United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R05-91/155
March 1991

EPA

Superfund Record of Decision:

Kentwood Landfill, MI

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R05-91/155	2.	3. Recipient's Accession No.

4. Title and Subtitle
SUPERFUND RECORD OF DECISION
Kentwood Landfill, MI
First Remedial Action - Final

5. Report Date 03/29/91

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

13. Type of Report & Period Covered 800/000

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The 72-acre Kentwood Landfill site is an inactive municipal landfill in Kentwood, Kent County, Michigan. Land use in the area is primarily residential and recreational. Twenty-two residences to the south and east of the site use ground water as their drinking water supply. Landfilling operations at the site began in the 1950s, and continued intermittently until the county capped and closed the landfill in 1976. The site consists of two municipally-owned landfill areas: a larger original landfill; and a 20-acre southern extension located south-southeast of the original landfill. Both landfills are constructed into the uppermost aquifer beneath the site, and as a result, the landfilled wastes including garbage, rubbish, construction, and demolitions wastes are in direct contact with the upper aquifer ground water. Site disposal records show no indication that RCRA hazardous wastes were placed into the landfills. In 1983, construction of a leachate collection system to pump leachate to a publicly owned treatment works (POTW) was completed on the eastern side of the original landfill, however, contamination from leachate is still of concern. The primary contaminants of concern affecting the debris, ground water, and leachate are VOCs including benzene, PCE, and TCE; other organics; and metals including arsenic, chromium, and lead.

(See Attached Page)

17. Document Analysis a. Descriptors
Record of Decision - Kentwood Landfill, MI
First Remedial Action - Final
Contaminated Media: debris, gw, leachate
Key Contaminants: VOCs (benzene, PCE, TCE), other organics, metals (arsenic, chromium, lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 72
	20. Security Class (This Page) None	22. Price

Abstract (Continued)

The selected remedial action for this site includes improving the landfill cap to include gas controls and a leachate collection system; pumping and pretreating ground water onsite along with collected leachate, as needed, before discharging to a POTW; monitoring sediment, ground water, surface water, and air; and implementing institutional controls including deed and ground water use restrictions, and site access restrictions such as fencing. If for any reason the leachate or contaminated ground water cannot be treated by the POTW, these liquids will be treated onsite, with subsequent onsite discharge to surface water. The estimated present worth cost for this remedial action is $5,700,000, which includes an annual O&M cost of $210,000 for years 0-9, and $200,000 for years 10-30.

PERFORMANCE STANDARDS OR GOALS: Chemical-specific cleanup goals for ground water in the aquifer are based on SDWA MCLs and State standards including benzene 1 ug/l (State), PCE 0.7 ug/l (State), TCE 3 ug/l (State), arsenic 0.02 ug/l (State), chromium 30 ug/l (State), and lead 5 ug/l (State).

Declaration for the Record of Decision

Site Name and Location

Kentwood Landfill
Kentwood, Michigan

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Kentwood landfill site, in Kentwood, 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 State of Michigan has assisted in the development and review of the Administrative Record. However, U.S EPA has not received a written confirmation of State acceptance of the selected remedy.

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 the low level threat wastes and contaminated ground water of the Site.

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 landfills do not have a threat that can be classified as a principal threat.

The major components of the selected remedy include the following:

Groundwater:

* Groundwater use restrictions;

* Groundwater extraction followed by treatment of the extracted contaminated water at a POTW. Extracted water will be treated on site to meet POTW pretreatment standards if necessary, before being sent to the POTW.

Leachate:

* A leachate extraction system will be installed to reduce the amount of leachate in the landfill. Leachate extracted would be treated at a POTW. Extracted leachate will be treated on site to meet POTW pretreatment standards if necessary, before being sent to the POTW.

Landfill Contents:

* Landfill contents will be contained by utilizing a RCRA Subtitle D type consisting of (from bottom up) a 2-foot clay layer, topped by a 6-inch layer of topsoil. Gas venting and leachate breakout collection will be incorporated into the cap design.

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. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. The remedy does not satisfy the statutory preference for remedies that employ treatment 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. Although the remedy selected employs treatment of contaminated ground water, overall, treatment is not employed by the remedy to an extent where it can be considered a principal element of the remedy. Instead, 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 within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

March 29 1991
Date

FOR Valdas V. Adamkus
Regional Administrator

DECISION SUMMARY

A. Site Location and Description

The Kentwood Landfill site is located at 4900 Walma Avenue in the City of Kentwood, Kent County, Michigan. The landfill is located immediately east of the City of Kentwood Municipal Buildings.

The site occupies 72 acres of land that is bordered by the City of Kentwood City Center and apartment buildings to the west, a church and residential areas to the south, Plaster Creek and ravine areas to the east, and vacant residential zoned land, a residential area and golf course to the north.

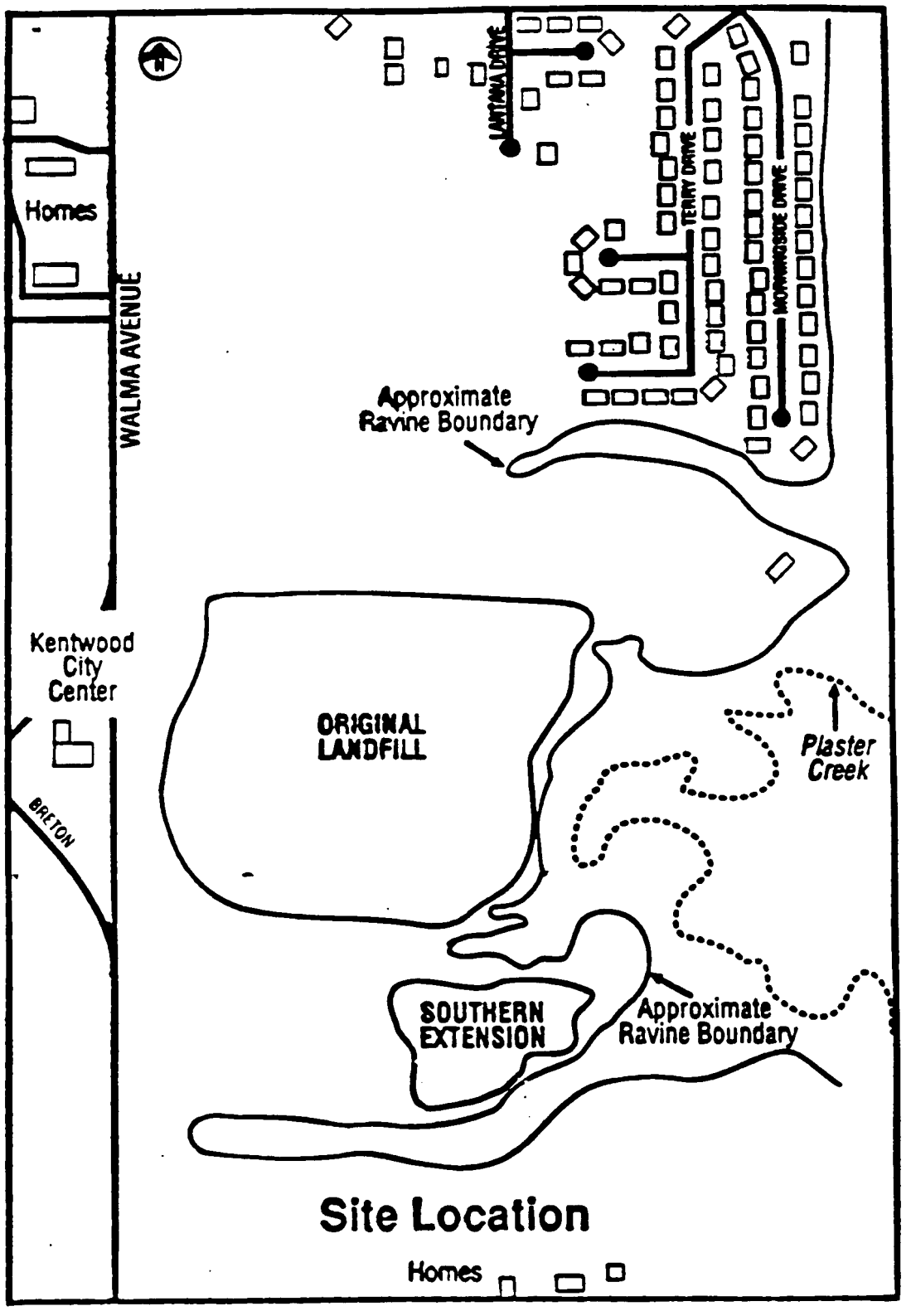
The site is actually comprised of two landfilled areas; the original landfill which is the larger of the two and the southern extension located just south-southeast of the original landfill. Figure 1 is a drawing of the Kentwood Landfill Property. Figure 1A indicates the general location of the site.

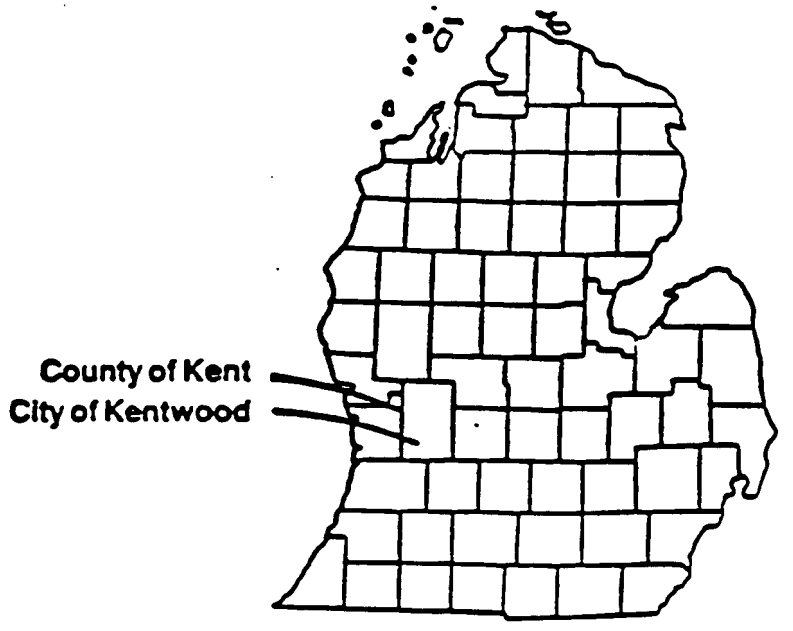
The property is located near residential areas, schools and the City of Kentwood City Center and is easily accessible to the public. A land developer currently owns and plans to build additional homes on the vacant land immediately to the north of the site.

The City of Kentwood has a municipal water-supply system which supplies the majority of households in the area of the landfill. The source of water for this water-supply is Lake Michigan. However, the Remedial Investigation (RI) identified 22 residences in the area surrounding the site that use ground water as water supplies. Eight residential wells were selected for sampling and analysis. The basis for well selection was the proximity of the wells to the Site.

The land to the west of the site, and the majority of the land to the north and south of the landfill is described as a till plain (flat land). The land to the east and some of the land to the north and south of the landfill has ravines that drain into Plaster Creek. The natural topography of the landfill site has been changed due to landfill activities. Ravines with intermittent streams which drained into Plaster Creek have been filled with waste.

