatment Standards*

Contaminant	Daily Allowable Maximum Concentration (mg/l)
Cadmium	0.040
Chromium	4.67
Copper	2.23
Cyanide (total)	0.25
Lead	0.110
Nickel	1.59
Mercury	0.25
Zinc	5.30

* The POTW may be required to develop additional pretreatment standards for contaminants not listed here, but found in the discharge from the site.

Contaminated ground water and leachate would be collected and treated until each contaminant meets the cleanup standards. The cleanup standards are the Michigan Act 307, Type B cleanup criteria. It is currently estimated that it will require 20 years, pumping groundwater at 45 gallons per minute to reach the cleanup levels. Actual pump rates will be determined during the Remedial Design phase. Monitoring of the ground water would continue once cleanup standards were met to assure stable contaminant concentrations were achieved.

It is estimated that this alternative will have a capital cost, an O&M cost and a present worth of \$147,000, \$212,500 and \$2,150,000, respectively.

REMEDIAL ALTERNATIVES---Source Control Alternatives

Alternative SC-1: No Action

This alternative is the same as alternative MM-1. The NCP program requires that the "no action" alternative be evaluated at every site to establish a baseline for comparison against the other cleanup alternatives. Under this alternative, EPA would take no further action at the Site. This alternative does include a review every five years to determine the need for additional action.

Alternative SC-3: Surface Capping with Clay

Alternative SC-3 includes construction of a solid waste cap, which meets Michigan Act 641 requirements, over the entire Site (approximately 1.18 million cubic yards of soils and waste). This cap, consisting of two feet of clay and a vegetative layer (four inches of soil and grass cover), would meet State and Federal closure requirements for solid waste landfills. An additional frost protection layer may be required to protect the clay cap from frost damage. This alternative would require the importation of clean fill to develop an acceptable grade to the land. This cap would prevent exposure to landfill wastes and reduce infiltration of precipitation into the landfill.

It is estimated that this alternative will require 1-2 years to construct and will have a capital cost, an O&M cost and a present worth of \$5,730,500, \$41,300 and \$6,119,500, respectively.

Alternative SC-4: Surface Capping with Type III Solid Wastes and Clay

This alternative is the same as Alternative SC-3 except that it uses Type III solid wastes and inert materials, to develop the acceptable grades on the Site prior to capping, instead of clean fill. Type III waste is generally construction debris or specially approved solid wastes with low potential to contaminate the groundwater. At completion of the cap, this option would prevent exposure to landfill wastes and reduce infiltration of precipitation into the landfill.

It is estimated that this alternative will require 3-4 years to construct and will have a capital cost, an O&M cost and a present worth of \$4,304,000, \$36,300 and \$4,646,000, respectively.

Alternative SC-5: High-Temperature Thermal Treatment of Landfill Residuals and Associated Soils

Alternative SC-5 involves the excavation of approximately 1.18 million cubic yards of soils and landfill contents from areas where filling historically occurred and treatment of the materials through incineration or another high-temperature thermal treatment process option. The treated materials would be backfilled into the excavation, regraded and the area revegetated. This alternative would be designed and implemented to comply with all federal and state air pollution regulations. This alternative would also be implemented to comply with all federal and state solid waste disposal restrictions. RCRA Land Disposal Restrictions would become ARARs only if the residue from treatment became a characteristic hazardous waste.

It is estimated that this alternative will require 5 years to implement and will have a capital cost and a present worth of \$519,800,000 - 611,600,000.

Alternative SC-7: Surface Capping with Type III Solid Wastes and Clay

Alternative SC-7 includes the construction of a hazardous waste landfill clay cap which complies with the State of Michigan's Act 64 standards for hazardous waste landfills. This clay cap would be placed over approximately 1.18 million cubic yards of waste. Michigan Act 64 standards include a three-foot-thick clay cap, a two-foot-thick protective soil layer, and a four-inch-thick vegetated topsoil layer. This alternative would include the continued filling of Type III solid wastes on top of the old municipal landfill to produce the proper grades prior to placing the clay cap. Type III wastes are generally construction debris or specially approved solid waste with low potential to contaminate the groundwater. The cap in Alternative SC-7 would meet State and Federal closure requirements for hazardous waste landfills. SC-7 would prevent exposure to landfill wastes and minimize the infiltration of precipitation through the landfill and into the groundwater.

It is estimated that this alternative will require 3 to 4 years to construct and will have a capital cost, an O&M cost and a present worth of \$8,076,000, \$36,300 and \$8,418,000, respectively.

10. Comparative Analysis of Alternatives: The Nine Criteria

The following nine criteria, outlined in the NCP at Section 300.430(e)(9)(iii), were used to compare the alternatives and to determine the most appropriate alternative for remediation of the soils and groundwater contamination that is protective of human health and the environment, attains applicable or relevant and appropriate requirements (ARARs), is cost-effective and represents the best balance among the evaluating criteria. An alternative

providing the "best balance" of trade-offs, with respect to the nine criteria, is determined from this evaluation.

The Nine Criteria

-Threshold Criteria:

Overall Protection of Human Health and the Environment addresses whether or not a remedy provides adequate protection and describes how risks posed by each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

All of the alternatives, with the exception of the No-Action alternatives (Alternative SC-1 and MM-1), are protective of human health and the environment.

Alternatives MM-3 and MM-4 both would equally minimize the risks to human health and the environment from exposure to the groundwater by taking active measures rather than relying solely on institutional controls. These active measures include installation of extraction wells, which would collect leachate and contaminated ground water, and treatment of the leachate and contaminated ground water; MM-3 would treat the water on-site and discharge to Davis Creek and MM-4 would send the water to the City of Kalamazoo's POTW for treatment. By collecting the leachate and contaminated ground water, these alternatives will prevent further impacts on the wetlands and creek and reduce the risks associated with ingestions of the contaminated ground water.

Alternatives SC-3, SC-4 and SC-7 all utilize a cap, however, they differ as to the type of cap placed over the waste. Any of the caps proposed will prevent contact with the contaminated waste by wildlife and humans and reduce infiltration of precipitation. The caps would also prevent erosion from depositing contaminated soils in the wetlands and creek sediments. None of the caps will result in complete cleanup of the aquifers under the Site, as waste will remain in contact with the ground water.

SC-3 uses clean fill to regrade the Site and SC-4 uses inert and Type III wastes instead of the clean fill. Alternative SC-4 would produce the most runoff because of the cap's increased slope due to the proposed continued filling of the Site with Type III and inert wastes. The final grade would be above the minimum requirements achieved by SC-3. Both alternatives SC-4 and SC-7 would pose a greater risk than SC-3 to the ground water because, by definition, Type III waste has a greater possibility to impact the groundwater than clean fill and any leachate exposed to that waste may become contaminated with new chemicals.

Alternative SC-5 provides the maximum reduction of risks at the Site by incinerating the landfill residuals and associated soil, thereby, eliminating risks due to exposure to the landfill contents and eliminating the source of the groundwater contamination.

Compliance with ARARs addresses how the proposed alternative complies with all applicable or relevant and appropriate

requirements of Federal and more stringent State environmental laws (ARARs). It also considers how the alternatives comply with advisories, criteria or other guidance to be considered (TBCs) that do not have the status of laws, but that the U.S. EPA and the State have agreed are "appropriate" for protectiveness or to carry out certain actions or requirements, and/or provide grounds for invoking a waiver.

A summary of identified ARARs for the ground water and soils alternatives is included in Section 11 below. Only ARARs necessary for on-site remedial activities have been identified. In some instances, rules cited contain both substantive and procedural or administrative requirements. Only the substantive requirements are ARARs for the purpose of on-site activities. Examples of administrative or procedural requirements which are not considered ARARs include, but are not limited to, reporting requirements and permit application requirements.

The major ground water ARARs, as discussed in the FS report, include the federal Safe Drinking Water and Clean Water Acts and Michigan Act 307. Because the landfill operated under Act 641, and because there is no documented evidence of hazardous waste being disposed of in the landfill, Act 641 will be the closure ARAR for this Site.

Alternative MM-1 (No Action) will not comply with the groundwater cleanup standards. Alternatives MM-3 and MM-4 will be designed and implemented to comply with ground water cleanup standards at the point of compliance, the boundary of the final landfill cover. The cleanup standards for contaminated ground water at the Site are Michigan Act 307 Type B standards, which treat each contaminant to the 1×10^{-6} excess cancer risk level, or federal Safe Drinking Water Act standards, whichever is lower. The effluent discharge to surface water will comply with the substantive NPDES requirements, and the discharge to the POTW will comply with all pretreatment standards. Any sludges produced from on-site treatment will comply with RCRA, including Land Disposal Restrictions (LDRs).

Alternative SC-1 will not comply with the State of Michigan Solid Waste Act (Act 641) closure requirements. All of the proposed landfill caps will comply with all of the state and federal requirements and meet closure requirements.

The landfill caps will be designed to limit impacts on adjacent wetlands and the floodplain. Impacts include wetland hydrology changes due to excavation, drain fields and filling activities. Currently it is not anticipated that any work will be performed in the wetlands or floodplain at the Site. If, during design or construction, it is determined that work in these areas is necessary, all of the capping options will comply with State and/or Federal ARARs governing these circumstances: Clean Water Act, Section 404, Dredge and Fill Provisions; Wetlands Management Executive Order 11990; Goemnere-Anderson Wetland Protection Act (Act 203 of 1979); Floodplain Management Executive Order 11988; RCRA - Location Standards 40 CFR Part 264.18. The cap will also be sufficiently protected from flooding events through proper engineering.

Alternative SC-5 will be designed and implemented to comply with all state and federal requirements, including air quality laws, and, due to the placement of the unit, wetlands protection requirements. Alternative SC-5 involves the excavation, treatment and placement of waste, thus making the Resource Conservation and Recovery Act (RCRA) land disposal restrictions (LDR) potential requirements if hazardous waste is placed on-site after treatment.

-Primary Balancing Criteria:

Long-Term Effectiveness and Permanence refers to the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup standards have been met.

Alternatives MM-1 and SC-1 provide no long-term effectiveness or permanence. Both Alternatives MM-3 and MM-4 provide an equal degree of long-term effectiveness and permanence. By extracting and treating the groundwater to reduce contaminant concentration in the aquifer, both alternatives will reduce and control the risks associated with the groundwater at the Site. However, any long-term effectiveness and permanence provided through these alternatives relies on control of the source of contaminants.

Each of the capping alternatives will reduce the amount of infiltration of rainfall through the landfill and thereby reduce the amount of contaminated leachate and groundwater produced by the Site. In general, an Act 64 cap is less permeable than an Act 641 cap due to an extra foot of clay. However, at this Site, some of the landfilled waste sits in the shallow groundwater, making the additional impermeability afforded by SC-7 unnecessary. In addition, the two feet of soil cover included in the Act 64 cap would protect the clay layer from frost, burrowing animals, deep rooted plants and erosion and excessive drying.

Both Alternatives, SC-4 and SC-7 have a greater risk of cap failure than SC-3 due to settling of the fill. The heterogeneous nature of the Type III and inert wastes will make it difficult to get adequate compaction of the fill layer. In the future this could cause the cap to settle and crack allowing water through the cap, into the fill and eventually the groundwater. SC-3 poses less of a risk of that happening because it will use a homogeneous clean fill and can achieve better compaction. Also, because Type III waste, by definition, poses a greater risk to the groundwater than clean fill, Alternative SC-3 would present less of a risk if the cap did fail, i.e., it would be less likely to leach contaminants.

All three capping options will require long-term maintenance and deed restrictions to assure the effectiveness and integrity of the cap. Because SC-4 and SC-7 will be developed above minimum grade with Type III waste, maintenance of the caps will be more critical than in SC-3 in order to avoid erosion. The increased slopes associated with SC-4 and SC-7 will also increase the difficulty in developing the proper vegetative cover required.

Alternative SC-5 will result in the greatest long-term effectiveness and permanence. It will permanently remove all of

the landfilled material through excavation and incineration, eliminating all source materials in the landfill. There is a possibility that incinerator residuals may have elevated levels of metals. Such materials will be stabilized and disposed of on-site, or if necessary, at a hazardous waste landfill.