Figure 1


LANTANA DRIVE
TERRY DRIVE
MORNINGSIDE DRIVE
Homes
WALMA AVENUE
Approximate
Ravine Boundary
Kentwood
City
Center
ORIGINAL
LANDFILL
Plaster
Creek
BRETON
SOUTHERN
EXTENSION
Approximate
Ravine Boundary
Site Location
Homes



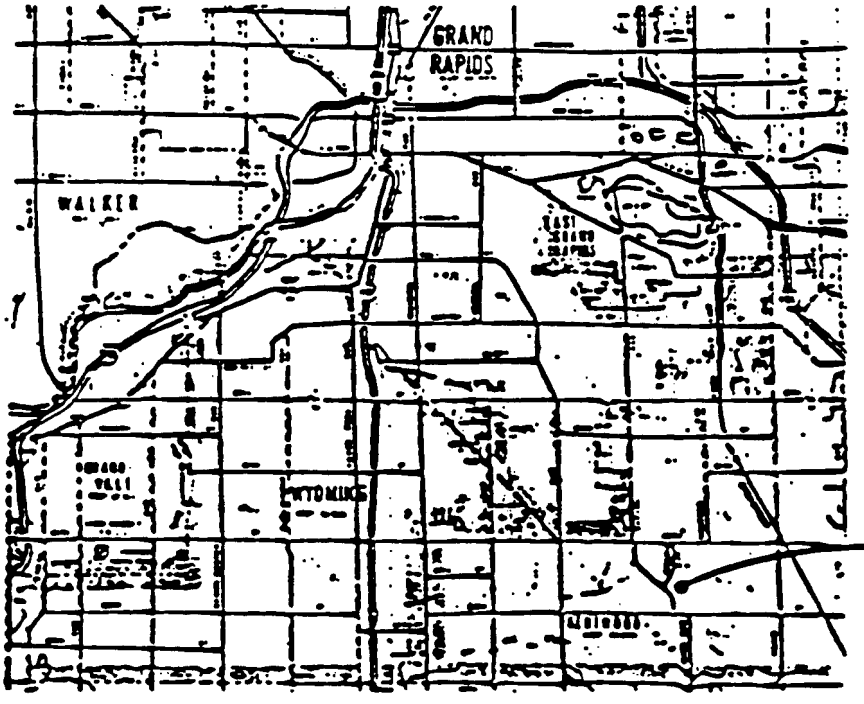


FIGURE 1-A
SITE LOCATION MAP
KENTWOOD LANDFILL

B. Site History and Enforcement Activities

The Kentwood Landfill site originated as the Paris Township Dump in the early 1950's. Refuse was dumped into ravines and burned. In 1966, the site was licensed as a solid waste disposal facility by the Michigan Department of Public Health (MDPH) with the stipulation that refuse would be covered daily and burning would cease. In November 1966, the MDPH and the Kent County Health Department (KCHD) inspected the site and noted surface seeps of leachate and open burning. Burning continued until at least 1969. In January 1968, the MDPH transferred the license to the City of Kentwood.

The City of Kentwood operated the site as an open dumpsite from January 1968 to June 1970. In June 1970, the City of Kentwood sent a letter to the KCHD, stating that the dump would be closed to all haulers beginning June 27, 1970.

In 1971, the Kent County Department of Public Works (KCDPW) took over operation of the landfill and obtained a license from the MDPH. Kent County designed an engineered landfill and the facility was licensed in accordance with Michigan Act 87 (P.A. of 1965). The operation plan for this engineered landfill called for the excavation of 11 landfill cells around the ravine and filling of the ravine. A clay berm was to be constructed at the down-water-gradient end of the cells supposedly to contain leachate.

In June 1975, the KCDPW was issued a license to operate an additional landfill on a 20-acre site just south-southeast of the original landfill. This landfill is called the southern extension. The plans for this landfill called for the excavation of 5 cells, each cell having a leachate collection sump. The leachate sumps were not interconnected. Leachate was to be removed by pumping the liquid into a truck and hauling it to a sanitary sewer connected to the City of Wyoming wastewater treatment facility for treatment.

Both the original and southern extension landfill cells were constructed into the clay rich till that forms the base for the uppermost aquifer beneath the site area (upper aquifer). As a result the landfilled waste is in direct hydraulic connection with the upper aquifer ground water.

The original site and the southern extension landfills were capped in late 1975 and early 1976. The Kentwood Landfill was closed in May 1976. The site was operated prior to the enactment of the Resource Conservation and Recovery Act of 1976, as amended (RCRA).

A leachate collection system at the eastern side of the original landfill in order to intercept leachate breakouts (surface seeps) was installed with construction beginning in the fall of 1981 and completed in the spring of 1983. This collection system consisted of 6 interconnected manholes connected to a central lift station pumping into a forced main to a sanitary sewer leading to the City of Wyoming wastewater treatment facility.

Available records indicate that the Kentwood Landfill site accepted general garbage, rubbish, construction and demolition waste. No records indicating placement of RCRA hazardous waste, at the site have been found.

The U.S. EPA identified two Potentially Responsible Parties (PRPS). These two parties were the owners and operators of the site, the City of Kentwood and the County of Kent. Both PRPs entered into an Administrative Order by Consent with the U.S. EPA in December of 1985 for the conduct of a Remedial Investigation and Feasibility Study (RI/FS).

C. Community Participation

The RI Report, FS Report and the Proposed Plan for the Kentwood Landfill site were released to the public for comment on February 14, 1991. These documents were made available to the public in both the administrative record and an information repository maintained at the U.S. EPA offices in Region 5, Kentwood City Center and the Kent County Library. The notice of availability for these documents was published in The Kentwood Advance and Grand Rapid's Press Newspapers on February 13, 1991. A public comment period on the documents was held from February 20, 1991, to March 21, 1991. In addition, a public meeting was held on March 6, 1991. At this meeting, representatives from U.S. EPA and Michigan Department of Natural Resources (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 public participation requirements of CERCLA Sections 117 and 113 (k)(2)(B)(i-v) have been satisfied.

D. Scope and Role of Response Action Within Site Strategy

This 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 leachate 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. 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 landfills contents was determined inappropriate. 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 effectively.

E. Summary of Site Characteristics

Pursuant to its authority under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), a Remedial Investigation (RI) and Feasibility Study (FS) were conducted at the site.

The following conditions were observed at the Kentwood Landfill site:

1. Topography

The most prominent topographic features at the site are the ravines and Plaster Creek to the east of the landfill. The landfill began as placement of waste into existing ravines at the site. Existing ravines and ravines that were filled in exhibit(ed) intermittent streams and/or seeps which flow(ed) into Plaster Creek. As the landfilling operations grew, additional cells were excavated into the till plain west of the ravines and between ravines.

2. Hydrogeology

There are four aquifers beneath the landfill that were addressed during the remedial investigation. These aquifers are termed upper, middle, lower and bedrock.

a. Upper Aquifer. The upper aquifer is unconfined and underlies most of the area investigated. It ranges in thickness from 0 to 30 feet. The base of the upper aquifer consists of a clay-rich-glacial till which is at an elevation above Plaster Creek and its floodplain. Where topography steepens toward Plaster Creek, the upper aquifer has been eroded and is not present. The upper aquifer also terminates along ravines surrounding the northern, southern, and eastern perimeters of the southern extension.

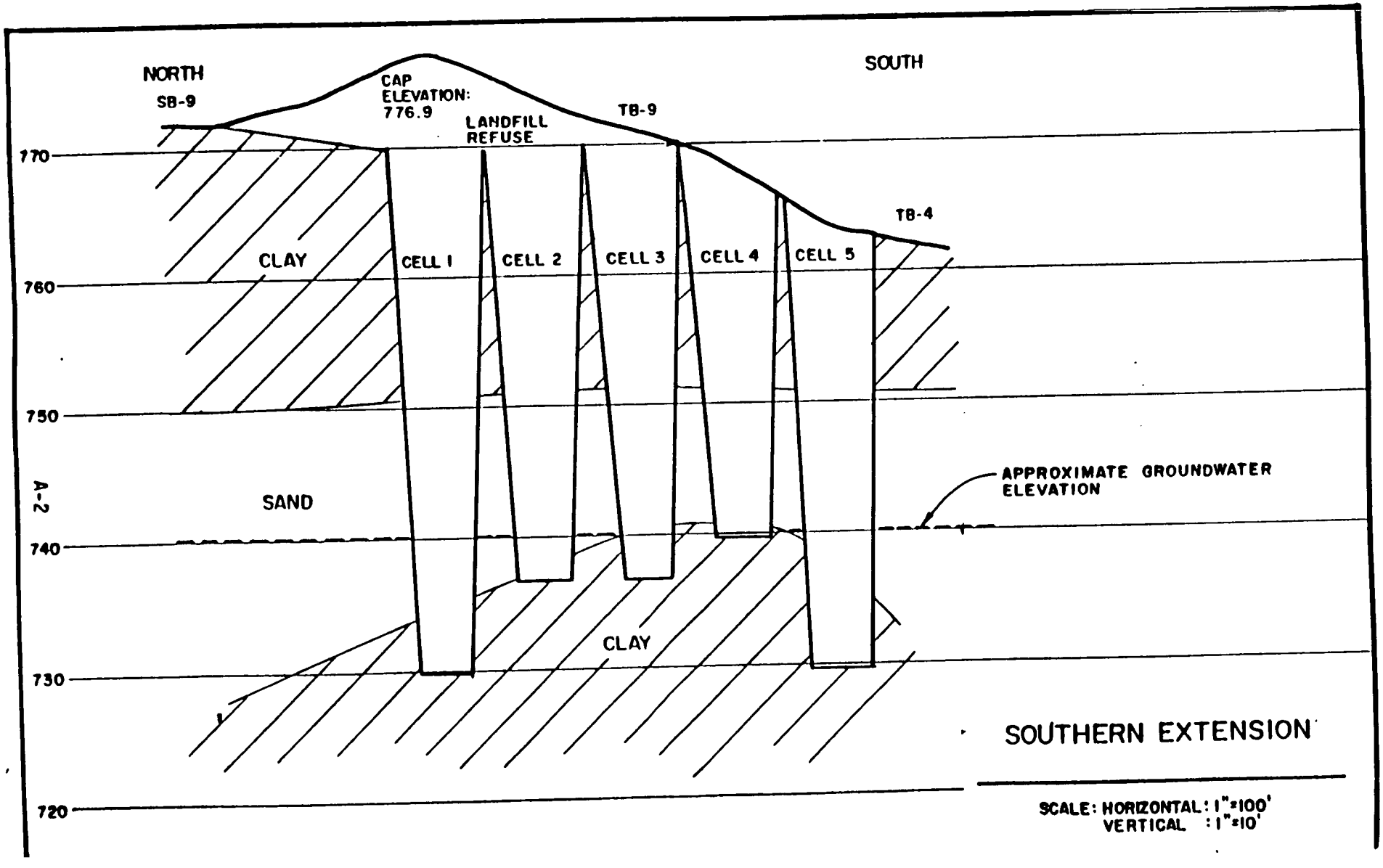
The top of the upper aquifer is approximately at 750 ft. Mean Sea Level (MSL). The base of the upper aquifer is approximately at 728 ft. MSL. These elevations are generalized, since the thickness and position of the aquifer varies within the investigated area.

Ground water flow direction in the upper aquifer is generally from west to east. North of the original landfill the direction of ground water flow is generally to the east-northeast. Ground water flows toward ravines and Plaster Creek's floodplain. In these areas, upper aquifer ground water discharges into Plaster Creek. The approximate ground water velocity in the area of the original landfill is 0.80 ft/day. This translates into an estimated 19,000 gallons of ground water per day that flows horizontally into the original landfill within the upper aquifer. No calculations were made for the southern extension.

The cells of the original and southern extension landfills were excavated through the upper aquifer and into the aquitard forming the base of the upper aquifer. This means that waste placed into the landfills is in direct contact with upper aquifer ground water and ground water actually moves laterally through the waste. See Figures 2 and 3.

b. Middle Aquifer. The middle aquifer underlies, and is separated from, the upper aquifer by a clay-rich-till aquitard. The aquifer appears to be made up of discontinuous sand lenses which are confined or unconfined over different portions of the area of investigation. The thickness of the middle aquifer is approximately 50 feet. The average thickness of the

Figure 2


NORTH
SB-9
CAP
ELEVATION:
776.9
LANDFILL
REFUSE
TB-9
SOUTH
TB-4
770
760
750
740
730
720
CLAY
CELL 1
CELL 2
CELL 3
CELL 4
CELL 5
A-2
SAND
APPROXIMATE GROUNDWATER
ELEVATION
CLAY
SOUTHERN EXTENSION
SCALE: HORIZONTAL: 1"=100'
VERTICAL : 1"=10'

overlying aquitard separating the upper aquifer (and landfill cells) and the middle aquifer is approximately 40 feet. The top surface of the middle aquifer is approximately 10 feet below the floodplain of Plaster Creek; therefore, the aquifer is separated from the surface water by an estimated 10 feet of clay-rich till and does not discharge significantly to Plaster Creek.

The top of the middle aquifer is approximately at 710 ft. MSL. The base of the middle aquifer is approximately at 670 ft. MSL. These elevations are generalized, since the thickness and position of the aquifer varies within the investigated area.

The vertical hydraulic head (static water pressure) between the upper aquifer and middle aquifer is approximately 40 feet. This vertical head indicates that there is potential for ground water movement downward from the upper to middle aquifer. The vertical head also indicates that the intervening aquitard offers some resistance to downward movement of upper aquifer ground water. The remedial investigation estimated that approximately 2,100 gallons of water per day can move through the overlying aquitard into the middle aquifer beneath the original landfill. An estimated 350 gallons of water per day can move down into the middle aquifer beneath the southern extension.

Ground water flow direction in the middle aquifer is uncertain due to the low hydraulic gradient measured within the aquifer and periodic fluctuations in ground water levels at different rates causing apparent reversals of flow. The approximate ground water velocity for this aquifer in the area of the site is 0.12 ft/day.

The cells of the original and southern extension landfills were excavated so that they penetrate the aquitard overlying the middle aquifer but do not extend through the aquitard.

c. Lower Aquifer. This aquifer consists of predominantly sand and gravel. The lower aquifer is separated from the middle aquifer by clay-rich till.

The top of the lower aquifer is approximately at 650 ft. MSL. The base of the lower aquifer is approximately at 645 ft. MSL. These elevations are generalized, since the thickness and position of the aquifer varies within the investigated area.

- The ground water flow direction was not established during the investigation since only two monitoring wells were placed in the stratum. Seasonal fluctuations in ground water levels of the middle and lower aquifers generally coincide. The ground water level of the lower aquifer is below the base of the middle aquifer.

  The aquifer is underlain by a stratum consisting of clay and silt with minor amounts of sand and gravel. This stratum is approximately 7 ft. thick. Beneath this stratum is the Michigan Formation comprised of shales and gypsum. In the vicinity of the Site this formation is not considered an aquifer. The Michigan Formation is approximately 150 feet thick.

  d. Bedrock Aquifer. The principal bedrock aquifer in the investigated area is the Marshall Sandstone. The top of this formation lies approximately at 480 ft. MSL. There are seven identified residential wells in the investigation area that draw water from this aquifer.

Because each of the four aquifers are either currently used or are potentially available for drinking water or other beneficial uses the U.S. EPA has classified these ground-waters as Class II Ground Waters. This classification is site specific and limited in scope to the remedial action for this Site. The State of Michigan has not classified this ground water.

3. Landfills

Waste was placed at the original landfill site in existing ravines during the early operating life. Later, waste was placed in east and west trending excavated trenches. Waste was placed in the southern extension landfill in east and west trending excavated trenches.

The types of waste placed in the landfills included garbage, rubbish, construction and demolition wastes. Waste was placed into the landfills before the enactment of RCRA. Information on the waste placed into the landfills was not sufficient for U.S. EPA to confirm that the waste placed into the landfills were "RCRA hazardous waste" like or not.

Table A
Contaminants of Concern in Leachate
Summary of Detected Chemical Concentrations
Concentration Units in ug/l (ppb)

Contaminant CAS #	Frequency of Detection	Range of Detected Concentration	Mean
Acetone 67-64-1	7/9	11 - 8700	3638
Benzene 71-43-1	7/9	9 - 50	45
Chloroethane 75-00-3	5/9	29 - 130	100
1,1-Dichloroethane 75-34-3	5/9	5 - 890	344
1,2-Dichloroethane 107-06-2	1/9	14	14
1,2-Dichloroethene cis 156-59-2 trans 156-60-5	4/9	11 - 290	216
1,2-Dichloropropane 78-87-5	1/9	24	24
2-Hexanone (MBK) 591-78-6	2/9	14 - 630	503
2-Butanone (MEK) 78-93-3	6/9	34 - 6500	3059
4-Methyl-2-Pentanone 108-10-1 (MIBC)	2/9	107 - 170	170*
Methylene Chloride 75-09-2	7/9	3 - 2300	883
Trichloroethene 79-01-6	2/9	1 - 9	9*
Vinyl Chloride 75-01-4	3/9	6 - 140	140*
Benzo(a)anthracene 56-55-3	1/9	9	9*
Benzo(k)fluoranthene 207-08-9	1/9	18	18*
4-Chloro-3-methylphenol 59-50-7	3/9	10 - 27	27*
Diethylphthalate 84-66-2	5/9	2 - 53	30
2,4-Dimethylphenol 105-67-9	4/9	2 - 10	10*
Fluoranthene 206-44-0	1/9	23	23*
2-Methylphenol o-cresol 95-48-7	4/9	63 - 950	493
4-Methylphenol p-cresol 106-44-5	8/9	5 -13000	5100
Phenanthrene 85-01-8	2/9	4 - 21	21*
Aluminum 7429-90-5	5/9	392 - 3940	3405
Antimony 7440-36-8	5/9	2 - 114	72

Both the original and southern extension landfills have leachate collection systems. Leachate removed from the systems is treated at the City of Wyoming wastewater treatment plant. Both landfills' leachate collection systems are inadequate in preventing releases of leachate onto the surface, surface water and ground water.

Both landfills are covered with clay caps. The caps have fissures, thin areas, areas with excessive slope and areas of inadequate slope. The caps do not comply with the State standards for solid waste landfill caps found in rules promulgated under MI Act 641.

Waste decomposition gases were detected in the leachate collection system for both landfills.

4. Contamination

a. Source.

The source of contamination from this site is the landfilled waste. Some of the landfilled waste lies below the natural ground water table of the upper aquifer. This waste is in direct contact with laterally moving ground water. Leachate is produced by the movement of ground water through the waste and also by movement of precipitation down through the cap and into the waste mass. This lateral movement of ground water through the waste is believed to be the major producer of leachate in the landfills.

Hazardous constituents in the waste mass are present as indicated by the chemical composition of the leachate. Volatile and semi-volatile organic compounds, inorganic compounds and metals were detected in the leachate including benzene, vinyl chloride, arsenic and lead. Table A lists the concentrations of contaminants of concern in the leachate.

The leachate produced and released by the site has contaminated ground water, soils, and has potential to impact surface water and sediments at and near the site.

Table A Continued

Contaminant CAS #	Frequency of Detection	Range of Detected Concentration	Mean
Arsenic 7440-38-2	6/9	4 - 19	12
Barium 7440-39-3	9/9	255 - 1300	768
Cadmium 7440-43-9	5/9	9 - 92	74
Chromium 7440-47-3	6/9	11 - 105	75
Iron 7439-89-6	9/9	90,800 -981,000	461,210
Lead 7439-92-1	5/9	9 - 171	150
Nickel 7440-02-0	9/9	48 - 472	249
Vanadium 7440-62-2	5/9	13 - 138	109

Frequecy of Detection means how many times the constituent was detected in a given number of samples. As an example 7/9 means seven out of nine samples were found to have the constituent.

* = Maximum Detected Concentration

b. Ground Water.

Aquifers beneath the site are termed upper, middle,lower and bedrock.

i. Upper Aquifer. The landfills have contaminated the upper aquifer. Figure 4 indicates the approximate boundaries of the contamination in the upper aquifer. Contaminated groundwater has migrated to areas outside of the Kentwood Landfill property. The ground water contaminants include those found in the leachate. Table B summarizes the concentrations of contaminants found in the contaminated upper aquifer ground water.

ii. Middle Aquifer. The landfills have contaminated the middle aquifer to a much lesser extent. Only one volatile organic was detected above the sample quantification limit; 1,2-Dichloroethane at 8 ug/l. Only one semi-volatile organic, bis (2-ethylhexyl) phthalate, was detected and its concentration was below the sample quantification limit.

iii. Lower Aquifer. No evidence of contamination was found with the two wells screened in the lower aquifer.

iv. Bedrock Aquifer. Because of the depth to the bedrock aquifer and intervening aquitards the likelihood of bedrock aquifer contamination was considered very low. The RI did sample and analyze private wells in the area for possible contaminants from the site. No evidence of contamination from the site was found in these wells.

c. Soils

Surface soil samples were taken at background locations, original site, southern extension, and riparian areas (ravines).

Leachate from the landfills has contaminated the surface soil to a varying degree around the landfill site mostly in localized areas where leachate breakouts and seeps were observed. The contamination is mainly indicated by higher concentrations inorganic parameters than those found in background. Some higher concentrations of organic parameters were also