Reduction of Toxicity, Mobility, or Volume through Treatment is the anticipated performance of the treatment technologies a remedy may employ.

Alternatives MM-1 and SC-1 do not reduce toxicity, mobility or volume through treatment. Alternatives MM-3 and MM-4 will, to an equal extent, reduce toxicity, mobility and volume of contaminants in the groundwater through treatment on-site or via the POTW, respectively.

Alternative SC-5 will substantially reduce toxicity, mobility and volume of the contaminants in the landfill materials and soils through incineration. The other Source Control alternatives do not provide for any treatment.

Short-Term Effectiveness refers to the speed with which the remedy achieves protection, as well the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

All the alternatives evaluated are considered effective in the short-term, as certain aspects of the alternatives, such as institutional controls and monitoring would be implemented within a year. The time required to implement the construction components of Alternatives MM-3 and MM-4 would be between one and three years. It is estimated that it would take 20 years to restore the groundwater. These two alternatives have no adverse impacts on human health and the environment except for any damage that drilling may cause. This will be managed by monitoring during operations.

Of the Source Control Alternatives, SC-3 has the least negative short-term impacts. As far as time to construct these caps SC-3 takes the shortest time at approximately one year. The two other caps would require about two to three years to construct. Alternatives SC-4 and SC-7, by using Type III waste as fill may increase the amount of time the groundwater treatment is required to operate until cleanup levels are met, because of the possibility of leaching contaminants from the new waste.

All of these alternatives involve construction and have a degree of risk associated with them through potential exposure to dust, vapors, and contaminated waste. This potential would be minimized, as much as possible, through good construction practices and engineering controls.

The exposures associated with Alternatives SC-3, SC-4 and SC-7 would come about during construction of the landfill cap. These alternatives would result in increased truck traffic in the area and at the Site, as supplies and clay must be imported to the Site. SC-3 will involve greater risks from truck traffic, dust emissions, and vapors from the Site, than Alternative SC-4 and SC-

7 because Type III waste that was supposed to be landfilled at the site will be required to go to another landfill and the alternative also includes bringing in clean fill. SC-7 will involve more traffic than SC-4 because of the increased amount of material needed to construct the thicker cap.

The greatest potential for exposure is associated with Alternatives SC-5. This alternative involves excavating the waste and incinerating it, which could result in increased dust, vapors, and the potential for direct contact with contaminated soil and waste. During incineration there is the possibility that stack emissions may contain low levels of organic and/or inorganic chemicals. However, air quality monitoring, in place during the action, would trigger action to minimize such emissions. This alternative also requires the greatest length of time for the remediation process; 5 years instead of the one to three years required to construct a cap.

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

All of the alternatives are readily implementable. Alternatives MM-1 and SC-1 would be the easiest to implement with only five year reviews to perform. Alternatives MM-3 and MM-4 would require pilot studies to ensure the proper performance of the collection and treatment systems. MM-3 would also require meeting the substantive NPDES permitting requirements before discharging would be allowed to the creek, and MM-4 would require an agreement with the POTW to accept the waste water from the Site for treatment. MM-3 would require the handling and disposal of sludges and used activated carbon from the treatment system.

Of the Source Control alternatives, SC-4 and SC-7 are the only alternatives with implementation problems. These two alternatives include continued use of the Site as a Type III landfill. The MDNR has issued a Cease and Desist Order to MDS for the existing Type III operations and has denied a license to use additional portions of the property for this purpose. As discussed in previous sections the basis for issuing the order and the denial was the facility's inability to comply with Michigan's solid waste regulation's. Because the State has issued a cease and desist order and denied the operating license, it would be difficult to meet the substantive requirements of Act 641, and it would be difficult to implement Alternatives SC-4 and SC-7. No major implementability problems are anticipated for any of the other Source Control alternatives. The capping alternatives would require the importation of clay and fill materials. The technologies included in each alternative are readily available and easily implemented. Alternative SC-5 would be the most difficult to implement technically because of the need to handle the waste prior to incineration and the need to stabilize and dispose of the ash.

Cost includes estimated capital, operation and maintenance, and present net worth costs. Table 14 lists the cost for each of the alternatives.

Table 14
Estimated Cost

Alternative	Capital Cost (\$)	O&M Cost (\$)	Present Worth (\$)
MM-1	NONE	NONE	NONE
MM-3	1,273,000	671,300	7,600,000
MM-4	147,000	212,500	2,150,000
SC-1	NONE	NONE	NONE
SC-3	5,730,500	41,300	6,119,500
SC-4	4,304,000	36,300	4,646,000
SC-5	519,800,000 - 611,600,000	NONE	519,800,000- 611,600,000
SC-7	8,076,000	36,300	8,418,000

-Modifying Criteria:

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

The State of Michigan has assisted in the development and review of the Administrative Record. The State's position regarding the selected alternative is discussed in the State's concurrence letter.

Community Acceptance The specific comments received and U.S. EPA's responses are outlined in the attached Responsiveness Summary.

11. 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 Alternatives MM-4, ground water extraction and discharge to a POTW for treatment, and SC-3, surface capping with clay, are the most appropriate for the Michigan Disposal Service Landfill Site.

The components of the selected remedy are as follows:

1. Access Restrictions

a. Temporary and/or permanent fences and signs will be erected and maintained around the Site and pretreatment/treatment systems as specified by the U.S. EPA.

b. Pursuant to Michigan Act 307, institutional controls including, but not limited to, notice to future property owners of contamination at the Site, deed restrictions to regulate the development of the Michigan Disposal Service

Landfill property, and ground water use restrictions in the areas that have contaminated ground water will be instituted and enforced. Ground water use restrictions may be rescinded after remediation standards are met and proven to be maintained.

The purpose of these restrictions is to prevent exposure to Site contaminants, prevent erosion of the cap and provide security for the remedial action equipment.

2. Site Monitoring

a. Ground water and surface water monitoring. Ground water aquifers and surface waters and sediments in the Site vicinity will be sampled and analyzed periodically to monitor chemical contaminant levels during Site remediation.

Ground water monitoring will include monitoring above and below the shallow clay layer. Sampling and analysis will include existing ground water monitoring wells and additional ground water monitoring wells.

b. Volumes and contaminant concentrations of extracted leachate and contaminated ground water will be measured periodically.

3. Cap Construction and/or Improvements including Landfill Gas Controls and Leachate Collection

A cap will be constructed on the Site, or any existing cap improved and/or replaced so that it complies with Michigan Act 641, including the final cover specifications found under R 299.4305 Rule 305. This state regulation includes, but is not limited to: cap thickness and composition (2 feet of clay), compaction, vegetative cover, maximum and minimum slope, and gas venting performance. In accordance with accepted engineering practices, the cap will include an additional soil layer of a thickness specified by the U.S. EPA to protect the cap from frost, burrowing animals, deep rooted plants and other factors which may threaten the integrity of the cap.

A Michigan Act 641 cap is considered protective for this Site since it would provide protection against direct contact with waste at the Site and act as a significant barrier to infiltration of precipitation. The waste in the landfill is in direct hydraulic connection with the shallow ground water and produces significant amounts of leachate. For this Site, a less permeable cap such as a hazardous waste landfill cap under Michigan Act 64 would not provide a significant relative reduction of leachate. A leachate collection and ground water extraction system would still be required.

The leachate collection system will be installed to prevent leachate breakouts at the cap. The gas venting system will be installed and monitored periodically to determine if the levels of emissions may cause potential health hazards. If potential health hazards are indicated, an emission treatment system will be placed in the venting system to reduce emissions to acceptable levels.

4. Ground Water Extraction Wells

Ground water extraction wells will be installed to extract contaminated ground water for treatment. Ground water will be extracted until the remediation standards of Table 12 are achieved in all parts of the ground water contaminant plume beyond the point of compliance, including any plumes detected during pre-design or design studies. The point of compliance for the ground water remediation standards is the boundary of the final landfill cover. The placement of ground water extraction wells may be within and/or outside the Michigan Disposal Service Landfill property boundary. Additional studies on the nature and extent of the ground water contamination will be performed prior to the Remedial Design phase of the project. The results of these studies will be used, along with information from the Remedial Investigation, to place the extraction wells.

The goal of this remedial action is to restore the ground water to its beneficial use and to protect against current and future exposures. Specifically, the ground water will be pumped until the cleanup standards are met at the point of compliance.

Based upon information obtained during the RI and FS, the U.S. EPA believes that the selected remedy will meet these goals. It may become apparent during implementation or operation of the ground water extraction system, that contaminant levels cease to decline and are remaining constant at levels higher than the remediation standards in Table 12 over some portion of the contaminant plume. In such a case, or if other circumstances necessitate the system performance standards, the system design, and/or the remedy may be reevaluated. And, if such a reevaluation results in a determination that the remediation standards should be changed, a new proposed plan will be released for public comment and an amended ROD will be issued.

It is projected that the ground water extraction system will attain the remediation standards within 20 years. System performance monitoring will be performed on a regular basis. If warranted, the system may be modified without amendment to this ROD, in order to achieve the standards as follows:

- a) Pumping may be discontinued at individual wells where remediation standards have been attained;
- b) Wells may be pumped on an alternate basis to eliminate stagnation points;
- c) Additional extraction wells may be installed into any aquifer in the vicinity of the Site to facilitate or accelerate clean-up, and;
- d) "Pulse pumping" may be performed to allow the aquifer(s) to equilibrate and allow adsorbed contaminants to partition into ground water for extraction.

Ground water will be monitored periodically at any well where pumping has ceased to ensure that the remediation standards continue to be met.

5. Discharge of Leachate and Contaminated Ground Water to a POTW for Treatment

The extracted leachate and contaminated ground water will be treated by a POTW. If the extracted contaminated groundwater does not meet pretreatment standards, these standards will be met by an on-site treatment system prior to discharge of the leachate and contaminated ground water to a POTW. The specifics of the design and operation of the treatment systems will be determined during the Remedial Design phase of the project. Should the treatment of these liquids at the POTW be restricted for any reason, the complete treatment of these liquids to the standards of an NPDES permit will occur on-site. Such a treatment system will be required to meet the substantive requirements under, but not limited to the Clean Air Act, Clean Water Act, RCRA and any more stringent state standards. The treated liquids would then be discharged to surface waters in accordance with the substantive requirements of an NPDES permit.

6. Other Provisions

Mitigative measures will be taken during remedy construction activities to minimize the impacts of noise, dust and erosion run-off to the surrounding community and environs. Fugitive dust emissions will not violate the National Ambient Air Quality Standard for particulate matter smaller than 10 microns (PM-10). Potential runoff, silting and sedimentation problems from construction will be mitigated to comply with Michigan Acts including Public Acts 203 (1979), 346 (1972) and 347 (1972) for wetland protection, inland lakes and streams, and soil erosion and sedimentation control, respectively. Any residuals from on-site treatment of contaminated ground water will be handled in accordance with RCRA regulations.

The landfilled waste will continue to be contained on-site. Since this landfilled waste is the source of the contaminants, hazardous constituents will therefore remain at the Site. A review of Site conditions will be conducted every 5 years after the initiation of the remedial action.

12. Statutory Determinations

The selected remedy must satisfy the requirements of Section 121 (a) through (f) of CERCLA to:

1. Protect human health and the environment;
2. Comply with ARARs or justify a waiver;
3. Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and
4. Satisfy a preference for treatment that reduces toxicity, mobility, or volume as a principle element of the remedy.

The implementation of the selected alternative at the Michigan Disposal Service Landfill Site satisfies these requirements of CERCLA Section 121 as follows:

a. Protection of Human Health and the Environment;

Implementation of the selected alternative will reduce and control potential risks to human health posed by exposure to contaminated ground water. Extraction and treatment of contaminated ground water to meet Ground-Water Remediation Standards will reduce the potential excess lifetime cancer risk due to ingestion of contaminated ground water. As discussed above, the future scenario for ingestion of ground water at the Site results in an unacceptable excess risk of cancer of 1×10^{-3} . Implementation of this alternative will reduce the risk to 1×10^{-6} .