Figure 4

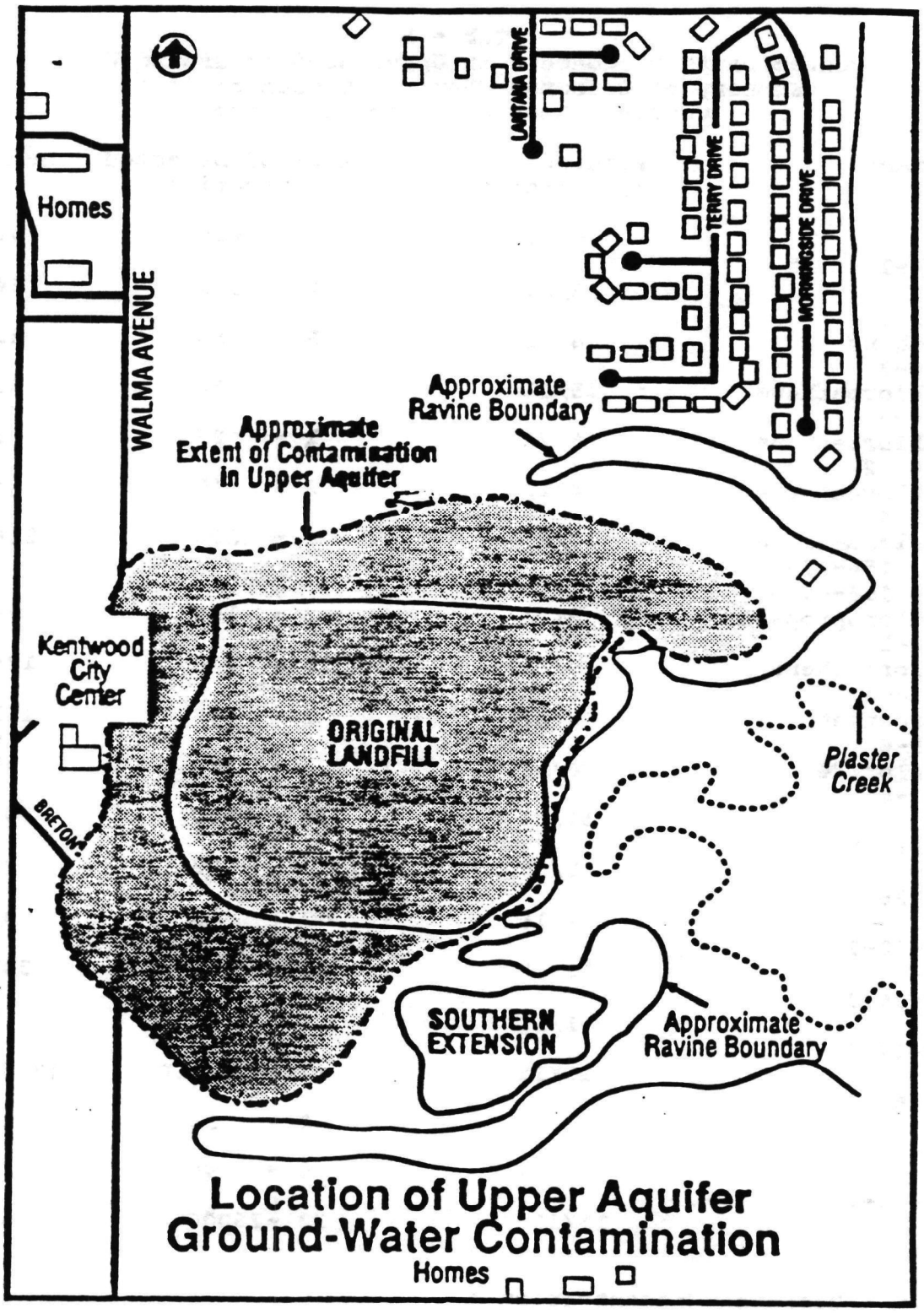

LANTANA DRIVE
TERRY DRIVE
MORNINGSIDE DRIVE
Homes
WALMA AVENUE
Approximate
Ravine Boundary
Approximate
Extent of Contamination
In Upper Aquifer
Kentwood
City
Center
ORIGINAL
LANDFILL
BRETON
Plaster
Creek
SOUTHERN
EXTENSION
Approximate
Ravine Boundary
Location of Upper Aquifer
Ground-Water Contamination
Homes

Table B
Contaminants of Concern in Upper Aquifer Ground Water
Summary of Detected Chemical Concentrations
Concentration Units in ug/l (ppb)

Contaminant CAS #	Frequency of Detection	Range of Detected Concentration	Mean
Acetone 67-64-1	6/21	1 - 620	109
Benzene 71-43-1	12/21	2 - 101	24
Chloroethane 75-00-3	8/21	3 - 66	23
1,1-Dichloroethane 75-34-3	15/21	1 - 160	62
1,2-Dichloroethane 107-06-2	6/21	1 - 26	6
1,1-Dichloroethene 75-35-4	4/21	1 - 15	5
1,2-Dichloroethene cis 156-59-2 trans 156-60-5	10/21	2 - 1200	216
1,2-Dichloropropane 78-87-5	6/21	2 - 160	29
Tetrachloroethene 127-18-4	6/21	15 - 710	128
Trichloroethene 79-01-6	8/21	2 - 450	113
Vinyl Chloride 75-01-4	6/21	3 - 130	39
Aluminum 7429-90-5	11/11	18 - 1530	502
Antimony 7440-36-8	1/15	28	28*
Arsenic 7440-38-2	9/15	3 - 78	31
Barium 7440-39-3	13/15	22 - 560	342
Chromium 7440-47-3	1/15	7	7*
Iron 7439-89-6	15/15	17 -130,000	43153
Lead 7439-92-1	2/1	2 - 24	15
Nickel 7440-02-0	7/15	30 - 90	53
Zinc	15/15	33 -26000	7241

* = Maximum Detected Concentration

- detected.

d. Surface Water and Sediments.

Surface water samples were taken from Plaster Creek, intermittent streams in ravines northeast of the original landfill and from water ponding on the site. The waters of Plaster Creek and intermittent streams show negligible impact by the site. The water sampled from an impoundment at the northeast corner of the original landfill contained elevated concentrations of chloride, iron, ammonia, sulfate and bis(2-ethylhexyl)phthalate and di-n-octyl phthalate.

Analyses of sediments of Plaster Creek downstream from the Site indicate minor elevations in concentrations of metals, ammonia, grease and oil at the sampling point compared to upstream sample analyses.

F. Summary of Site Risks

Pursuant to the NCP, a baseline risk assessment was performed based on the present condition of the site. The baseline risk assessment 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. 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 baseline risk assessment included the following assumptions:

- No "off-site" ground-water use restrictions will be enforced;
- The upper aquifer ground water contaminated by the site may be used as a drinking water source;
- Adjacent "off-site" residential development will continue to occur;
- Parts of the site might be used for residential development; and
- Access restrictions such as fencing of the site will not be implemented.

1. Contaminant Identification

The media of concern for human exposures were identified primarily as ground water, and soils. Leachate from the landfills is the major source of contamination of these environmental media. Surface water media was not considered for human exposure due to the negligible impact on this medium by the site. Surface water was however, evaluated for environmental impact.

The contaminants of concern selected for non-carcinogenic risk characterization in ground water were:

Acetone	Benzene	Chloroethane
1,2-Dichloroethane	1,2-Dichloroethene	1,2-Dichloropropane
Tetrachloroethene	Vinyl Chloride	Antimony
Arsenic	Barium	Iron
Lead	Zinc	Aluminum

The contaminants of concern selected for carcinogenic risk characterization in ground water were:

Chlorethane	1,1-Dichloroethane	1,1-Dichloroethene
1,2-Dichloroethene	1,2-Dichloropropane	Tetrachloroethene
Trichloroehene	Vinyl Chloride	Antimony
Arsenic	Chromium	Lead
Nickel	Aluminum	

The contaminants of concern selected for non-carcinogenic risk characterization in leachate and leachate breakouts were:

Acetone	Benzene	Chloroethane
1,2-Dichloroethane	1,2-Dichloroethene	1,2-Dichloropropane
2-Hexanone	2-Butanone	Methylene Chloride
Trichloroethene	Vinyl Chloride	Diethylphtalate
Benzo (a) anthracene	Benzo (k) fluoranthene	
1,2-Dimethylphenol	Fluoranthene	2-Methylphenol
4-Methylphenol	Antimony	Arsenic
Barium	Cadmium	Iron
Lead	Nickel	Vanadium
Aluminum	Phenanthrene	

The contaminants of concern selected for carcinogenic risk characterization in leachate and leachate breakouts were:

Chloroethane	1,1-Dichloroethane	1,2-Dichloroethene
2-Hexanone	4-Methyl-2-Pentanone	
Methylene Chloride	Vinyl Chloride	Benzo (a) anthracene
Benzo (k) fluoranthene	4-Chloro-3-Methylphenol	
Fluoranthene	2-Methylphenol	4-Methylphenol
Antimony	Arsenic	Cadmium
Chromium	Lead	Nickel
Aluminum	Phenanthrene	

The contaminants of concern selected for risk characterization from surface soils were:

Acetone	2-Butanone	Ethyl Benzene
Toluene	Xylene	Diethylphtalate
4-Methylphenol	Fluoranthene	Phenanthrene
Bis (2-ethylhexyl) phthalate		Butyl benzyl phthalate
Di-n-butyl phthalate		Arsenic
Barium	Chromium	Iron
Nickel	Zinc	

Analytical data gathered on surface water samples from Plaster Creek and Plaster Creek sediments indicate minor exceedances of constituents compared to background levels in the creek. The risk assessment concluded that the water and sediments in the Creek do not pose a risk to humans.

2. Exposure Assessment

Potential exposure to contaminants from this site are as follows:

- Incidental ingestion of surface soils by trespassers, site workers and residents;
- Dermal contact with surface soil by trespassers, site workers and residents;
- Dermal contact with leachate breakout water by trespassers and residents.
- Dermal contact with leachate and leachate breakout water by site workers;
- Accidental ingestion of leachate breakout water by trespassers and residents;
- Accidental ingestion of leachate and leachate breakout water by site workers;

- Inhalation of volatiles emitted from leachate in confined spaces by site workers; and

- Possible future use of upper and middle aquifer ground water for drinking and bathing, exposures would be to "off-site" residents and "on-site" residents through ingestion, inhalation while showering and dermal contact while bathing and showering.

3. Risk Characterization

For each of the potential receptors, the risks associated with ingestion, inhalation and dermal absorption to the site-specific contaminants from different routes of exposure have been evaluated. Both non-carcinogenic and carcinogenic health effects have been estimated.

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.

The following table indicates the total Hazard Index for different scenarios.

	Receptor	Total Hazard Indices (THI*)
1.	Adult Worker/ Non-Resident	1.3E-03
2.	Adult Off-Site Resident	4.4E+00
3.	Adult Worker/ Off-Site Resident	4.4E+00
4.	Adult Off-Site Resident/Trespasser	4.4E+00
5.	Adolescent Off-Site Resident/Trespasser	6.6E+00
6.	Child Off-Site Resident	1.5E+01
7.	Adult On-Site Resident	4.4E+00
8.	Adolescent On-Site Resident	6.6E+00
9.	Child On-Site Resident	1.5E+01

* THI value includes inhalation of volatiles from leachate in confined spaces.

The Hazard Index exceeds the value of 1.0 for all "on-site" and "off-site" residential scenarios.

Table C provides an additional breakdown of Hazard Indices relating to exposure routes.

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

Table C
Estimated Hazard Indices

ure Route	Adult Worker/ Non-Resident	Adult Worker/Off-Site Resident	Adult Off-Site Resident	Child Off-Site Resident	Adult Off-Site Resident/Trespasser	Adolescent Off-Site Resident/Trespasser	On-Site Resident		
							Adult	Adolescent	Child
duster[a] • a	--	4.4E+00	4.4E+00	1.5E+01	4.4E+00	6.6E+00	4.4E+00	6.6E+00	1.5E+01
	--	(5.9E-01)	(5.9E-01)	(1.8E+00)	(5.9E-01)	(7.8E-01)	(5.9E-01)	(7.8E-01)	(1.8E+00)
te Soil • b	7.8E-05	7.8E-05	--	--	4.7E-05	9.7E-06	1.2E-02	--	1.3E-01
ste lation of lles)[ee] • c	1.1E-05	1.1E-05	--	--	--	--	--	--	--
ste or ste ut[eee] ition and) • d	1.2E-03	1.2E-03	--	--	1.0E-04	3.9E-04	1.0E-03	4.0E-03	--
b • c • d	1.3E-03	4.4E+00	4.4E+00	1.5E+01	4.4E+00	6.6E+00	4.4E+00	6.6E+00	1.5E+01
(without tion of ion from ste) b • d	1.3E-03	4.4E+00	4.4E+00	1.5E+01	4.4E+00	6.6E+00	4.4E+00	6.6E+00	1.5E+01
(without water) c • d	1.3E-03	1.3E-03	0	0	1.5E-04	4.0E-04	1.3E-02	4.0E-03	1.3E-01
(without water and tion of ion from ste) d	1.3E-03	1.3E-03	0	0	1.5E-04	4.0E-04	1.3E-02	4.0E-03	1.3E-01

esents non-applicable exposure routes.

higher risk of the upper or middle aquifer has been used.
dle aquifer values are presented in parenthesis.

olation of volatiles occurs in confined space only.

e adult worker is affected by leachate, and adult trespasser, adolescent trespassers
d on-site residents are ...ted by leachate breakouts only.

dividual Hazard Quotients and the calculations are presented in Appendix B.

-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. $1X10^{-6}$ or 1E-6). An excess lifetime cancer risk of $1X10^{-6}$ 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 1E-04 to 1E-06 (1 in 10,000 to 1 in 1 million), with an emphasis on the lower end 1E-06 of the scale.

The following table indicates the Excess Lifetime Cancer Risks for different scenarios.

Receptor	Total Incremental Cancer Risk*
Adult Worker**/ Non-Resident	2.4E-06
Adult Off-Site Resident	1.7E-02
Adult Worker**/ Off-Site Resident	1.7E-02
Adult Off-Site Resident/Trespasser	1.7E-02
Adult On-Site Resident	1.7E-02

* Except for Adult Worker, all risk values include an incremental cancer risk of 1.7E-02 from future contaminated ground water use.

** For adult worker, an incremental cancer risk of 1.2E-06 is included from inhalation of volatiles from leachate in confined spaces.

The excess lifetime cancer risk for all "on-site" and "off-site" based reasonable maximum exposure in the residential scenarios exceed the acceptable risk range of 1E-04 to 1E-06. This risk range is also exceeded by the "on-site" resident who does not use contaminated ground water. Table D provides an additional breakdown of excess lifetime cancer risk relating to exposure routes.

Table D
Incremental Cancer Risk Estimates

Exposure Route	Adult Worker/ Non-Resident	Adult Worker/Off-Site Resident	Adult Off-Site Resident	Adult Off-Site Resident/ Trespasser	On-Site Adult Resident
Groundwater* = a	-- --	1.7E-02 (5.5E-03)	1.7E-02 (5.5E-03)	1.7E-02 (5.5E-03)	1.7E-02 (5.5E-03)
Surface Soil = b	2.3E-07	2.3E-07	--	2.4E-07	8.7E-04
Leachate (inhalation of volatiles)** = c	1.2E-06	1.2E-06	--	--	--
Leachate or Leachate Breakout*** (ingestion and dermal) = d	9.3E-07	9.3E-07	--	1.8E-07	1.8E-06
Total = a + b + c + d	2.4E-06	1.7E-02	1.7E-02	1.7E-02	1.7E-02
Total (without inhalation of volatiles from leachate) = a + b + d	1.2E-06	1.7E-02	1.7E-02	1.7E-02	1.7E-02
Total (without groundwater) = b + c + d	2.4E-06	2.4E-06	--	4.2E-07	8.7E-04
Total (without groundwater and inhalation of volatiles from leachate) = b + d	1.2E-06	1.2E-06	--	4.2E-07	8.7E-04

-- Represents non-applicable exposure routes.

* The higher risk of the upper or middle aquifer has been used. Middle aquifer values are presented in parenthesis.

** Inhalation of volatiles occurs in confined space only.

***The adult worker is affected by leachate, and adult trespasser and on-site adult resident is affected by leachate breakouts only.

The Incremental Cancer Risks and the calculations are presented in Appendix B.

4. Environmental Risks

In addition to human health risks, the risks to the environment were also considered during the remedial investigation. It is estimated that the greatest risks posed by the site are to aquatic life in surface water in the vicinity of the site. Leachate breakouts and contaminated ground water flows into Plaster Creek. As long as these liquids continue to be produced by the site they will be a source of contamination of the Creek.

Terrestrial organisms may also be affected by the leachate and contaminated ground water seeps through ingestion and dermal contact.

5. Risk Summary

The potential excess lifetime cancer risk posed by the site exceeds the acceptable risk range of $1X10^{-4}$ to $1X10^{-6}$ principally from the use of contaminated ground water. This represents unacceptable potential risks to human health.

The hazard indices for humans interacting with the site exceed the acceptable hazard index of 1.0, principally from the use of contaminated ground water. This represents unacceptable potential risks 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 Record of Decision, may present an imminent and substantial endangerment to public health. welfare, or the environment. The site poses risks to non-human receptors from contaminants released from the site into surface waters.

G. Environmental Standards not met at the Site.

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

1. Cap

The existing landfill cap does not meet the requirements of Michigan State Solid Waste Rules promulgated under Michigan Act 641, the current State landfill closure regulations which have been determined to be relevant and appropriate for this site.

2. Ground Water

Table E 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. The ground water contaminant plume contains concentrations of hazardous substances which exceed most of these ground-water standards and clean-up criteria.

3. Ground Water Protection Goals and the National Contingency Plan

The U.S. EPA's ground-water protection goal has been set forth in the NCP as follows:

The national goal of the remedy selection process is to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste. Title 40 of the Code of Federal Regulations (40CFR) Section 300.430(a)(1)(i)).

The NCP states that the U.S. EPA expects to return usable ground waters to their beneficial uses, wherever practicable, within a time frame that is reasonable given the particular circumstances of the site. Whenever restoration of ground waters is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to the contaminated ground water, and evaluate further risk reduction. (40 CFR Section 300.30(a)(1)(iii)(F)).

Also, the NCP considers the use of institutional controls to limit exposures to hazardous substances in the ground water:

EPA expects to use institutional controls such as water use and deed restrictions to supplement engineering controls as appropriate for short-and long-term management to prevent or limit exposure to hazardous substances, pollutants, or contaminants.... The use of institutional controls shall not substitute for active response measures as the sole remedy unless such response measures are determined not to be practicable.... (40 CFR Section 300.430(a)(1)(iii)(D)).

4. State of Michigan Ground Water Protection Goals

Michigan Act 307 provides for remedial action, at contaminated sites within the State, which "shall be protective of the public health, safety, and welfare and the environment and natural resources." Additionally, all "...remedial actions which address the remediation of an aquifer shall provide for removal of the hazardous substance

Table E
Comparison of Federal and State Ground Water Remediation Standards
Concentration Units in ug/l (ppb)

Contaminant CAS #	SDWA MCL	MI Act 307 Type B
Benzene 71-43-1	5	1
Chloroethane 75-00-3	NE	7
1,1-Dichloroethane 75-34-3	NE	700
1,2-Dichloroethane 107-06-2	5	0.4
1,1-Dichloroethene 75-35-4	7	0.06
1,2-Dichloroethene		
cis 156-59-2	70 (T)	70
trans 156-60-5	100 (T)	140
1,2-Dichloropropane 78-87-5	5 (T)	0.5
Tetrachloroethene 127-18-4	5 (T)	0.7
Trichloroethene 79-01-6	5	3
Vinyl Chloride 75-01-4	2	0.02
Arsenic 7440-38-2	50	0.02
Chromium 7440-47-3	100 (T)	30
Lead 7439-92-1	15 (P)	5
Nickel 7440-02-0	100 (T)	100

NE = Not Established
T = To Be Considered
P = Proposed

or substances from the aquifer...." Michigan Act 307 also provides for the determination of acceptable criteria for ground-water remediation at the site.

5. 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 the Agency must apply risk-based clean-up levels to reach the goal of protectiveness (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 figures to the site. The methodology for Type C clean-up reviews the actual conditions of the site; the uses, present and future, of the 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 Kentwood Landfill site.

Table F lists the Ground Water Remediation Standards for the Kentwood Landfill site.

Table F
Ground Water Remediation Standards
Kentwood Landfill

Contaminant CAS #	Standard ug/l
Benzene 71-43-1	1
Chloroethane 75-00-3	7
1,1-Dichloroethane 75-34-3	700
1,2-Dichloroethane 107-06-2	0.4
1,1-Dichloroethene 75-35-4	0.06
1,2-Dichloroethene cis 156-59-2 trans 156-60-5	70 100
1,2-Dichloropropane 78-87-5	0.5
Tetrachloroethene 127-18-4	0.7
Trichloroethene 79-01-6	3
Vinyl Chloride 75-01-4	0.02
Aluminun 7429-90-5	50
Antimony 7440-36-0	3
Arsenic 7440-38-2	0.02
Chromium 7440-47-3	30
Lead 7439-92-1	5
Nickel 7440-02-0	100

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.

H. 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 Record of Decision, 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, especially the ground-water protection policy, in the derivation of remedial alternatives for the Kentwood Landfill site.

I. Description of Alternatives

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

Alternative 1: No Action

Alternative 2: Access Restrictions, and Site Monitoring

Alternative 3: Access Restrictions, Site Monitoring, Cap Improvements, Landfill Gas Control, Leachate Collection, "On-site" Ground-water Extraction Wells, and Discharge of Leachate and Contaminated Ground Water to a Publicly Owned Treatment Works (POTW).

Alternative 4: Access Restrictions, Site Monitoring, Cap Improvements, Landfill Gas Control, Leachate Collection, "On-site" and "Off-site" Ground-water Extraction Wells, and Discharge of Leachate and Contaminated Ground Water to a POTW.

Alternative 5: On-site Incineration of the landfilled waste with Off-site Ash Disposal, "On-site" and "Off-site" Ground-water Extraction Wells, and Discharge of Contaminated Ground Water to a POTW.

(Note: The term "on-site" when used to describe the location of ground-water extraction wells (or residences) means the placement of these wells (or residences) within the property boundary of the land currently owned by the PRPs for the Kentwood Landfill. The term "off-site" when used to describe the location of ground-water extraction wells (or residences) means the placement of these wells outside of this property boundary. This use of the terms "on-site" and "off-site", when describing the wells (or residences), is not consistent with the definition of on-site in the NCP. Under the NCP's definition of this term all wells (or residences) placed into (or on top of) the plume of contaminated ground water at this site would be considered on-site.

Alternative 1: No Action

The NCP requires that the U.S. EPA evaluate the No-Action Alternative to provide a baseline for comparison of the effectiveness of the remedial alternatives.

Under the No-Action Alternative, no active response measures would occur. No institutional controls would be implemented to prevent human contact with contaminants, no reduction of the toxicity, mobility or volume of contaminants, or of the rate of leaching of contaminants to the ground water, would be provided by this alternative. No risk reduction would result from this action. The No-Action Alternative does not meet applicable or relevant and appropriate requirements (ARARs) for ground water and landfill closure at the site and is not protective of human health and the environment. Alternative 1 has no cost.

Alternative 2: Access Restrictions and Site Monitoring

Under Alternative 2, limited action would be taken to prevent direct human contact with the contaminants at the site. A fence and signs would be installed and maintained to prevent persons from trespassing the site. Deed and ground-water use restrictions would be placed on the site property to prevent the development of the landfilled areas, to prevent access to contaminated portions of the site and to prevent consumption of contaminated ground water. Restrictions would be placed on the use of land and/or ground water outside of the Kentwood Landfill property boundary that has been contaminated, to prevent access to contaminants.

Monitoring of the site including, but not limited to, monitoring of ground water aquifers, would continue to track contamination from the landfills and other conditions.

While Alternative 2 would control access to the site and contaminants, it would not prevent production of leachate and movement of contaminants from the landfills. This alternative does not reduce the toxicity, mobility or volume of contamination. This alternative relies an institutional controls to prevent human exposure to site contaminants which can not be considered effective or permanent in the long term. These institutional controls do not provide any protection to the environment. Thus, Alternative 2 provides no risk reduction. Alternative 2 would not meet ground water or landfill closure ARARs (Safe Drinking Water Act (SDWA) and RCRA).

Alternative 2 has an estimated capital cost of $280,000 and estimated annual operation and maintenance cost of 50,000. The present worth, based on 30 years at 5%, is estimated at $1,000,000.

Alternative 3: Access Restrictions, Site Monitoring, Cap Improvements, Landfill Gas Control, Leachate Collection, "On-site" Ground-water Extraction Wells, and Discharge of Leachate and Contaminated Ground Water to a Publicly Owned Treatment Works (POTW).

Alternative 3 includes the all components of Alternative 2. In addition this alternative includes:

Improvements of the existing landfill caps to bring the caps into compliance with the current promulgated State of Michigan Act 641 landfill cap (cover) standards. Improvements would include, but not be limited to, compaction, correct cap composition and thickness, slope, vegetative cover and maintenance.

Installation of a system to control the release of landfill gases as required to comply with the current promulgated State of Michigan Act 641 landfill standards.

Collection of leachate from the landfills for treatment.

Collection of contaminated ground water for treatment using "on-site" ground-water extraction wells.