Institutional controls will provide short-term effectiveness for the prevention of drinking contaminated ground water until the Ground Water Remediation Standards are met. The selected remedy also protects the environment by reducing the potential risks posed by Site chemicals discharging to surface water (Davis Creek) and the adjoining wetlands.

Capping the landfill, in addition to reducing any potential further risk posed by exposure to landfill contaminants, will reduce precipitation infiltration through the cap and maintain that reduction over time. The cap will reduce ground-water contaminant loading to the aquifer, allowing the restoration of the aquifer within a reasonable time frame. No unacceptable short-term risks will be caused by implementation of the remedy. The community and Site workers may be exposed to noise and dust nuisances during construction of the cap. As above, mitigative measures will be taken during remedy construction activities to minimize impacts of construction upon the surrounding community and environs.

b. Compliance with ARARs

The remedy selected will meet or attain the applicable or relevant and appropriate Federal and State requirements (ARARs), and will be implemented in a manner consistent with these laws. In particular, the remedial action selected for implementation at the MDS Site is consistent with the NCP, Michigan's Act 641 rules, and with Michigan's Act 307 rules.

The selected remedy will comply with the Federal and/or State, where more stringent, applicable or relevant and appropriate requirements (ARARs) listed below:

1. Chemical-specific ARARs

Chemical specific ARARs regulate the release to the environment of specific substances having certain chemical characteristics. Chemical-specific ARARs typically determine the extent of clean-up at a site.

Federal ARARs

Safe Drinking Water Act MCLs and MCLGs - Maximum Contaminant Levels (MCLs) and, to a certain extent, non-zero Maximum Contaminant Level Goals (MCLGs), the Federal Drinking Water Standards promulgated under the Safe Drinking Water Act (SDWA) are applicable to municipal drinking water supplies servicing 25 or more people. At the Michigan Disposal Service Landfill Site, MCLs and MCLGs are not applicable, but are relevant and appropriate since the aquifer is a Class II aquifer which is presently being used as a drinking water source in the area surrounding the Site and could potentially be used in the area of concern. MCLGs are relevant and appropriate when the standard is set at a level greater than zero (for non-carcinogens), otherwise, MCLs are relevant and appropriate. The point of compliance for Federal drinking water standards is at the boundary of the landfilled waste, because this is the point where humans could potentially be exposed to contaminated ground water. Because this landfill will have a final clay cover, the point of compliance will be at the boundary of the final landfill cover. This is to avoid the need to install monitoring wells through the cap, which may compromise the integrity of the cover.

Clean Water Act Section 304 - Surface water quality standards for the protection of human health and aquatic life were developed under section 304 of the Clean Water Act (CWA). The Federal Ambient Water Quality Criteria (AWQC) are nonenforceable guidelines that set pollutant concentration limits to protect surface waters that are applicable to point source discharges, such as from industrial or municipal wastewater streams. At a Superfund site, the Federal AWQC would not be applicable except for pretreatment requirements for discharge of treated water to a Publicly Owned Treatment Works (POTW). CERCLA (section 121(d)(1)) requires the U.S. EPA to consider whether AWQC would be relevant and appropriate under the circumstances of a release or threatened release, depending on the designated or potential use of ground water or surface water, the environmental media affected by the releases or potential releases, and the latest information available. Since the contaminated aquifer is a potential source of drinking water and since treated water may be discharged to the City of Kalamazoo waste water treatment plant (if pretreatment criteria are met) or to Davis Creek, AWQC adopted for drinking water and AWQC for protection of freshwater aquatic organisms are relevant and appropriate to the point source discharge of the treated water into Davis Creek. Discharge to Davis Creek would be required in the event that on-site treatment of the extracted ground water is necessary, because the POTW is incapable of treating the extracted ground water to the cleanup standards. If discharge to Davis Creek is

warranted the substantive NPDES permitting requirements would also need to be met.

Clean Air Act National Ambient Air Quality Standards 40 CFR 50 - These regulations provide air emission requirements for actions which may release contaminants into the air. As the selected remedy involves excavation and construction activities which may release contaminants or particulates into the air, emission requirements promulgated under this act are relevant and appropriate.

State ARARs

Michigan Act 307 - Establishes cleanup criteria based upon site-specific risk assessments for sites of environmental contamination within the state. The U.S. EPA has determined that the Type C criteria would be applicable within the area containing the landfilled wastes. Type A or B criteria would not provide for the derivation of cleanup standards which could be met unless the source materials were excavated. Therefore, Type C criteria would provide for a cost-effective and appropriate remedial action for the landfilled areas.

The U.S. EPA has determined that acceptable standards for ground water clean-up, that have been derived under Type B criteria, would be protective in all the areas of the plume outside of the landfilled waste. Clean-up levels derived under Type B criteria would allow the aquifer to be restored to its beneficial uses by achieving the risk-based clean-up standards. The U.S. EPA has determined that these clean-up standards are protective of human health and the environment. In accordance with the NCP Section 300.430(f)(5)(iii)(A), the point of compliance for these standards is to be at the boundary of the waste management area. Because this Site will have a final cover, which will extend beyond the edge of the landfilled waste, the point of compliance will be at the border of the final landfill cover.

The U.S. EPA has determined that Type B criteria would yield ground-water clean-up standards which would also provide for the protection of surface water quality, in turn protecting human health and the environment. Type B criteria will be as protective as a remedy consistent with the U.S. EPA risk assessment policy.

Michigan Water Resources Commission Act (Act 245) as amended - Portions of the Water Resources Commission Act 245 (Michigan Act 245) of 1929, as amended, will be applicable to the remedy and establish surface water-quality standards to protect human health and the environment. The State administers the NPDES program under Part 21 of Michigan Act 245; therefore, Part 21 of Act 245 would be applicable to the direct discharge of treated water to Davis Creek (if on-site treatment is necessary), to the indirect discharge through ground

water movement to a surface water body, or to a discharge to a POTW.

Michigan Air Pollution Act 348 provides air emission requirements for actions which may release contaminants into the air. The selected remedy involves excavation and construction activities which may release contaminants or particulates into the air. This act is relevant and appropriate.

2.0 Location-specific ARARS

Location-specific ARARS are those requirements that relate to the geographical position of a site. These include:

Federal ARARS

The Clean Water Act Section 404 - This section of the Act regulates the discharge of dredge and fill materials at sites to waters of the United States. These regulations are applicable to capping of the Site and other activities which may take place in the wetlands and/or Davis Creek.

Wetlands Management Executive Order 11990 - This order is applicable to the Site. The order requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands.

RCRA Location Standards 40 CFR Part 264.18 - These standards are relevant and appropriate for the remedy at Michigan Disposal Landfill because a portion of the Site is located in the 100-year flood plain. These standard specify that a facility located in a flood plain must be designed, constructed, operated, and maintained to prevent washout of hazardous wastes by a 100-year flood.

Floodplain Management Executive Order 11988 - This order is applicable at this Site. It requires the minimization of potential harm to or within flood plains and the avoidance of long- and short-term adverse impacts associated with the occupancy and modification of flood plains.

State ARARS

Goemnere-Anderson Wetland Protection Act, Act 203 of 1979 - Regulates any activity which may take place within wetlands in the State of Michigan. Act 203 is applicable at this Site; it may require the replacement of adversely impacted wetlands with comparable resources.

Soil Erosion and Sedimentation Control Act, Act 347 of 1972 - This act is applicable to this Site due to the selected remedy's use of construction activities which may impact Davis Creek. The act regulates earth

changes, including cut and fill activities which may contribute to soil erosion and sedimentation of surface water of the State. Act 347 would apply to any such activity where more than 1 acre of land is affected or regulated action occurs within 500 feet of a lake or stream.

3. Action Specific ARARs

Action-specific ARARs are requirements that define acceptable treatment and disposal procedures for hazardous substances.

Federal ARARs

RCRA Subtitle C Land Disposal Restrictions (LDRs)- The requirements of this act would be applicable to the selected remedy if the ground water treatment requires a pretreatment step and any of the waste products of that process are RCRA hazardous waste. These regulations govern the storage and disposal of hazardous waste.

40 CFR Part 403 - These regulations are applicable to the selected remedy. They establish pretreatment standards for controlling pollutants discharged to a publicly owned treatment works (POTW).

State ARARs

Michigan Solid Waste Management Act (Act 641) - For landfill closure, because the old municipal landfill was operated prior to the promulgation of Act 641, and because the landfilled waste is sufficiently similar to waste regulated under the act, that act's requirements are relevant and appropriate for the old municipal waste. However, because the Type III facility was operated under Act 641 regulations the requirements of that law are applicable for the portions of the Site operated as a Type III facility. A hazardous waste cap (regulated under Michigan's Act 64) is not an ARAR at this Site, because there is no documented evidence of hazardous waste being deposited in the landfill. These regulations govern design, licenses, construction, operation, environmental monitoring, and closure and post-closure care of sanitary landfills.

Michigan Public Health Code, Public Act 368 of 1978, Part 127 - This act regulates the construction of private drinking wells and monitoring wells. This act is applicable to the selected remedy.

Michigan Environmental Protection Act, Public Act 127 of 1970 - The act regulates activities which may pollute, impair, destroy or cause harm to the environment. This act is applicable to the Site.

Inland Lakes and Streams Act, Public Act 346 of 1972, as amended - The act regulates construction activities

on or over bottomlands of inland lake and streams. This act will be applicable to the selected remedy if pretreatment standards are not met for the POTW and on-site treatment with discharge to Davis Creek becomes necessary.

Mineral Well Act, Public Act 315 of 1969, as amended - this act regulates construction and abandonment of monitoring and test wells. This act is relevant and appropriate for the selected remedy.

c. Cost Effectiveness

Cost effectiveness compares the effectiveness of an alternative in proportion to its cost of providing environmental benefits. Table 14 lists the costs associated with the implementation of the remedies.

The selected remedy for management of migration, Alternative MM-4, has been determined to afford overall effectiveness proportional to its cost. It is the least costly of the two management of migration alternatives which protect human health and the environment.

The selected remedy for source control, alternative SC-3, has also been determined to afford overall effectiveness proportional to its cost. It has the second lowest cost of those alternatives which protect human health and the environment. The only other alternative which costs less is SC-4. However, the use of Type III waste in the remedy may increase the cost and duration of the ground water remedy if the Type III waste contains contaminants and the contaminants leach into the ground water. This may also limit the effectiveness of the ground water remedy if new contaminants leach from the new waste and the POTW cannot handle them. The selected remedy, therefore, affords the greatest effectiveness proportional to its cost.

d. 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 utilized in a cost effective manner for this Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, the U.S. EPA has determined that the selected remedy provides the best trade-offs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, cost, and considering State and community acceptance.

While the selected remedy does not offer as high a degree of long-term effectiveness and permanence as the incineration alternative, it will significantly reduce the inherent hazards posed by the contaminated ground water and leachate by treating these substances while containing the waste at the Site and reducing further generation of leachate. These

benefits are achieved at a reasonable cost. Contaminants from the ground water are extracted and permanently addressed through treatment.

e. Preference for Treatment as a Principal Element

The statutory preference for treatment as a principal element of a remedy is satisfied by the selected alternatives.

Due to the large volume of landfilled waste that would need to be treated, approximately 1.18 million cubic yards, treatment of this low level threat waste is considered impracticable. However the remedy selected employs treatment of contaminated ground water and is considered a principle element of the remedy. The remedy employs treatment to return contaminated ground water to beneficial uses, and employs engineering controls which will be protective of human health and the environment to address the low level threat posed by the landfilled waste.

13. Summary

The presence of ground water contamination at and around the Michigan Disposal Service (Cork Street) Landfill requires that remedial actions be implemented to reduce the risk to public health and the environment. The U.S. EPA believes, based upon the RI/FS and the Administrative Record, that the selected alternatives provide the best balance of trade-offs among alternatives with respect to the criteria used to evaluate the remedies. Based upon the information available, at this time, the U.S. EPA believes that the selected remedy will be protective of human health and the environment, will attain ARARs and will utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.

The total estimated costs for the selected remedy at this Site are as follows:

<u>Alternative</u>	<u>Total Capital Cost</u>	<u>Total O&M, 30 yr.</u>	<u>Total Present Worth</u>
MM-4	\$147,000	\$212,500	\$2,150,000
SC-3	<u>\$5,730,500</u>	<u>\$41,300</u>	<u>\$6,119,500</u>
TOTAL	\$5,877,500	\$253,800	\$8,269,500

Responsiveness Summary

This Responsiveness Summary has been prepared to meet the requirements of Sections 113(k)(2)(B)(iv) and 117(b) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA), which requires the United States Environmental Protection Agency (EPA) to respond "...to each of the significant comments, criticisms, and new data submitted in written or oral presentations" on a proposed plan for a remedial action. The Responsiveness Summary addresses concerns expressed by the public, potentially responsible parties (PRPs), and governmental bodies in written and oral comments received by EPA and the State regarding the proposed remedy for the Michigan Disposal Service (Cork Street) Landfill Site (MDS Site).

A. Overview

1. Background/Proposed Plan

The MDS Site is located on the eastern border of the City of Kalamazoo, Michigan. The 65 acre Site has been used as a landfill since approximately 1925. The City of Kalamazoo owned and operated the landfill from approximately 1961 to 1981 when it sold the property to Dispos-O-Waste, a predecessor company of the current title-holder, Michigan Disposal Service Corporation (MDS). MDS is currently accepting waste at the Site under a Kalamazoo County Court injunction. The injunction was issued in connection with a law suit filed by MDS against the Michigan Department of Natural Resources (MDNR), because MDNR had issued a cease and desist order and a license denial to MDS for its Type III landfill operations. (Please see the Decision Summary section of the Record of Decision for further explanation of the background of the Site)

In 1981, testing of ground water monitoring wells at the MDS Site found elevated levels of lead and arsenic. Testing during the Remedial Investigation (RI) determined the nature and extent of contamination and found that the old municipal landfill was serving as a source of contamination in the ground water. The Feasibility Study evaluated eight cleanup alternatives in order to address the areas of concern.

The proposed plan for remedial action included the following:

- Ground water extraction followed by treatment of the extracted contaminated water at the POTW. If necessary, extracted water will be treated on-site to meet POTW pretreatment standards before being sent to the POTW;
- Deed restrictions to control the use of the land and the

ground water;

- Containment of the landfill contents using a clay cap with a vegetated soil layer which complies with RCRA Subtitle D and Act 641 closure requirements. The cap will consist of (from top to bottom) four inches of top soil with vegetation, a layer of soil for frost protection and drainage, clean fill to develop the required grades, and a 2-foot thick clay layer; and,

- Installing fencing and warning signs to restrict access.

Reliance on institutional controls (e.g., deed restrictions), in conjunction with engineering controls (e.g., fencing), would aid in the prevention of the ingestion of contaminated ground water and of contact with landfill contents.

2. Public Comment Period

A public comment period on the proposed plan and FS for this Site was held from July 11, 1991 to September 8, 1991. In addition, a public meeting was held on July 17, 1991 at the Kalamazoo City Hall. At this meeting, representatives from EPA and MDNR answered questions about problems at the Site and the remedial alternatives under consideration. Comments from the public were also accepted at the meeting. During the comment period, EPA received approximately 12 written submittals of comments and 4 oral comments concerning the proposed plan.

B. Community Involvement

The level of public interest regarding this Site has been fairly minimal since the listing of the Site on the National Priorities List (NPL). Since the issuance of the Proposed Plan for public comment the general public has had opposing views on the selected remedy. Some commentators agree with the selected remedy. They believe that the possible future risks to the public health and the environment, from continued filling with Type III waste, are not warranted and the landfill should be closed as soon as possible. Other citizens oppose the capping portion of the remedy mainly because it may cost the taxpayers in Kalamazoo \$5.7 million if clean fill is required to be brought in to develop the appropriate grades at the Site, where it would cost them nothing if Type III waste is used instead. The commentators saw no justification in the Administrative Record for the Agency's determination that continued filling with Type III waste is not acceptable.

C. Summary of Significant Comments

The public comments regarding the MDS Landfill Site are organized into the following categories:

- Summary of comments from the PRPs concerning the FS and the proposed plan;
- Summary of Comments from the local community regarding the FS and the proposed plan;
- Summary of comments from MDNR and State legislators regarding the FS and proposed plan.

Many of the comments below have been paraphrased in order to effectively summarize them in this document. The reader is referred to the Administrative Record for this Site, located at the City of Kalamazoo Public Library, which contains copies of all written comments submitted to EPA. The Administrative Record also contains a copy of the public meeting transcript.

Comments from the Potentially Responsible Parties

Comment #1:

Alternative SC-3 is no longer implementable, because the 2 percent slope to be attained at the completion of the capping is not possible due to approximately 60 percent of the Site being covered with Type III fill and capped with an Act 641 cap. The commentor states that the 60 percent of the Site that has been filled approximates a 25 percent slope and the remaining portions of the Site will have slopes approximating 16 percent. The only versions of SC-3 that could realistically be implemented would be a modified version of SC-3 that: a) would use clean fill to cover only the remaining 40 percent of the Site; b) would have a slope of 25 percent on the portion that has been filled to date; and c) would necessarily have a slope of approximately 16 percent on the portion not yet filled.

Response #1:

EPA disagrees with this comment. SC-3 remains implementable even though 60 percent of the Site has been filled. The commentor ignores another option which would most likely minimize the amount of imported clean fill necessary to achieve acceptable grade at the Site. This option would be to regrade the currently landfilled Type III waste down to the 2 percent slope specified in the FS and the Proposed Plan. If this option were implemented, and less clean fill were required than anticipated, the cost estimates associated with importing clean fill to the Site may turn out to have been overestimated in the FS, and the cost of implementing SC-3 may be lower than expected. EPA maintains that Alternative SC-3

remains implementable regardless of the current state of the Type III waste landfilled at the Site. EPA continues to express concern over the changing conditions at the Site due to the continued filling and the difficulty this poses in designing the cap.

Comment #2:

Several commentors stated that both the FS and Proposed Plan fail to acknowledge that the true net cost of SC-4 will be approximately zero, because revenues generated from the operation of the Type III filling activities are sufficient to offset the costs of this alternative. They cite the NCP as stating that revenues from recycling should be included when calculating the costs of a response action, and if this were done on this Site it would show that SC-4 is the only alternative that is cost effective and consistent with the NCP. The commentors state that Alternative SC-3 will put a \$5.7 million burden on the taxpayer of Kalamazoo.

Response #2:

EPA does not agree with the commentor's interpretation of the NCP or the conclusion reached that revenues from operating the landfill should be considered in the cost analysis. The costs compiled in the FS, and deemed appropriate by the PRPs, showing a difference in capital costs of \$1.4 million between SC-3 and SC-4, are those that EPA believes are appropriate for this Site. In EPA's, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, October 1988, (OSWER Directive 9355.3-01) factors such as revenues from an operating facility are not appropriate considerations in the cost analysis of remedial alternatives. The following are the factors, listed in the RI/FS Guidance, that may be considered in developing direct and indirect capital costs for an alternative.

Direct Costs

- 1) Construction costs--Costs of materials, labor (including fringe benefits and worker's compensation), and equipment required to install a remedial action;
- 2) Equipment costs--Costs of remedial action and service equipment necessary to enact the remedy (these materials remain until the site remedy is complete);
- 3) Land and site-development costs--Expenses associated with the purchase of land and the site preparation costs of existing property;

- 4) Buildings and services costs--Costs of process and nonprocess buildings, utility connections, purchased services, and disposal costs;
- 5) Relocation expenses--Costs of temporary or permanent accommodations for affected nearby residents. (Since cost estimates for relocations can be complicated, FEMA authorities and EPA Headquarters should be consulted in estimating these costs.)
- 6) Disposal Costs--Costs of transporting and disposing of waste material such as drums and contaminated soils.

Indirect Costs

- 1) Engineering expenses--Costs of administration, design, construction supervision, drafting, and treatability testing;
- 2) License or permit costs--Administrative and technical costs necessary to obtain licenses and permits for installation and operation of off-site activities;
- 3) Startup and shakedown costs--Costs incurred during remedial action startup; and
- 4) Contingency allowances--Funds to cover costs resulting from unforeseen circumstances, such as adverse weather conditions, strikes, and inadequate site characterization.

Based upon these factors, it is clearly not appropriate for EPA to take into consideration, during its decision process, the source of funds used to implement a remedy. Such a consideration would have the potential to bias the Agency's decision and would not present an accurate cost-effectiveness analysis.

In addition, the contention that the revenues from operating the landfill are actually revenues from recycling goes beyond what EPA would define as recycling. Landfilling waste is generally not considered recycling, i.e. recycling is the recovery of materials or energy, or the controlled removal of reusable materials from solid waste. Neither situation includes the landfilling of solid waste. Finally, if EPA were to implement this remedy, the agency would not be in the position to operate a facility such as a landfill, and such revenues would not be generated, and should not be considered in this analysis. EPA disagrees with the comment and believes

its analysis of cost-effectiveness in the proposed plan and Record of Decision is appropriate.

Comment #3:

The proposed plan incorrectly states that, the Site "was eventually finalized on the NPL in February of 1990." The commentor believes the statement fails to acknowledge that in March of 1991, as a result of a judicial challenge to the NPL listing, initiated by MDS, agreed that it had made a mistake in the Site's scoring and agreed to reconsider if the Site qualifies for listing on the NPL.

Response #3:

The comment correctly notes that the listing of the Site on the NPL was challenged in court by MDS. In the course of the proceedings, EPA requested that the listing be remanded to the Agency to allow a factual misstatement in the record be corrected. EPA did not acknowledge, or imply, that it had erred in scoring the Site for the NPL, or "formally agree to reconsider" the Site listing; the motion and order attached to the comment are self-explanatory. EPA's review of the remanded matter is presently ongoing.

Comment #4:

The proposed plan correctly concludes that the closure requirements of Michigan's Act 641, rather than Michigan's Act 64, are applicable to this former municipal landfill.

Response #4:

Comment noted.

Comment #5:

Several commentors noted that the State's position, that a flexible membrane liner (FML) is necessary at the Site, is not supported by Michigan's Acts 641 or 64, nor is supported by the conditions at the Site. It is also not discussed in the FS that an FML would be necessary to meet ARARs at the Site. The commentors agree with the proposed plan's conclusions that the FML is not necessary here because the landfilled waste sits in the ground water and will not afford any additional protectiveness. The commentors stated that nowhere in the Administrative Record is it documented that MDNR has stated that a flexible membrane line should be required at the Site.

Response #5:

The comment is noted, so far as the need for an FML at the

Site. As to the Administrative Record documenting MDNR's position on the FML, the original request to include an FML in the source control remedy was part of oral, undocumented remarks from MDNR. A letter from MDNR to EPA, clarifying the State's position has been added to the record in an update. MDNR maintains that an FML is needed at this Site to protect human health and the environment.

Comment #6:

The Administrative Record does not support MDNR's suggestion that more than 4 inches of soil cover should be required to protect the cap from frost. The comment says that the Administrative Record discloses a "hasty effort by MDNR to develop an argument for the frost protection layer." The commentor states that the requirement for a frost protection layer is a departure from MDNR's previous interpretations of Michigan's Act 641 rules.

The commentor also states that no support for additional frost protection can be derived from the July, 1989 technical guidance document concerning final covers on hazardous waste landfills in the Administrative Record. The commentor maintains that this document is only applicable to hazardous waste landfills, and, because no hazardous waste has been deposited at the MDS landfill, this document should not be relied upon at this Site. The commentor refers to the preamble to EPA's recently proposed regulations governing municipal solid waste landfills which states that design features recommended for hazardous waste landfills are not necessarily appropriate for municipal solid waste landfills and that the Agency should avoid over regulation.