- Discharge of the leachate and contaminated ground water to a POTW for treatment.

The access restrictions and site monitoring would be established as in Alternative 2. The landfill caps would be improved to the MI Act 641 standards in order to prevent direct contact with landfill wastes and to reduce the amount of precipitation infiltration through the landfilled wastes. Landfill gas control systems would be installed to prevent build-up of gases within the landfill and uncontrolled migration of gases away from the landfill. Leachate and contaminated ground water would be extracted from the site for treatment. Treatment of these liquids would take place at a POTW. POTW pretreatment standards would be met by pretreatment of these liquids on-site prior to discharge into storm sewers for the POTW.

If for any reason, the leachate and/or contaminated ground water can not be treated by a POTW, these liquids will be treated on-site and discharged to surface waters in compliance with the substantive requirements of an NPDES permit, as administered by the State under Part 21 of Michigan Act 245.

Collection of contaminated ground water and leachate would be conducted to meet the ground-water remediation standards as listed in Table F. Based on computer modelling the Feasibility Study estimated that the ground-water remediation standards would be met within all areas of the contaminated plume in 19 years. To prevent leachate production by lateral movement of upper aquifer ground water through the landfilled waste, the extract of ground water would continue to maintain the upper aquifer ground water table below the landfilled waste to the maximum extent practicable. production by lateral movent

Under this alternative, the placement of ground-water extraction wells is limited to "on-site" (within the boundary of the Kentwood Landfill property). This limitation could prevent the installation of ground-water extraction wells into areas, outside of the property boundary, which could collect contaminated ground water more efficiently.

Alternative 3 has an estimated capital cost of $2,300,000 and estimated annual operation and maintenance cost of $190,000. The costs assume some pretreatment will be necessary prior to discharge of leachate and contaminated ground water to a POTW. The present worth, based on 30 years at 5%, is estimated at $5,200,000.

Alternative 4: Access Restrictions, Site Monitoring, Cap Improvements, Landfill Gas Control, Leachate Collection, "On-site" and "Off-site" Ground-water Extraction Wells, and Discharge of Leachate and Contaminated Ground Water to a POTW.

Alternative 4 includes all components of Alternative 3 with the addition of "off-site" ground-water extraction wells.

This alternative would allow the installation of ground-water extraction wells in areas outside of the boundary of the Kentwood Landfill property. The addition of "off-site" ground-water extraction wells is a major benefit to the remedy.

Alternative 3 includes a limitation on the installation of extraction wells to within the Kentwood Landfill property. This limitation is based on property boundaries, lines drawn on land deeds, as opposed to the actual extent of contaminated ground water and the need to extract that ground water for treatment as quickly as possible.

Alternative 4 does not restrict the placement of extraction wells. Thus, this alternative will allow design of an extraction system that is the most efficient in extracting contaminated ground water. The FS estimated that this alternative will meet the remediation standards for ground water listed in Table F in 9 years.

Alternative 4 has an estimated capital cost of $2,600,000. The estimated annual operation and maintenance cost of for years 1-9 is $210,000 and for years 10-30 is 200,000. The costs assume some pretreatment will be necessary prior to discharge of leachate and contaminated ground water to a POTW. The present worth, based on 30 years at 5%, is estimated at $5,700,000.

Alternative 5: On-site Incineration with Off-site Ash Disposal, "On-site" and "Off-site" Ground-water Extraction Wells, and Discharge of Contaminated Ground Water to a POTW.

The principal difference between this alternative and all the others is that this alternative addresses the source of the contamination at the site through thermal destruction of the landfilled waste while the other alternatives contain the landfilled waste within the present landfills. The landfilled waste would be excavated and incinerated on-site. Ash from the incineration would be managed in a

landfill off-site.

The thermal destruction of the waste would be required to meet the substantive State and Federal requirements for the incineration of solid waste. The off-site ash monofill would require all necessary permits required for solid waste ash landfills.

Alternative 5 includes the same active ground water remediation component of Alternative 4.

The estimated time needed to locate the incinerator, locate and permit an off-site ash monofill and incinerate the waste is 10 years. The ground water remediation would meet the remediation standards in approximately 9 years. Alternative 5 has an estimated capital cost of $10,000,000 and estimated annual operation and maintenance cost of $10,000,000. The costs assume some pretreatment will be necessary prior to discharge of leachate and contaminated ground water to a POTW. The present worth, based on 30 years at 5%, is estimated at $160,000,000.

I. Comparative Analysis of Alternatives: The Nine Criteria

In accordance with the NCP, the relative performance of each alternative is evaluated using the nine criteria, 40 CFR Section 300.430 (e) (9) (iii), as a basis for comparison. An alternative providing the "best balance" of trade-offs with respect to the nine criteria is determined from this evaluation.

The following two threshold criteria; overall protection of human health and the environment, and compliance with applicable or relevant and appropriate requirements, are criteria that must be met in order for an alternative to be selected.

1. Overall Protection of Human Health and the Environment

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

The major exposure pathways of concern at the Kentwood Landfill site are the potential ingestion of and contact with contaminated ground water and leachate produced by the landfills. Based upon these pathways of concern, the alternatives were evaluated on their ability to reduce the amount of leachate produced by the landfill to prevent exposure to leachate and contaminated ground water and to achieve the ground-water remediation standards.

Alternatives 3, 4 and 5 are protective of human health and the environment.

Alternatives 3 and 4 have active ground-water remediation measures that would reduce ground-water contaminants to the remediation standards, and leachate collection and other measures to reduce the amount of leachate produced by the landfills. Alternative 4 will achieve ground-water remediation standards in half the time of Alternative 3. Alternative 5 includes the ground-water remediation measure of Alternative 3 and 4 and involves destroying the source of the leachate by thermal destruction of the landfilled waste.

Over the long term, Alternatives 1 (No Action) and 2 (Access Restrictions and Site Monitoring) do not provide adequate protection of human health and the environment since no protection of ground water is provided either through extraction and treatment of ground-water contaminants or through cap improvements or leachate collection. Alternatives 1 and 2 do not prevent direct exposure to contaminants by humans and environmental receptors. Contaminants in the leachate produced by the landfills would continue to contaminate ground water and the surrounding environment.

2. Compliance with Applicable or Relevant and Appropriate Requirements

This criterion evaluates whether an alternative meets applicable or relevant and appropriate requirements set forth in Federal, or more stringent State, environmental standards pertaining to the site or proposed actions (Note: Section K discusses ARARs in more detail for the site.)

The major ground water ARARs include the requirements of the Federal Safe Drinking Water and State Safe Drinking Water Act (Act 399) and the State Environmental Response Act (Act 307). Landfill closure ARARs include Michigan Act 641 which include the landfill cap specifications.

Alternatives 1 and 2 do not meet the requirements for the remediation of contaminated ground water of MI Act 307 since no active measures for ground-water remediation would be initiated. These alternatives do not meet the landfill closure of MI Act 641 since no work would be done to improve the cap to MI Act 641 standards.

Alternatives 3 and 4 include improvements to the existing cap and installation of gas controls to comply with MI Act 641.

Alternatives 3, 4 and 5 include active ground-water remediation which would meet the ground-water remediation standards of the Safe Drinking Water act and MI Act 307 Type B criteria. Pretreatment and treatment of leachate and contaminated ground water would be carried out to meet the requirements of the Clean Water Act and Clean Air Act. Discharge of treated leachate and ground water would comply with the Clean Water Act.

Alternative 5 includes thermal destruction of the landfilled waste and would comply with Federal and State requirements for solid waste incineration.

3. Long-Term Effectiveness and Permanence

This criteria refers to the ability of an alternative to maintain reliable protection of human health and the environment over time (lower residual risk) once the clean-up goals have been met.

Alternative 5 provides the most reliable protection since the landfilled waste is destroyed and ground water remediated.

Alternatives 3 and 4 provide long-term effectiveness by containing the landfilled waste on-site through engineering controls, collecting leachate and preventing the production of leachate. These alternatives involve continual extraction of leachate and ground water to prohibit the production of leachate meaning that they are not as permanent as Alternative 5.

Alternatives 1 and 2 do not provide long-term effectiveness or permanence since they provide no response measure to address the wastes or contamination. These alternatives rely exclusively on institutional controls to protect human health. Institutional controls do not protect the environment and can not be considered permanent.

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

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

Alternative 5 includes the greatest level of treatment of contaminants at the site. This alternative employs treatment to an extent to which it can be deemed as a principal element of the remedy. The landfilled waste would undergo thermal destruction. The leachate and contaminants in ground water would undergo treatment through on-site pretreatment and off-site through treatment at a POTW.

Alternatives 3 and 4 include treatment of leachate and contaminated ground water. The leachate and contaminants in ground water would undergo treatment on-site through pretreatment and off-site through treatment at a POTW to reduce the mobility and toxicity of contaminants and reduce the amount of contaminated ground water.

Alternatives 1 and 2 do not provide any treatment of the hazardous substances, pollutants and contaminants.

5. Short-Term Effectiveness

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

Alternative 4 reaches the ground-water clean-up goals (remediation standards) and protects human health and the environment fastest. This alternative allows placement of ground-water extraction wells within and outside of the Kentwood Landfill property. This flexibility of placement would allow installation of these extraction wells in the most efficient area to collect the contaminated ground water plume. The estimated time necessary to achieve the ground-water remediation standards is 9 years. This alternative also involves containment of the landfilled waste on-site within a relatively short period of time. Community and worker health can be protected during the construction of the remedy through safety control measures.

Alternative 3 reaches ground water remediation standards in an estimated 19 years. The longer time necessary for the ground water clean-up is due to the limitations on the installation of ground-water extraction wells to within the Kentwood Landfill property boundary. Community and worker health can be protected during the construction of the remedy through safety control measures.

Alternative 5 reaches the remediation standards in an estimated 9 years. Community and worker health would be more difficult to protect due to the activity of excavating the landfilled waste, and incineration on-site. Uncovering waste would increase the potential for exposure to hazardous constituents by direct contact and inhalation.

Alternatives 1 and 2 may never achieve ground-water remediation standards since no active ground-water remediation would take place and the landfills would continue to produce leachate.

6. Implementability

This criterion considers the technical and administrative feasibility of implementing an alternative.

No significant implementation problems are projected for Alternatives 1 through 4. Cap materials are expected to be obtainable from nearby sources including a stockpile currently on-site. The engineering expertise and construction practices and equipment for installation, operation and maintenance of these alternatives' components are available and proven. Access to areas outside of the Kentwood Landfill property is necessary for Alternative 4, e.g., for installation of the ground-extraction system and piping to the pretreatment system. Although, statutory authority guarantees access to these areas, access to these areas might be a delay.

Alternatives 3, 4 and 5 include treatment of the leachate and contaminated ground water at a POTW. Early discussions with the City of Wyoming waste water treatment plant indicate that this waste can be accepted and treated by the plant. If for any reason, POTW treatment is prohibited the treatment of these liquids would be completed on-site prior to discharge to surface waters. The on-site treatment would meet the substantive requirements of ARAR permits including, but not limited to, requirements of Clean Air Act, RCRA, Clean Water Act (NPDES).

Alternative 5 poses substantial implementation problems. Siting and permitting of an off-site facility for the ash disposal would be necessary. Siting of an incinerator in residential communities can be very time consuming and difficult. The actual excavation of landfilled waste can be very complex and must be done very carefully to assure protection of workers and the community.

7. Cost

This criterion compares the capital, operation and maintenance, and present worth costs of implementing the alternatives at the site.