Response #6:

The basis for requiring a frost protection layer, above the 4 inches of soil required under Michigan's Act 641, is not based upon ARARs. Rather, the requirement is based upon sound engineering practice. The MDS Site is located in a portion of this country where the maximum frost depth has been estimated to be 42 inches and freeze-thaw conditions pose a major threat to the long-term effectiveness of the cap. As stated in the, Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments (July 1989), "Freeze-thaw conditions are an important potential of damage to the soil component of the low-permeability layer (clay layer). Cycles of freezing and thawing may cause material cracking, lessening of density, and loss of strength." Accordingly, the EPA believes that the 4 inches of soil required under Michigan's Act 641 would not be sufficient to protect the clay cap from freeze-thaw conditions. The addition of this layer to the cap will minimize cap failure and subsequent increases in leachate

production and will minimize long-term maintenance costs. MDNR has required additional frost protection layers on several sites as listed in its internal memo of July 10, 1991 from John Craig to Dennis Eagle.

In response to the comment on use of the technical guidance document mentioned above, this document was relied upon in reference to frost protection, not as an ARAR, but rather as a guide to the need for additional protection of the cap at this Site. The section of that document discussing the need for frost protection at sites where freeze-thaw cycles are a factor is clearly applicable to a site such as the MDS Site. EPA is not over regulating, but merely requiring the minimal amount of cover to ensure long-term effectiveness of the cap.

Comment #7:

A straightforward application of the remedy selection process, as set forth in the NCP, clearly demonstrates that Alternative SC-4 is the only source control remedy that is consistent with the NCP. The comments were based on the following major points:

- a) SC-3 and SC-4 both satisfy the "threshold criteria";
- b) A proper consideration of the primary balancing criteria requires selection of Alternative SC-4 because,
 - 1) EPA's argument that Type III fill is more prone to differential settlement is not true and is not supported in the Administrative Record;
 - 2) Type III and inert fill do not present a significantly greater risk of ground water contamination than "clean fill";
 - 3) Alternative SC-4 is equally protective, or more protective, than SC-3 in providing short term protection, after considering the environmental and safety effects of additional truck traffic and dust emissions in the area caused by the unnecessary excavation and transportation of clean fill, and the environmental effects of having to provide alternative landfill capacity to accept the Type III fill that is currently going to the Site; and,
 - 4) For this Site, cost is the determining factor

in the consideration of the primary balancing criteria, because all other primary balancing criteria are either equal or inapplicable.

- c) EPA mistakenly interprets State Acceptance to mean MDNR acceptance. Two other branches of Michigan's State Government have spoken out in favor of Alternative SC-4 and the proposed plan should have stated that State Acceptance favors Alternative SC-4 (Several commentors made this comment).

Response #7:

EPA disagrees with the comment that a straightforward application of the remedy selection process, as set forth in the NCP, clearly demonstrates that Alternative SC-4 is the only source control remedy that is consistent with the NCP. EPA strongly believes that it has implemented its decision process properly and appropriately at this Site, in accordance with the NCP, and refers the reader to the Record of Decision for the rationale behind its selection of Alternative SC-3. Alternative SC-3 has been selected as part of the remedy at this Site based upon its long-term and short-term effectiveness, implementability and state acceptance, largely because it uses clean fill to develop acceptable grades instead of Type III fill. A remedy which includes the importation of waste as part of a remedy clearly contradicts EPA's program goal as stated in the NCP (55 CFR 8846) of selecting remedies minimizing untreated waste. Such a remedy would, in fact be introducing untreated waste to the site, in addition to that already present.

a) Although both Alternative SC-3 and SC-4 will attain ARARs at the conclusion of the remedy, MDNR maintains that SC-4 will not be able to attain the substantive requirements of Michigan's Act 641 during the implementation of the remedy.

b) The assertion by the commentor that Type III fill is not more prone to differential settlement than clean fill is not correct. Based upon common engineering knowledge of construction debris and other wastes common to Type III waste streams, these materials may contain wood or other degradable materials and may cause settling of the waste in the future, regardless of the waste being compacted during placement. The commentor's own remarks state that Type III waste contains paper mill sludges which, with its high water content, will be more difficult to compact than clean fill. Paper mill sludge also has a predisposition to biodegrade and will be more susceptible to settling than clean fill. The argument that the underlying Type II waste is unstable and some settling will occur regardless of the material placed above it, is questionable. The Type II waste has been in place for

over 15 years now and the majority of settling will have occurred already. Using clean fill to develop the required grades at the Site will minimize any settling that may occur, any costs associated with maintenance of the cap due to settling, and will preserve the long-term effectiveness of the cap.

The following argument is also questionable: Because 60 percent of the Site is already filled with Type III waste and, if the final 40 percent of the Site were filled with clean fill, the risk of uncontrollable differential settlement at the interface of the existing Type III and clean fill, would be virtually guaranteed. This is questionable for two reasons: a) this scenario does not consider regrading the existing Type III waste over the area of the Site and minimizing the amount of clean fill to develop the required grades which would limit the amount of differential settlement that might occur, and b) proper engineering would be used to minimize any settling that could occur at the interface of the two types of materials.

Type III waste, by definition, does have a potential to contaminate the ground water. That risk of contamination is greater than that of clean fill. It is recognized that, in general, materials used in clean fill may contain low levels of some naturally occurring hazardous substances, however, all materials used in capping this Site will undergo chemical analysis prior to placement and if any unacceptable levels of contaminants are found the materials will be rejected and another source of clean fill may be required. EPA is unable to comment on the validity of the data submitted by the PRPs from the tests performed on several soil samples, because EPA has no knowledge of the source of the samples, the reliability of the testing procedures used, or the reliability of the laboratory. EPA reiterates that any material used in the cap will undergo analysis prior to placement to determine if it is suitable for use. EPA will not select a remedy which may potentially further endanger public health or the environment. By using analytically confirmed clean fill we avoid any further endangerment, but by incorporating Type III waste there is the possibility of further contamination.

The claim that ground water monitoring data shows that levels of hazardous substances have been decreasing since the Type III operations began in 1982 is misleading. EPA acknowledges that, some of the parameters included in Geological Services' study may be decreasing, however, others may be constant or increasing. In that same report, arsenic, the one compound contributing most to the risk at the Site, was shown to be increasing over time. This may be due to several factors; one being that there is a continual source in the old municipal waste, and another being that the new Type III waste may be

contributing arsenic to the ground water. It is impossible to determine, from the data available, precisely the reason for this increase. Benzene, on the other hand, was not included as a parameter in the analysis performed by Geological Services, and no trend in its concentration can be rightfully implied from the study.

The statement that, "Any theoretical concern that the use of Type III fill may adversely affect groundwater is refuted by the fact that actual data from groundwater monitoring shows that the levels of hazardous substances have generally decreased since the Type III filling operations began in 1982," is refuted by EPA. EPA must stress that concerns about Type III waste affecting ground water quality are based upon the definition of Type III waste having greater potential to contaminate the ground water than clean fill (see the discussion above).

The claim, "...Type III fill rather than clean fill would probably reduce further degradation of ground water because Type III fill is generally less permeable...", is unsubstantiated speculation. The studies referenced by the commentor which evaluate the permeability of Type III waste have not been submitted to EPA, and the results have not been verified. Without seeing the reports the concept is suspect for the following reason: Type III fill is generally heterogenous and permeabilities over the area of the Site will vary greatly. In implementing the remedy, it would be largely impossible to rely on any theoretical impermeability afforded by Type III waste because confirmation of attainment of sufficient impermeability over the entire area of the Site would be impossible. The studies also do not discuss the long-term permeability of the materials tests. Based upon common knowledge of papermill sludges, they would have a tendency to degrade over time and the effective permeability would decrease in proportion to that degradation. To ensure that a remedy will be protective, EPA cannot rely on such speculative statements.

EPA disagrees with the contention by the commentor that even some minimal impact on the ground water would not justify an additional "\$5,700,000" in a situation where all ground water will be captured and treated. Even if any additional contamination is captured by the ground water extraction system, EPA's preference is to avoid creating additional ground water contamination. If other contaminants are introduced into the ground water which are not present now, pretreatment of the ground water, if not already in place, may be required. If it were in place, the pretreatment system may require redesign. Such a situation would greatly increase the time and cost of implementing MM-3. This type of situation reiterates EPA's position that continued operation of the

landfill will make it impossible to design a remedy for the Site due to the constant changes in conditions of the Site. The reader is also referred back to Response #2 for a discussion of EPA's position on the "additional \$5,700,000" cost of implementing Alternative SC-3.

Remediation with Type III fill will result in steeper slopes and will cause erosion problems and difficulties in establishing vegetation. If continued filling occurs the final slopes of the landfill, as projected by MDS's engineers, will be 25%. If filling ceases, the current 25% slopes may be regraded down to a lesser slope and erosion and establishment of vegetation will be less of a problem.

EPA acknowledges that the discontinued filling at the Site will result in more traffic in the county wide area and the ROD has been changed to reflect this. However, EPA disagrees that that is sufficient cause to regard Alternative SC-4 as equally, or more protective, than SC-3 in providing short-term effectiveness. Short-term effectiveness takes the following into consideration:

- 1) Short-term risks that might be posed to the community during implementation of an alternative;
- 2) Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures;
- 3) Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and
- 4) Time until protection is achieved.

With the continued addition of Type III waste and its potential to contaminate the ground water, Alternative SC-4 may add substantial time until protection is achieved if additional contaminants are introduced into the ground water. In addition SC-4 will take 1 to 2 years longer than SC-3 to construct. The commentor's claim that the basis in the FS for assuming a shorter construction time for SC-3 no longer exists, is not true. It is possible to regrade the existing Type III waste and cap the Site in a shorter period of time than it would to import Type III waste.

Although EPA is concerned with any risk that may be associated with truck traffic and air emissions caused by the capping of the landfill, the risk associated with prolonged cleanup of the aquifer far out weighs the short-term risk of truck traffic. The risks caused by the extra truck traffic will be temporary (lasting the 1-2 years that the landfill cap

installation will take place) and should cause minimal additional risks to residents if proper driving precautions are taken. Air monitoring will be employed at the Site to control any possible air pollution problems. The commentor's statistical analysis of the approximate additional number of miles of truck traffic and associated casualties is largely unsubstantiated. In fact, any estimate of the number of miles of truck traffic would be greatly reduced if consideration were given to the option of regrading the existing Type III waste at the Site, thereby minimizing the amount of clean fill required in the remedy.

The commentor's claim that shutting down this facility will require the county to site a new landfill is not valid. According to MDNR's Waste Management Division, Kalamazoo County does not have plans for 20 years of disposal capacity, either in the county or through the use of disposal facilities in other counties, and will be required, by state law, to provide for the siting of additional landfill capacity as part of Kalamazoo County's Solid Waste Management Plan. Siting of an additional landfill will be necessary regardless of whether the Site continues to operate or not. Kalamazoo County has been continuously advised by MDNR not to rely on MDS Landfill as capacity in its plan, because it has been ordered to close by MDNR, it is a Superfund site, and it is a continuing source of ground water contamination. MDNR does not anticipate being able to accept this landfill as capacity for purposes of the Kalamazoo County Solid Waste Management Plan. The County also has the option to develop disposal capacity in other counties if they choose.

EPA disagrees that cost effectiveness is the only primary balancing criterion on which to base a selection between alternatives SC-3 and SC-4 and refers the reader to the Record of Decision for EPA's evaluation of each alternative under the nine criteria and to the Response #2 concerning the appropriate factors to consider in developing costs. The cost analysis submitted by the commentor is inappropriate because of its consideration of revenues from operation of the landfill. EPA reiterates that, based upon an appropriate evaluation under the nine criteria, as set forth by the NCP, Alternative SC-3 has been selected based upon its superior performance under long-term-effectiveness, short-term effectiveness, implementability and state acceptance.

The selected remedy for source control, Alternative SC-3, affords overall effectiveness proportional to its cost. It has the second lowest cost of those alternatives that protect human health and the environment. SC-4 costs less, however, the use of Type III waste may increase the cost and duration of the ground water remedy if the waste contains contaminants and the contaminants leach into the ground water. This may

also limit the effectiveness of the ground water remedy if new contaminants leach from the new waste and the POTW cannot handle them.

c) EPA disagrees with the commentor's statements concerning the analysis of state acceptance. CERCLA contemplates significant involvement of the states throughout the Superfund process. Pursuant to the National Contingency Plan (NCP), this notion of EPA/State involvement is embodied in a Superfund Memorandum of Agreement (SMOA). This document establishes the nature and extent of EPA/State relations and designates the state agency responsible for carrying out the terms of the SMOA. On May 6, 1981 Governor Milliken of the State of Michigan designated the Michigan Department of Natural Resources (MDNR) as the state lead agency for the planning and implementation of CERCLA. MDNR, created by the State of Michigan legislature to enforce and manage Michigan's environmental programs, has entered into a SMOA with EPA. As a result, MDNR is the designated state agency responsible for providing the State of Michigan's position on EPA's Record of Decision for the MDS Site. Therefore, in evaluating state Acceptance under the NCP, the position taken by MDNR is considered the position taken by the State of Michigan. Decisions rendered by Michigan's courts and views held by Michigan legislators do not amount to state acceptance under the NCP. Finally, With the relatively few comments received on the proposed plan and the fact that several commentors wrote in favor of EPA's selected remedy discount the claim that the local community strongly supports the selection of Alternative SC-4.

Comment #8:

The proposed plan concludes that the point of compliance for meeting ground water standards is the landfill boundary.

Response #8:

Comment noted.

Comment #9:

The proposed plan incorrectly concludes that the Michigan Act 307 (Act 307) Type B criteria are appropriate for the Site. Site-specific factors which preclude completion of an on-site exposure route along with technical concerns about achieving Type B standards or even measuring constituents at that level make Type C criteria the appropriate cleanup standards for the Site. The commentor stated that under Michigan Act 307 rules and Type C analysis, Federal Maximum Contaminant Levels (MCLs) promulgated under the Federal Safe Drinking Water Act as the National Primary Drinking Water Act Standards are the

appropriate ARARs for ground water cleanup.

Response #9:

EPA supports the determination of Act 307 Type B criteria as the ARAR for ground water at the Site, and does not agree with the commentor's conclusion that Type C cleanup would be appropriate for the ground water at this Site for several reasons:

1) Michigan Act 307 Type B standards, a more stringent State ARAR than Federal MCLs, has been identified as an ARAR at this Site and takes precedence over the MCLs;

2) The Agencies believe it is necessary to establish risk-based cleanup levels for the Site. The basis for selection of these cleanup levels is provided in CERCLA Section 121 and the NCP. In order to protect human health and the environment, under CERCLA and the NCP, a risk-based cleanup is necessary due to the potential future use of ground water at and near the Site.

The NCP requires a site be remediated within a 10^{-4} to 10^{-6} risk range. In order to achieve a level of acceptable risk at the Site, cleanup levels were established at a 10^{-6} risk level rather than at the MCLs or the non-zero MCLGs. Due to multiple contaminants at the MDS Site, MCLs would not sufficiently protect human health and the environment. The target residual risk under the Safe Drinking Water Act is consistent with a Type B cleanup.

3) EPA disagrees with the commentor's discussion on the technical limitation in achieving Type B cleanup standards. In the case where a cleanup goal is below the method detection limit (MDL) for a given compound, EPA will generally establish the cleanup goal at the method detection limit. This method has also been adopted by MDNR under Act 307. MDLs are based on the lowest acceptable detection limits established by EPA for routine analytical services. Because MDLs vary considerably between laboratories, MDNR has compiled a list of acceptable MDLs for several compounds under Act 307.

EPA disagrees that practical quantitation limits (PQLs) are more appropriate cleanup levels than MDLs. The primary difference between the MDL and the PQL is that the MDL is a detection limit, and the PQL is a quantitation limit. The detection limit is a measure of when an analytical system indicates that a substance is

present above a certain limit, there is a 99 percent probability that the substance is present, but not necessarily at the reported level. The PQL is established at a level above the MDL where quantitative certainty is higher. PQL is the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. EPA developed the PQL concept to define measurement concentration that is time and laboratory independent for regulatory purposes. EPA estimates that the PQLs are 5 to 10 times higher than the MDLs.

The use of MDLs is more appropriate than PQLs as a lower detection limit on target cleanup levels because:

- a) MDLs extend the analytical range to lower levels based on presence/absence of a contaminant. If a target cleanup level is below the MDL and lab analysis confirms the presence of a contaminant above the MDL, then the cleanup level has not been achieved;
- b) Although it is true that more quantitative uncertainty exists with MDLs than PQLs, this uncertainty is reduced through reliance on multiple samples; and,
- c) In the absence of a large interlaboratory study to identify the PQL, the PQL defies precise definition. The PQL can only be estimated from the MDL using the 5 to 10 factor. MDLs can be determined for a single laboratory using a specific instrument and a specific analyst.

The EPA performance study indicates that initial expectations are "often" not met by ground water extraction systems. The Agency acknowledges that certainties with regards to achieving the health based cleanup levels are not guaranteed, and that attainment of these levels may involve a greater investment than if these levels were not required. However, the Agencies have determined that the cleanup levels formalized in the ROD are required for protection of public health and the environment. EPA feels that the cleanup levels can be achieved through the use of the chosen alternative. It is not appropriate to argue that the remedy will incur greater costs than a remedy which would not achieve the goal of protectiveness. If, in fact, it is determined that cleanup levels will not be achievable, EPA will consider other options to achieve protection.

4) EPA disagrees with the commentor's evaluation of cost effectiveness in regards to achieving Type B standards in relation to achieving MCLs. The difference in the present worth costs of those two options would be minimal over the period of time required to implement either type of cleanup.

5) EPA disagrees with the commentor's discussion on the consideration of other Type C factors. Both EPA and MDNR identified Act 307 as an ARAR at this Site when review comments on the draft FS were provided to the commentor. The revised FS incorrectly analyzed Act 307 as a hazardous waste statute, eliminating it from consideration as an ARAR and placing it in the "to-be-considered" category. If a Type C proposal was to be considered for MDNR approval it should have been presented as one of the remedial alternatives analyzed in the FS and not presented in the limited form in the comments to the proposed plan. Nevertheless, even if the proposal put forth by the commentor had been addressed in the FS, the Type C proposal would not have been approved. The following are deficiencies in the commentor's proposal:

- a) The statement is made that the "only conceivable points of exposure are a small, narrow area between the Landfill and Davis Creek", and that, "The potential for future unacceptable exposure will be prevented by deed restrictions..." First, the total extent of ground water contamination is not known at this time because samples were not collected from the deeper semi-confined aquifer under the Site or from either aquifer east of Davis Creek. Secondly, the ground water flow direction has not been determined north and east of the Site and it is not known if all ground water from the Site discharges to Davis Creek. Therefore, it is not possible at this time to know all conceivable points of exposure. In addition, if ground water extraction is stopped once some Type C level is obtained then ground water may migrate off-site, past the creek, with the potential to expose a future user to ground water which contains chemicals above strictly health based risk levels, i.e. Type B levels;
- b) The analysis fails to recognize either surface water or the wetland area as potential environmental media. This completely invalidates the statement that, "Because there

will be only one environmental medium of concern following the overall Site remedy, overly conservative methodologies which make allowances for multiple exposure paths need not be considered for the development of cleanup criteria in this instance.";

- c) The geology and hydrogeology have not been adequately identified in that the deeper aquifer, and the geology/hydrogeology east and north of the Site have not been adequately characterized. Therefore, the physical setting of the Site cannot be evaluated;
- d) Implementation of Type C criteria would not result in ground water concentrations as close to background as technically feasible; implementation of Type A criteria would;
- e) It is true that the potential migration pathway is ground water, however, the physical migration pathway has not been identified. Also, ground water discharges to Davis Creek and this migration pathway is not discussed under this comment;
- f) Residual levels of parameters of concern will remain dissolved in the ground water, however, it has not been demonstrated that anything other than health based risk criteria are appropriate and protective;
- g) Type B levels are technically feasible in that they are set at the acceptable method detection limit if the health based criteria is below that limit. Also Act 307 Rule 299.5601(3) states that, "The cost of a remedial action shall be a factor only in choosing among alternatives which adequately protect the public health, safety, welfare and environment and natural resources, consistent with the requirements of part 7 of these rules." This rule precludes the selection of Type C criteria based on cost alone and mandates that a Type C remedial action must be thoroughly evaluated using the Part 7 rules. Adequate information has not been provided for this evaluation using the comments provided by the commentor;
- h) The FS did not identify or compare a Type B or Type C alternative under Act 307. Rule

299.5717(3)(1) states, "The technical feasibility and cost effectiveness of remedial action alternatives, including alternatives which comply with Type B criteria," shall be provided by a party who proposes a Type C remedial action. This was not done in the FS and therefore a comparison of the alternatives cannot be made; and,

- i) It is simply not the case that the application of Type B criteria will result in a situation where remedial performance cannot be monitored. Type B levels revert to MDLs which can be achieved by standard laboratory procedures.

The above listed deficiencies do not support the statement that Type C levels are more appropriate than Type B levels for ground water remediation at this Site.

Comment #10:

One commentor questioned where in the Administrative Record are the documents supporting the following statements in the proposed plan:

- a) Type III fill material is more difficult to compact than clean fill and may be more prone to differential settlement and cracking of the clay cap;
- b) Type III waste, by definition poses a greater risk to ground water than clean fill;
- c) The steeper slope associated with alternative SC-4 would make maintenance of the cap more critical to avoid erosion and will make development of a vegetative cover more difficult;
- d) Type III fill material would involve greater risk from truck traffic, dust emissions, and vapors;
- e) Type III fill material may increase the time during which the ground water treatment system is required to operate;
- f) Alternatives SC-4 and SC-7 are not acceptable to the State.

The commentor questioned where, and how, EPA has considered cost in choosing between Alternatives SC-3 and SC-4.

The commentor questioned what criteria EPA would establish for the clean fill to be used in Alternative SC-3, and stated that even clean fill contains various levels of hazardous substances.

The commentor went on to state that because EPA chose not to place copies of any of the documents listed in the "Guidance Documents Index" with the repositories of Administrative Record documents in Kalamazoo, these documents are not part of the Administrative Record and EPA cannot rely upon any of them as a basis for its remedy selection. The commentor requested that copies be placed in the record and not consider the comment period as begun until those documents were placed there.

Response #10:

In response to the point by point questioning of the Administrative Record, the documents EPA considered and relied upon in support of the above referenced statements in the proposed plan and ROD included, but was not necessarily limited to, the following:

- a) - Document #19 of Administrative Record Update #2, "MI Disposal Site EPA ID MID 006029102", dated 9/18/91.
- b) - Document #8 of the Administrative Record, "Letter Forwarding Results of Monitoring Well Data and Samples Taken From French Drain", dated 1/19/89; and,
 - Document #47 of the Administrative Record, "Cork St. Landfill- Analytical Results", 2/13/91.
- c) - "Revised Draft Report FS Cork Street Landfill Superfund Site", document #84 of the Administrative Record.
- d) - "Revised Draft Report FS Cork Street Landfill Superfund Site", document #84 of the Administrative record, and (The reader is referred to Response #7 for further discussion on this issue).
- e) - Document #8 of the Administrative Record, "Letter Forwarding Results of Monitoring Well Data and Samples Taken From French Drain", 1/19/89; and,
 - Document #47 of the Administrative Record, "Cork St. Landfill- Analytical Results", 2/13/91.
- f) - Document #7 of Administrative Record Update #1,

"Director's Order to Cease and Desist", 11/10/88;

- Document #18 of the Administrative Record, "Letter re: requesting re-evaluation" (from Al Howard to Dave Ullrich), 4/18/90; and,
 - Document #12 of Administrative Index #2 "Letter re: Completed review of the final proposed plan for MI Disposal Service Corp", 9/9/91 (The reader is referred to Response #7(c) for a discussion of state acceptance).
- g) The reader is referred to the Decision Summary of the Record of Decision for a discussion on how EPA considered cost in choosing between alternatives SC-3 and SC-4. The reader is also referred to Response #7 for a discussion of EPA's cost effectiveness analysis. EPA maintains that SC-3 is the most cost-effective remedy for source control at this Site.
- h) Although this will be further refined during design, EPA anticipates the material to be used as clean fill will be material not regulated under Michigan's Act 641 solid waste regulations and not exhibiting unacceptable chemical concentrations above background levels for inorganics or at non-detect for organics.
- i) Under Section 300.805(a)(2) of the NCP, "Guidance documents not generated specifically for the Site at issue need not be located at or near the Site at issue, provided that they are maintained at the central location and the index to the administrative record file indicates the location and availability of these guidance documents." EPA has complied with this section of the NCP and has supplied the required information in the Administrative Record Index for the MDS Site. These documents can be relied upon by the Agency as part of its basis for its remedy, and copies of the guidance documents will be located solely in EPA's Region V office. The period for public comment will remain unchanged.