The costs for each alternative are as follows:

Alternative	Capital Cost	Annual O&M Cost	Present Worth
1	$0	$0	$0
2	$280,000	$70,000	$1,000,000
3	$2,300,000	$190,000	$5,200,000
4	$2,600,000	$210,000	$5,700,000
5	$10,000,000	$10,000,000	$160,000,000

Present Worth= Present Net Worth calculated for 30 years at 5%. Calculation of Present Net Worth is an estimate of the value of money used to pay future costs in "today's" dollars. The calculation is based on the assumption that an existing dollar will earn interest and therefore has a greater value that a future dollar.

8. State Acceptance

The State of Michigan has assisted in the development and review of the Administrative Record. However, U.S EPA has not received a written confirmation of State acceptance of the selected remedy.

9. Community Acceptance

Based on the comments received by the U.S. EPA, the selected alternative appears to be acceptable to the community. Community concerns are addressed in the attached Responsiveness Summary.

J. - Selected Remedy

Based upon considerations of the requirements of CERCLA and the NCP, balancing of the nine criteria, and public comment, the U.S. EPA has determined that Alternative 4 is the most appropriate remedy for the Kentwood Landfill site.

The components of the selected remedy are as follows:

1. Access Restrictions

a. Temporary and/or permanent fences and signs shall be erected and maintained around the landfills and pretreatment/treatment systems as specified by U.S. EPA. The U.S. EPA specifications will include, but not be limited to, the location, design specifications, warning language, and timing of installation of the fences and signs.

b. Institutional controls including, but not limited to, deed restrictions to regulate the development of the Kentwood Landfill property, and ground water use restrictions in the areas that have contaminated ground water shall 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 shall be sampled and analyzed periodically to monitor chemical contaminant levels during site remediation.

Ground-water monitoring shall include, but not be limited to, monitoring of the upper, middle and lower aquifers. Sampling and analysis shall include, but not be limited to, existing ground water monitoring wells and additional groundwater monitoring wells installed as specified by U.S. EPA, and residential wells.

The start and frequency of sampling and analysis, and chemical analyzed for (analytes) of ground-water monitoring wells, residential wells, and surface water and sediments shall be specified by the U.S. EPA.

Ground water and surface water monitoring shall be implemented for up to 30 years following the achievement of the ground water remediation standards.

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

3. Cap Improvements including Landfill Gas Controls and Leachate Collection.

The existing cap on the landfill shall be improved and/or replaced so that it complies with MI 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.

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 landfills is in direct hydraulic connection with upper aquifer ground water and produce significant amounts of leachate. For this Site, a less permeable cap such as a hazardous waste 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 shall be installed to prevent leachate breakouts at the cap. The gas venting system shall be monitored periodically to determine if the levels of emissions may cause potential health hazards. If potential health hazards are indicated, an emission treatment system shall be placed in the venting system to reduce emissions to acceptable levels.

4. Ground-Water Extraction Wells

Ground water extraction wells shall be installed to extract contaminated ground water for treatment. Ground water shall be extracted until the remediation standards of Table F are achieved in all parts of the ground water contaminant plume including, but not limited to, contaminant plumes documented during the remedial investigation and/or discovered during site monitoring above. Therefore, the point of compliance for the ground-water remediation standards is the edge of

landfilled waste. The placement of ground-water extraction wells may be within and/or outside the Kentwood Landfill property boundary. The ground-water extraction wells will also serve to lower the water table height in the upper aquifer below the level of the landfilled waste, thus minimizing the production of leachate reducing the amount of ground water that moves laterally through the waste.

The goal of this remedial action is to restore the ground water to its beneficial use and to protect against current and future exposures. Ground water is a valuable resource and should be protected and restored. Ground water not currently used may be a drinking water supply in the future. Ground water plays an important role as a water supply for environmental uses other than human consumption.

Based on 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 ground water remediation standards over some portion of the contaminant plume. In such a case, 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 Record of Decision will be issued.

It is projected that the ground-water extraction system may attain the remediation standards within 9 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 goal 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 the remediation standards continue to be met.

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

The selected alternative contemplates that the extracted leachate and contaminated ground water shall be treated by a POTW. Pretreatment standards shall 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 a POTW be restricted for any reason, the complete treatment of these liquids to the standards of a NPDES permit shall occur on-site. Such a treatment system will be required to meet the substantive permit 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 a 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 shall not violate the National Ambient Air Quality Standard for particulate matter smaller that 10 microns (PM-10). Potential runoff, silting and sedimentation problems from construction shall be mitigated to comply with MI Acts including, but not limited to, Public Acts 203 (1979), 346 (1972) and 347 (1972) for wetland protection, inland lakes and streams, and soil erosion and sedimentation control, respectively.

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, the remedy's progress toward achievement of remediation standards and the availability of new emerging technologies which could further reduce the toxicity, mobility or volume of hazardous constituents remaining at the landfill shall be reviewed every 5 years after the initiation of the remedial action.

K. 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. Be cost effective;
4. Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and
5. Satisfy a preference for treatment that reduces toxicity, mobility, or volume as a principal element of the remedy.

The implementation of the selected alternative at the Kentwood Landfill site satisfies these requirements of CERCLA section 121 as follows:

1. 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 from the unacceptable risks currently posed (e.g., 1.7×10^{-2}) by ground water contaminants to a maximum risk for individual carcinogenic chemicals of approximately 1×10^{-6}. As above, assuming that all carcinogens were only treated to the 1×10^{-6} level, the maximum cumulative risk would be approximately 1×10^{-5}, which is an acceptable level. The Hazard Index would be reduced to below 1.0, which is also an acceptable level.

Extracting ground water in the vicinity of the landfills will lower the water table of the upper aquifer to below the level of the landfilled waste to the maximum extent practicable, thus minimizing the production of leachate by ground water flowing laterally through the waste.

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 (Plaster Creek).

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. Improvement of 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.

2. Compliance With ARARs

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

a. 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.

i. Landfills

No Federal chemical-specific standards exist for the landfills.

Within the landfilled waste, the U.S. EPA has determined that Act 307, Type C criteria would be appropriate. The foreseeable use of the site is a landfill, and Type A or Type B criteria would not provide for the derivation of clean-up standards which could be met unless the source materials were removed. Therefore, Type C criteria would provide for a cost-effective and appropriate remedial action for the landfill areas.

ii. Ground Water

Federal ARARs

Maximum Contaminant Levels (MCLs) and, to a certain extent, Maximum Contaminant Level Goals (MCLGs), the Federal drinking-water standards promulgated under the Safe Drinking Water Act (SDWA), are applicable to municipal water supplies servicing 25 or more people. At the Kentwood landfill site, MCLs and MCLGs are not applicable but are relevant and appropriate, since the upper aquifer is a Class II source which could potentially be used for drinking in the areas of concern, and has the potential to contaminant the aquifers beneath it that are being used for drinking water. 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 wastes.

State ARARs

The substantive provisions of Parts 6 and 7 of Michigan Act 307 is applicable or relevant and appropriate to the Kentwood Landfill site. 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. The point of compliance for these standards is at the boundary of the landfilled waste.

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.

iii. Surface Water

Federal ARARs

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 retreatment 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 Wyoming waste water treatment plant (if pretreatment criteria are met) or to Plaster 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 Plaster Creek.

State ARARs

Portions of the Water Resources Commission Act 245 (Michigan Act 245) of 1929, as amended, 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 Plaster Creek, to the indirect discharge through ground water movement to a surface water body, or to a discharge to a POTW.

b. Location-specific ARARs

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

Federal ARARs

Executive Order 11988 - Protection of Flood Plains - are relevant and appropriate for this site. This order would require that the leachate and ground-water treatment system be located above 100-year flood plain elevation and be protected from erosional damage. The landfills are not currently in a 100-year floodplain. However, any portion of the remedy that is constructed within the 100-year flood plain must be adequately protected against a 100-year flood event (e.g., geotextiles should be used to secure topsoil, etc.)

Section 404 of the CWA regulates the discharge of dredged or fill material to waters of the United States. Activities during the remedy may be regulated under section 404 of the CWA; therefore, the substantive requirements of section 404 would be relevant and appropriate to the remedial action at the site.

Executive Order 11990 - Protection of Wetlands - is an applicable requirement to protect against the loss or degradation of wetlands. The site is not in a wetland. However, remedy activities may pose a threat to wetlands including siltation and sedimentation from construction. The scope of the impact has not yet been determined. Mitigative efforts will be applied to the clean-up if an impact is seen on wetlands.

State ARARs

The Goemaere-Anderson Wetland Protection Act 203 of 1979 (Act 203) regulates any activity which may take place within wetlands in the State of Michigan. Act 203 is relevant and appropriate to the remedial action at the Kentwood Landfill site; it may also require the replacement of adversely impacted wetlands with comparable resources.

The Inland Lakes and Streams Act 346 of 1972, as amended, regulates inland lakes and streams in the State. Act 346 would be applicable to any dredging or filling activity on Plaster Creek bottomlands.

The Soil Erosion and Sedimentation Control Act 347 of 1972 regulates earth changes, including cut and fill activities, which may contribute to soil erosion and sedimentation of surface waters of the State. Act 347 would apply to any such activity where more than 1 acre of land is affected or the regulated action occurs within 500 feet of a lake or stream. Act 347 would be applicable to the cap and ground-water extraction system construction activities since these actions could impact the Plaster Creek, which is less than 500 feet from the landfill area.

c. Action-specific ARARs

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

Federal ARARs

For landfill closure, RCRA Subtitle C requirements are not applicable since the hazardous substances of concern were disposed of prior to November 1980. RCRA Subtitle C requirements are not relevant and appropriate because the landfilled waste is not considered sufficiently similar to listed and/or characteristic RCRA Subtitle C waste.

RCRA Land Disposal Restrictions (LDR or Land Ban) would not be applicable since no "placement" of RCRA hazardous waste would be occurring at this site.

RCRA Subtitle C requirements, including LDR, would be relevant and appropriate if wastes were to be excavated and managed and these wastes were determined to be characteristic RCRA Subtitle C hazardous wastes.

The only foreseeable manner in which the selected remedy may store or dispose of hazardous waste is when or if the ground-water treatment system requires emission control units to capture or contain volatile organics derived from aeration of the leachate and contaminated ground water. The RCRA waste generation and temporary storage regulations under 40 CFR Part 262 would then be applicable to that action. For example, activated carbon canisters utilized as emission controls would be managed, when spent, as a characteristic waste if the waste canisters were to fail the Toxicity Characteristic Leaching Procedure (TCLP) test.

The treatment contemplated for the extracted leachate and contaminated ground water includes treatment of these liquids by a POTW. The POTW is regulated by regulations under the National Pollution Discharge Elimination System (NPDES). The actions of this remedy shall meet the substantive requirements of NPDES.

State ARARs

The State of Michigan administers RCRA within the State. Under Hazardous Waste Management Act 64 of 1979, as amended, the State regulates the generation, transport, treatment, storage, and disposal of hazardous waste. Act 64 also regulates the closure, and the postclosure care, of hazardous waste disposal facilities in the State. As with RCRA Subtitle C, above, Act 64 is not applicable or relevant and appropriate to closure of the landfill. Act 64 would be applicable to the treatment or storage of hazardous landfill contents and/or hazardous residuals from on-site treatment units.

The Michigan Solid Waste Management Act (Act 641) is applicable or relevant and appropriate for closure of the landfill. The landfill cover design required by regulation promulgated under this State statute provides adequate protection from direct contact with the landfilled waste and minimizes leachate produced by the site. Because wastes landfilled at the site are in direct contact with the upper aquifer ground water, the leachate and ground-water extraction system will provide a major role in reducing leachate produced. This leachate ground-water extraction system would be required regardless of the permeability of the cap.

Parts 4, 9, and 21 of the Water Resources Commission Act 245 of 1929, as amended, establish rules for water quality by prohibiting injurious discharges to surface water. These rules would be applicable to the discharge of treated ground water to Plaster Creek or to a POTW treatment system.