Comment #11:

Operating the Type III landfill on top of the old municipal landfill would close the old landfill in an environmentally safe manner, at no expense to the taxpayers.

Response #11:

Based upon EPA's analysis of the alternatives under the nine criteria, Alternative SC-3 has been selected as the source

control alternative for this Site, based largely on the fact that it does not involve continued filling with Type III waste. Continued filling with Type III waste is not an environmentally sound response to the contamination problems presented by this landfill. Testing of leachate produced by the Site indicate that the Type III waste contains additional contaminants which may further degrade the ground water conditions. In addition, increased differential settlement of the Type III waste may threaten the integrity of any cap placed over the waste possibly increasing the amount of leachate produced by the Site. The reader is referred to the Decision Summary of the Record of Decision and Response #7 above for further discussion on why SC-3 is the selected remedial alternative instead of SC-4. The reader is also referred to Response #2 for a discussion on the costs of the alternatives.

Comment #12:

The City of Kalamazoo has spent \$550,000 doing studies on the Site, which is two and a half percent of the City's property taxes and now EPA wants the taxpayers to spend \$5.7 million on this remedy, SC-3, when other protective, viable solutions are available.

Response #12:

EPA certainly is sensitive to the issue of the cost of any remedy to taxpayers, however, as discussed in Response #2, the source of money used to fund a cleanup at a Superfund site is not a proper consideration under the NCP. The selected remedy is considered the most cost-effective remedy for this Site. It should be pointed out that the cost of the selected remedy, when compared to other remedies at municipal landfill Superfund sites, is not considered high. Also, the amount spent on the RI/FS, based upon estimates given in EPA guidance document "Scoper's Notes, An RI/FS Costing Guide", \$550,000 is considered well within the average cost for studies performed at sites similar to this.

Comment #13:

"From our standpoint this is our community. These are our citizens, this is our environment. And its our resources and dollars. And I can assure you that we are concerned about all of those issues, very much so because it impacts us directly. We live here. We work here. We are very concerned about these issues. And we intend to deal with them effectively. All we ask from EPA and DNR is for your support in reaching a solution, a reasonable solution. One that is in the best interest of all, but most importantly in the best interest of our residents."

Response #13:

Congress, in passing CERCLA, has delegated to EPA the duty and the powers to protect human health and the environment at the nation's worst uncontrolled hazardous waste sites. EPA has established guidelines for implementing CERCLA in the NCP, and it is in the NCP that the nine criteria for selecting remedies have been established; one of them being community acceptance. In the remedy selection process at a site, EPA must take into consideration which components of the alternatives interested persons in community support, have reservations about, or oppose. This responsiveness summary is part of the Agency's effort to assess the community's opinions on the proposed plan and the FS, and it is in the responsiveness summary that EPA responds to each significant comment submitted by the community.

After evaluating each of the alternatives proposed in the FS, EPA believes it has selected a remedy that is cost-effective and protective and in the best interest of human health and the environment.

Comment #14:

It is clear that Type III waste is not the threat on this site.

Response #14:

EPA disagrees with this comment and refers the reader to Response #7(b).

Comment #15:

Type III wastes and inert material would be the best use to develop acceptable grades on the site prior to capping.

Response #15:

EPA disagrees and refers the reader to the discussions under Response #7.

Comment #16:

Several commentators agreed with the selection of Alternative MM-4 to address the ground water.

Response #16:

Comment noted.

Comment #17:

Eliminating a safe and satisfactory depository for Type III wastes in the community only compounds the community's capacity problems.

Response #17:

EPA disagrees with this comment. The comment is based upon the idea that the Type III landfill is safe and satisfactory. MDNR has already determined that the landfill is not adequate and should not be operating. EPA supports MDNR in their implementation of their solid waste program and their determination in this matter. The reader is referred to Response 8(c) in regards to the community's capacity problems.

Comment #18:

The proposed plan incorrectly states that, "Type III fill is defined as having low potential to contaminate the ground water." The Act 641 Rules actually say "minimal".

Response #18:

Comment noted.

Comments from the Community

Comment #19:

Several commentators expressed concern that additional data should be gathered before a cleanup plan is chosen. They believe that additional data should be gathered to determine if there are sources of contamination to the ground water other than the landfill and if other private wells exist down gradient from the Site.

Response #19:

EPA agrees that additional data must be gathered at this Site to adequately implement the selected remedy. Data on ground water conditions below the local shallow clay layer and east of Davis Creek will be gathered with other data during the Remedial Design phase of this project. In addition, efforts will be made to identify any private wells in the vicinity of the Site that weren't identified during the RI. If additional wells are located, and circumstances warrant it, those wells will be tested to determine if contamination from the Site has affected the quality of water drawn from them. However, we also believe that sufficient data exists at this time, to select the most appropriate remedy for this Site.

In regards to determining the source of contamination in the ground water, well placement during the Remedial Investigation

was such that other possible sources of contamination upgradient from the Site were taken into account, and the MDS landfill was found to be the source of contamination in the ground water.

Comment #20:

Two commentors, spoke out against selecting Alternative SC-3. The commentors believe that the money spent by the City on implementing the selected remedy could be used for better purposes. Both stated that the money could be used to address real or more important threats to society and the environment, rather than hypothetical threats associated with this Site. For example, the money could be used to build more prisons, for city youth programs, or for repair of the City's infrastructure. One commentor would prefer to see the Site only monitored every five years. Both commentors believe that SC-4 is preferable over SC-3 because the waste will have to be deposited somewhere anyway. Both cite the extra pollution that will be caused by closing this landfill and requiring the Type III waste to be brought to another landfill as reasons why SC-4 is superior to SC-3.

Response #20:

Although EPA acknowledges the other social and environmental problems in this world, they are not addressable under CERCLA and are not appropriate considerations during remedy selection at Superfund sites. The investigations performed at this Site have detected a real problem which poses a threat to human health and the environment. It is EPA's obligation and duty to take some action at this Site to protect present and future generations from the risks posed by the Site's contamination.

The EPA assesses the risks posed by a site by conducting a baseline risk assessment which assumes no corrective action will take place at a site and that no site-use restrictions or institutional controls such as fencing and ground water use restrictions will be imposed. The risk assessment then determines actual or potential risks or toxic effects the chemical contaminants at the Site pose under current and future land use assumptions. The risk assessment for the Site found that the Site poses an excess cancer risk of 1×10^{-3} for future ingestion of ground water, which is outside of EPA's acceptable risk range of 10^{-4} to 10^{-6} . Based upon the baseline risk assessment, EPA has determined that the Site may pose an imminent and substantial endangerment to human health or the environment if the Site is not addressed by the selected remedy. If only 5 year monitoring were implemented the risk levels would remain the same at the Site and that is

unacceptable to EPA. Some action must be taken.

EPA does not believe that continued filling with Type III waste is an appropriate means to address the risk posed by this Site. The reader is referred to the Decision Summary of the Record of Decision and Responses #2 and #7 for discussions on the issues of the County's landfill capacity, the appropriateness of using Type III waste as part of this Site's remedy, and the cost of the selected remedy.

Comment #21:

Two commentors wrote supporting the selection of Alternatives MM-4 and SC-3. The commentors prefer SC-3 over SC-4 because of the possibility of potential additional contamination of the ground water from the Type III waste and the need for an Act 641 cap to ensure Site integrity. One commentor would prefer the addition of an FML in the cap design.

Response #21:

The comments are acknowledged. EPA does, however, disagree with the addition of an FML to the cap design. Based upon the fact that the waste sits in the ground water, the additional impermeability afforded by the FML would not be cost-effective and may not be any more protective than a cap constructed of 2 feet of clay, a frost protection layer, and a vegetated soil layer.

Comments from State Legislators and MDNR

Comment #22:

Several commentors support the City of Kalamazoo and MDS in their preference for Alternative SC-4 over SC-3. The commentors are concerned that the issue of spending \$5.7 million of taxpayers money has not received higher priority in EPA's review process. They stated that Alternative SC-4 provides an option where the users of the landfill will cover the costs of the remedy, not the taxpayers and does not affect landfill capacity in the County of Kalamazoo. The commentors are concerned with the accuracy of the statement that SC-4 is not acceptable to the State because it does not comply with Michigan's Act 641 for two reasons:

- The proposed plan states that all of the proposed landfill caps will comply with all ARARs for meeting closure requirements; and,
- The MDS has received permits and licenses from MDNR in the past under Act 641 and that act has not changed since those licenses were issued.

The commentators also stated that two branches of the government, the Judicial Branch and the Legislative Branch are supporting Alternative SC-4, so the statement that the State does not favor that alternative is not correct.

The commentators concluded by supporting the remediation goal of capping, pumping and monitoring, but asked for reason as to the methods for achieving these goals.

Response #22:

EPA reiterates its position that it is not appropriate to consider the source of funding for a cleanup when selecting a remedy. The Agency has appropriately evaluated each alternative against the nine criteria established in the NCP and has selected the alternatives that are cost effective and protective. The reader is referred to Response #2 under PRP comments for a response to the issue of considering the cost of Alternative SC-3 to taxpayers.

EPA acknowledges that each of the capping alternatives will comply with all landfill closure ARARs at the completion of the remedy. However, MDNR has already determined that during the implementation of SC-4 the Site will not be able to comply with the substantive permitting and licensing requirements under Michigan's Act 641, e.g. a baseline water quality could not be established for the facility. In addition, Although Act 641 has not changed since the first licenses were issued to MDS for the landfill, MDNR, in its denial of the last license application and by issuing the cease and desist order, has expressed its determination that the operation of a Type III landfill at this Site would not be in compliance with Act 641.

On the issue of what is considered State Acceptance, the reader is referred to Response #7(c) for a response. It must be added, however, that the Judicial branch of the State has not overruled MDNR's refusal to grant an operating license. Rather, the Court has issued a temporary injunction allowing MDS to continue operating until a final ruling is made.

EPA has used reason in its selection of the final remedy for the MDS Site and refers the reader to the Record of Decision for the Agency's basis for the selection of Alternatives MM-4 and SC-3. The reader is also referred to Response #7 for a response to the issue of landfill capacity in the County.

Comment #23:

MDNR has commented in favor of Alternative MM-4 because it will prevent flow of contaminated ground water off-site or into Davis Creek. MDNR added that a pretreatment system will

need to be installed if pretreatment standards are not met. MDNR strongly supports additional studies of the deep aquifer to further define the extent of contamination.

Response #23:

Comment noted.

Comment #24:

MDNR has commented that it does not totally agree with the selection of Alternative SC-3 as the preferred source control remedy for the Site. MDNR agrees with SC-3 in principle, as the source control remedy and supports it rather than SC-4, because SC-4 would include continued filling with Type III waste. MDNR states that the use of Type III waste would contribute to continued leachate production over time and would not appreciably decrease the permeability of the fill as a layer of properly compacted clean fill would. The ground water beneath the Site is very susceptible to contamination from infiltrating precipitation leaching chemicals out of the old and new waste.

MDNR does not agree with the technical design of the closure cap. MDNR states that the two feet of clay with four inches of vegetative cover are minimum requirements under Act 641 rules and are not considered fully protective of human health and the environment. MDNR states that they are consistently attaining cap designs which exceed these requirements. MDNR believes the design should be one which includes, in addition to the minimum requirements of Act 641, a minimum 40 mil FML, a minimum three foot drainage/frost protection layer, and six to twelve inches of vegetative soil cover.

Response #24:

EPA acknowledges the concurrence on the selected remedies, but disagrees with some of the additional layers added to the cap design. An FML, if added to the cap design would not afford significant additional protection because the landfilled waste is in contact with ground water. This is the major route of migration for the contaminants at the Site. Any additional impermeability given to the cap by the FML would not shorten the amount of time required to reach cleanup standards in the ground water and is not considered to be cost-effective. EPA does agree with MDNR on the need for a frost protection layer in the cap design and it is included as part of the cap design in the Record of Decision. Any party implementing the selected remedy will be required to maintain a vegetated layer on the cap. Under the current Act 641 rules this layer must be four inches thick. EPA strongly believes that the cap design included in the selected remedy will be fully

protective of human health and the environment. The design criteria for the selected remedy will comply with Act 641 rules and are consistent with criteria used at other Superfund sites located in Michigan. Another major consideration when defining what is an appropriate cap design is the amount of hazardous material disposed of in the landfill. At this Site, information indicates that significant amounts of hazardous industrial material was not disposed of at this Site.

Comment #25:

MDNR stated that the statement under State Acceptance in the proposed plan implies that the State arbitrarily prefers an FML and additional soil layers. The statement should have read, "The State believes the preferred alternative should be one which is fully protective of the public health and the environment, and complies with Michigan's Act 641. In order to meet both of these objectives, the State submits that a composite cap design should be constructed over the fill. This design would include a two foot clay layer, a minimum 40 mil FML, a minimum three foot drainage/frost protection layer, and six to twelve inches of vegetative soil cover."

Response #25:

Comment noted.

Comment #26:

MDNR commented that the costs estimated in the FS for the clean fill to be used in Alternative SC-3 were over-estimated. MDNR states that the cost estimate of \$3,904,500 for the clay cap for SC-3 is \$1,056,500 higher than the \$2,848,000 for SC-4. MDNR does not understand why there would be such difference, especially when the clay cap designs are essentially the same. It would not be necessary to bring in the same amount of clean fill as Type III waste. The existing topography could be regraded to a lower elevation, reducing the volume of sand needed to prepare the subgrade. The FS did not estimate the minimum volume of Type III waste needed to bring the Site to grade. Such an estimate should be developed for cost purposes in the remedial design phase to determine if it is more feasible to regrade the existing fill to minimize the amount of clean fill needed, thus greatly reducing the cost.

Response #26:

Comment noted.

Comment #27:

MDNR does not believe the three to four years estimated for the years to construct Alternative SC-4 is valid. The operators of the Site have been estimating this amount of time to complete the landfill since 1982. It may take up to 5 more years to close the facility if continued operation is allowed.

Response #27:

Comment noted.



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APPENDIX 1
ADMINISTRATIVE RECORD INDEX
MICHIGAN DISPOSAL SERVICE/CORK ST. LANDFILL SUPERFUND SITE
KALAMAZOO, MICHIGAN

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
2	00/00/00		Letter re: Thanks given for assistance given by Kalamazoo County	Helms, G.	Powers, M. - Commission	Correspondence	1
1	87/12/01		Letter re: Effective date for the Cork Street Landfill	Cozza, D.J. - U.S. EPA	Minsley J. - Kalamazoo	Correspondence	2
1	87/12/03		Letter re: Drums taken in 1969 and 1970	Milejczak, R. - MDNR	Cozza, D. - U.S. EPA	Correspondence	3
3	88/03/10		Letter re: response to request of review of the Draft Work Plan	Kolar, M.T. - U.S. Dept. of the Interior	Cozza, D. - U.S. EPA	Correspondence	4
2	88/08/22		Letter re: renewal of operating license at Cork St. Landfill	Constantelos, B. - U.S. EPA	Dekruyter, J. - MI Disp.	Correspondence	5
1	89/01/05		Cork St. Landfill GAPP Approval	Cozza, D. - U.S. EPA	Minsley, B. - Kalamazoo	Correspondence	6
12	89/01/13		Letter re: submitted a report detailing the results of an electromagnetic & groundpenetrating radar survey	Emilsson, G.R. - Environmental Resources Management, Inc.	Obradovic, M. - Canonic	Correspondence	7
1	89/01/19		Letter re: forwarding for review results of the monitoring well data, the results of samples collected from the french drain	Mulcahey, D. - MDNR	Cozza, D. - U.S. EPA	Correspondence	8
	89/01/20		Contract No. 68-01-7351 Letter Report	Ehrhard, L. - Jacobs Engineering Group	Cozza, D. - U.S. EPA	Correspondence	9
	89/07/16		Letter re: Test Pit	Gerken, S. - Canonic	Cozza, D. - U.S. EPA	Correspondence	10

ADMINISTRATIVE RECORD INDEX
MICHIGAN DISPOSAL SERVICE/CORK ST. LANDFILL SUPERFUND SITE
KALAMAZOO, MICHIGAN

FICHE/FRA	FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCU-
				Location Selection and Proposed Procedures Cork St. Landfill	Environmental			
7		89/04/06		Letter re: Technical Memorandum Ground Water Pumping Tests Cork St. Landfill Site	Obradovic, M. - Canonic Environmental	Cozza, D. - U.S. EPA	Correspondence	11
2		89/09/22		Letter re: Comments of MDNR on the Preliminary Phase I Remedial Investi- gation Report, Cork St. Landfill Site	Phillips, S. - MDNR	Nicke, F. - U.S. EPA	Correspondence	12
1		89/10/12		Monthly Status Report No. 20	Obradovic, M. - Canonic Environmental	Nicke, F. - U.S. EPA	Correspondence	13
2		89/11/09		Obradovic, M. - Canonic Environmental	Obradovic, M. - Canonic Environmental	Nicke, F. - U.S. EPA	Correspondence	14
1		89/11/28		Letter re: the Risk Assessment to be prepared as soon as possible; the request of a previous phone call on 11/2/89	Nicke, F. - U. S. EPA	Minsley, B. - MDNR	Correspondence	15
1		90/01/04		Letter re: Approval of the Preliminary Phase I Remedial Investigation Report for the Michigan Disposal Services	Nicke, J. - Mich. Disposal Service	Kalamazoo	Correspondence	16
5		90/03/19		Comments on Michigan Disposal Addenda	Prendiville, T. - U.S. EPA	Minsley, D. - Kalamazoo	Correspondence	17
2		90/04/18		Letter re: requesting re-evaluation	Howard, A. - MDNR	Ullrich, D. - U.S. EPA	Correspondence	18

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6	90/06/19		Letter re: Draft Detailed Analysis of Alternatives Work Plan Cork Street Landfill, Trench Drain Kalamazoo, MI	Gerken, S. - Canonic Environmental	Nicke, F. - U.S. EPA	Correspondence	20
1	90/06/26		Cork St. Type III Landfill, Trench	DeKruyter, J. - Michigan Disposal Service	Leep, T. - MDNR	Correspondence	21
9	90/07/11		Capping Plan Revisions Cork St. Landfill/ Kalamazoo County	Braithwaite, J. - Braithwaite Consultants Incorporated	Sadowski, R. - MDNR	Correspondence	22
9	90/08/21		Review of Draft Remedial Investigation of the Michigan Disposal Landfill	Weston - Krums, C. Gilbertsen, R.W.	Prendiville, T. - U.S. EPA	Correspondence	23
2	90/08/24		Letter re: Response on behalf of Michigan Disposal Service regarding the cap construction activities	Braithwaite, R. - Braithwaite Consultants	Prediville, T. - U.S. EPA	Correspondence	24
4	90/08/24		Letter re: Assumed responsibility of Remedial Project Manager for Cork St. Landfill Site	DeKruyter, J. - Michigan Disposal Service	Prendiville, T. - U.S. EPA	Correspondence	25
1	90/10/04		Letter re: Inspection of 7/19/90	Cummins, D.	Speeter, W. - MI Human Ser	Correspondence	26
12	90/12/07		Review of the Draft Feasibility Study for	Klainer, M., Gilbertsen, Weston	Prendiville, T. - U.S. EPA	Correspondence	27

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7	91/01/23		Review of Canonic's Responses to U.S. EPA's Comments on the draft RI Report and Baseline Risk Assessment	Gilbertsen, R. - Weston	Prendiville, T. - U.S. EPA	Correspondence	29
5	91/02/07		Letter re: to inform the MDNR comments on the final drafts and addendums to the Remedial Investigation Report and Risk Assessment for the Cork St. Landfill	Eagle, D. - MDNR	Prendiville, T. - U.S. EPA	Correspondence	30
35	91/02/28		Letter re: attached a list of State of Michigan applicable or relative and ARARs which the MDNR has identified as applicable or potentially applicable to the Michigan Disposal site	Eagle, D. - MDNR	Prendiville, T. - U.S. EPA	Correspondence	31
4	91/04/23		Letter re: attached are comments received from Felix Adatsi, toxicologist with the Special Services Section	Eagle, D. - MDNR	Prendiville, T. - U.S. EPA	Correspondence	32
7	91/05/20		Review of Revised	Weston, R., for the	Prendiville, T. -	Correspondence	33

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4	90/12/11	Water Division Review of Draft Feasibility Study for Michigan Disposal Landfill Superfund Site	Watter, E.P. - U.S. EPA	Niedergang, W. - U.S. EPA	Memorandum	45	
2	90/12/12	Review of the Draft Feasibility Study for the Michigan Disposal	Tran, X. - U.S. EPA	Prendiville, T. - U.S. EPA	Memorandum	46	
14	91/02/13	Cork St. Landfill - Analytical Results	Byrd, L.A. - MDNR	Craig, J. - U.S. EPA	Memorandum	47	
3	91/02/25	Fax Transmittal re: Review of Cork St. Landfill FS	Tech, R. - MDNR	Eagle, D. - MDNR	Memorandum	48	
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6			89/03/16	Letter re: Test Pit Location Selection and Proposed Proce- dures Cork St. Landfill	Gerken, S. - Canonic Environmental	Cozza, D. - U.S. EPA	Correspondence	4
2			89/09/22	Letter re: Comments of the MDNR on the Prelimi- nary Phase I Remedial Investigation Report, Cork St. Landfill Site	Phillips, S. - MDNR	Mickie, F. - U.S. EPA	Correspondence	5
6			90/06/19	Letter re: Draft Detailed Analysis of Alternatives Work Plan Cork Street Landfill Site	Gerken, S. - Canonic Environmental	Micke, F. - U.S. EPA	Correspondence	6
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3		91/06/17	Frost Protective Layer for Cork St. Landfill Superfund Site	Craig, J. - WMD	Eagle, D. - ERD	Memorandum	11
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	2		91/07/10	Letter re: list of updated Michigan Environmental Response Act	Eagle, D. - MDNR	Prendiville, T. - U.S. EPA	Correspondence	3
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	4		91/07/23	Transmittal Cover Sheet re: Letter asking questions in meeting of 7/18/91	Trepod, G. - Law Offices Honigman, Miller, Schwartz and Cohn	Prendiville, T. - U.S. EPA	Correspondence	5
	3		91/07/28	Letter re: submitting comments/advice on the Proposed Cleanup Plans for the Cork Street Landf.	Miller, C.	U.S. EPA	Correspondence	6
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2		91/09/06	Letter re: Kalamazoo and Michigan Disposal Services have contacted my office and are very concerned with the proposed cleanup actions	Shugars,D. - House of Representatives	Schutte,P. - U.S. EPA	Correspondence	10
2		91/09/06	Letter re: Concern with the proposed cleanup actions being proposed by the EPA for the Michigan Disposal Service Superfund Site	Welborn, J. - Senate, Lansing, Michigan	Schutte,P. - U.S. EPA	Correspondence	11
5		91/09/09	Letter re: Completed review of the final proposed plan for MI Disposal Service Corp.	Howard, J. - MDNR	Traub, J. - U.S. EPA	Correspondence	12
3		91/09/10	Letters re: Comments on Proposed Plan for Cork Street Landfill	Dunsky,C., Brown,M.	Schutte,P.- U.S. EPA	Correspondence	13
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