As described earlier in this document, the Michigan Environmental Response Act 307 of 1982, as amended (Act 307), provides for the identification, risk assessment, and evaluation of contaminated sites within the State. The U.S. EPA has determined that the substantive provisions of Parts 6 and 7 of Act 307 are applicable or relevant and appropriate to the Kentwood Landfill site. The Act 307 rules require that remedial actions shall be protective of human health, safety, the

environment, and the natural resources of the State. To achieve this standard of protectiveness, the Act 307 rules require that a remedial action achieves a degree of clean-up under either Type A (clean-up to background levels), Type B (clean-up to risk-based levels), or Type C (clean-up to risk-based levels under site-specific considerations) criteria. U.S. EPA has determined that the Type C criteria are appropriate for the containment portion of this remedy. Type B criteria are appropriate for the ground-water remediation portion of this remedy. The point of compliance for the Type B clean-up standards is at the boundary of the landfilled waste.

3. Cost-effectiveness

Cost-effectiveness compares the effectiveness of an alternative in proportion to its cost of providing its environmental benefits. The table under Section I. 7. lists the costs associated with the implementation of the remedies.

Alternative 1 and Alternative 2 are the least expensive alternatives. However, they do not provide adequate protection of human health and the environment, do not meet ARARs, and do not provide effectiveness over the long term.

Alternatives 3 and 4 have similar costs. The lower costs of Alternative 3 compared to 4 reflect the limitation of placing ground water extraction wells to within the Kentwood Landfill site property boundary. Alternative 3 might have fewer wells installed and less contaminated ground water to treat. Alternative 3 would be less effective in remediating ground water. These placement limitations mean that Alternative 3 would take over twice as long to achieve remediation standards when compared to Alternative 4; 19 years vs. 9 years.

The selected alternative (Alternative 4) is considered cost-effective. This alternative achieves remediation standards more quickly and is protective of human health and the environment. The shortening of time needed to achieve remediation standards easily out-weighs the additional costs associated with installation of extraction wells outside of the property boundary.

Alternative 5, the most expensive alternative evaluated in detail in the feasibility study, would permanently destroy source waste at the site, whereas Alternative 3 and Alternative 4 only contain the wastes. However, due to potential short-term risks associated with on-site incineration at this site, extreme cost, plus the fact that

Alternative 4 would remediate the ground water with a identical ground water extraction and treatment system, the U.S. EPA has determined that Alternative 4 is a cost-effective remedy.

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

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be 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 balance of tradeoffs 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 prohibiting further generation of leachate. These benefits are achieved at a reasonable cost. Contaminants from the ground water are extracted and permanently addressed through treatment.

The selected remedy can be implemented quickly and achieves ground water remediation goals the quickest.

5. Preference for Treatment as a Principal Element

The statutory preference for treatment as a principal element of a remedy is not satisfied by the selected alternative.

Due to the large volume of landfilled waste that would need to be treated, treatment of this low level threat waste is considered impracticable. Although the remedy selected employs treatment of contaminated ground water, overall, treatment is not employed by the remedy to an extent where it can be considered a principal element of the remedy. Instead, 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.

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 (U.S. EPA) to respond "...to each of the significant comments, criticisms, and new data submitted in written or oral presentations" on a proposed plan for remedial action. The Responsiveness Summary addresses concerns expressed by the public, potentially responsible parties (PRPs), and governmental bodies in the written and oral comments received by the U.S. EPA and the State regarding the proposed remedy for the Kentwood Landfill site.

A. Overview

The selected alternative for the Kentwood Landfill includes:

> Access Restrictions, Site Monitoring, Cap Improvements, Landfill Gas Control, Leachate Collection, "On-site" and "Off-site" Ground-water Extraction Wells, and Discharge of Leachate and Contaminated Ground Water to a POTW.

The selected alternative was identified as Alternative #4 in the Feasibility Study Report dated November 1990, and as the preferred alternative in the Proposed Plan dated February 1991. More detailed information on the selected alternative, as well as other alternatives considered to remediate this site, is available in these documents. The documents are available in the information repository and administrative record for the Site.

No changes have been made to the selected alternative (Alternative #4) compared to preferred alternative (Alternative #4) as proposed to the public in the Proposed Plan.

The majority of public comment on the proposed plan appears to support the selection of this alternative as the final remedy for the Site.

B. Background on Community Involvement

The RI Report, FS Report and the Proposed Plan for the Kentwood Landfill site were released to the public for comment on February 14, 1991. These documents were made available to the public in both the administrative record and an information repository maintained at the U.S. EPA offices in Region 5, Kentwood City Center and the Kent County Library. The notice of availability for these documents was published in The Kentwood Advance and

Grand Rapids Press Newspapers on February 13, 1991. A public comment period on the documents was held from February 20, 1991, to March 21, 1991. In addition, a public meeting was held on March 6, 1991. At this meeting, representatives from U.S. EPA and MDNR answered questions about problems at the site and the remedial alternatives under consideration. Comments received during this period are included in this Responsiveness Summary.

C. Summary of Comments Received and Agency Responses

The public comments regarding the Kentwood Landfill site are organized into two categories:

- Summary of comments from the community;

- Summary of comments from the City of Kentwood and Kent County;

Many of the comments below have been paraphrased in order to effectively summarize them in this document. The Administrative Record contains copies of written comments submitted during the public comment period and a written transcript of the public meeting held on March 6, 1991, which includes the oral comments received during the formal comment session of that meeting. No comments were received from the State of Michigan on the Proposed Plan during the public comment period.

Community Comments

Several commenters expressed support for the preferred alternative (Alternative 4) at the public meeting. The majority of comments received from the community appeared to support Alternative 4 and no objections were raised in opposition to Alternative 4. Several other commenters only iterated their concerns, rather than supporting any particular remedy.

Comments received from the community and responses are listed below:

1. Comment One commenter would like more information on the negotiation process and was concerned that the negotiations between the Potentially Responsible Parties (PRPs) and the U.S. EPA will slow down the implementation of, or alter the selected remedy for the Site.

   Response The law (CERCLA) provides a period of negotiation between the PRPs for a site and the U.S. EPA for the implementation of a remedy after the Record of Decision is signed by the U.S. EPA. This period of negotiation begins with a 60-day period for the PRPs to present a good faith offer for the conduct of the remedy, to the U.S. EPA. The

U.S. EPA reviews the offer, against established criteria, to judge if the offer is made in good faith. If an offer is judged to be a good faith offer the negotiation period is extended another 60 days. If the negotiations result in agreement, a legally enforceable written agreement called a Consent Decree is signed by the PRPs and the U.S. EPA. The Consent Decree requires the PRPs to conduct the remedy as selected and memorialized in the Record of Decision, according to a schedule, and under the guidance and oversight of the U.S. EPA.

The opportunity for a PRP to negotiate an agreement for the conduct of the design (Remedial Design (RD)) and implementation (Remedial Action (RA)) of a remedy is written into law. This provision in the law allows PRPs to take financial responsibility for a site and allows the U.S. EPA to conserve the "Superfund" monies.

The negotiation period lasts a total of 120 days. The U.S. EPA considers this time period as time well spent considering the limits of resources in the "Superfund" and that PRPs are given an opportunity to take responsibility for a site.

If no good faith offer is received or Consent Decree is signed for the remedy at a site, the U.S. EPA has a number of powerful legal options which it can use to compel PRPs to take responsibility for a site, or U.S. EPA can use the "Superfund".

2. Comment One commenter expressed concerns over the quality of the ground water that her family uses for drinking. The commenter's home is close to the Site. The commenter requests that her drinking water well be sampled and analyzed periodically.

Response The remedy selected for the Site includes periodic monitoring of residential wells as specified by the U.S. EPA. The number, location, frequency of sampling and analyses will be determined by the U.S. EPA to assure protection of human health.

The sampling and analysis of ground water near the Site indicates that the Site has not contaminated existing residential wells. Should contamination that endangers human health be discovered in residential wells, the U.S. EPA will use its authority to provide alternate sources of drinking water to affected residences.

3. Comment Several comments concerned the commenters' perceptions of "finger pointing" between different local, State and Federal agencies and citizens on responsibility for the Site.

Response It should be clear to persons that have followed the recent events and decisions on this Site that U.S. EPA has taken its responsibilities concerning this Site very seriously. The U.S. Congress delegated very powerful and broad authority to the U.S. EPA, through CERCLA, to clean-up sites such as the Kentwood Landfill site. This statutory authority includes holding Potentially Responsible Parties (PRPs) financially responsible for clean-ups at sites.

It is important to note that regardless of outcomes of negotiations with PRPs, settlements, etc., the U.S. EPA will initiate and complete a remedy at this site, using "Superfund" money if necessary.

4. Comment One commenter expressed concerns that a more detailed environmental assessment of the vicinity of the Site is necessary.

Response An environmental assessment of the Site vicinity was conducted. At this time, U.S EPA considers the quality and amount of data gathered sufficient to select a final remedy for the Site. The selected remedy includes monitoring of surface water and other conditions at the Site. The remedy selected employs active measures that not only protect human health but also the environment. If additional information concerning endangerment of the environment that is not addressed by the selected remedy is found, the U.S. EPA will examine the information and decide on a course of action.

5. Comment Several comments were received concerning installation, as soon as possible, of a fence around the Kentwood Landfill property to warn and protect persons of Site threats.

Response The selected remedy includes restricting access to the Site by various means including fencing and signs. Installation of fencing will be a priority at the site. One possibility may be the installation of temporary fencing and/or signs warning trespassers of dangers on the Site, until specifications for permanent fencing are determined.

6. Comment Several comments were received concerning the preservation of naturally occurring vegetation on the Site, the planting of indigenous plants other than grasses on the landfill caps, and volunteer work to save plants at the Site.

Response Improvements to the caps on top to the landfills will result in some destruction of the vegetation in place. This is unavoidable during the activity to ensure that the cap complies with regulations for the protection of human health. Grasses are planted on landfill covers to prevent erosion of the cover The types of grasses used for vegetative cover are similar to those used in highway construction. The grasses in these seed mixes are selected for drought resistance, root depth, and minimal maintenance. Shallow rooting vegetation is planted because vegetation that roots deep into the cover creates pathways for waste or wastes generated gases to migrate uncontrolled out of the landfill.

7. Comment One comment was received proposing the plantation of evergreens or hedges to screen noise and view of the Site.

Response The proposal to use vegetative barriers to noise and views will be evaluated during the Remedial Design phase of the project.

8. Comment One commenter had concerns that the proposed location of ground-water extraction well was within a habitat for an indigenous amphibian known as "the spring peeper", and that this location might disturb the creatures' habitat.

Response The locations of ground-water extractions wells will be decided upon during the Remedial Design phase of this project. Adverse impacts of any remedy components to biota will be minimized to the extent possible.

9. Comment A comment was received that concerned the future uses of land along the northern boundary of the Kentwood Landfill property. This property is currently owned by a land developer and the developer has plans to use the land for residential development.

Response The selected remedy includes use of institutional controls such as deed restrictions to protect human health and the environment. Institutional Controls are necessary to maintain integrity of the caps and prevent future use of contaminated ground water.

10. Comment One commenter suggested that ground-water extraction wells be located as close to the site as possible to obtain maximum results and asked whether the extraction wells make noise.

Response The location of ground-water extraction wells will be determined during the Remedial Design phase of the project. The wells will be placed where they are most efficient in collecting contaminated ground-water for treatment. Ground-water extraction wells of the type used for these purposes generally do not make intrusive noise.

11. Comment A comment was received requesting that future investors/buyers of contaminated property be warned of the presence of contamination through deed restrictions and development alerts.

Response The selected remedy includes the employment of deed restrictions.

12. Comment A commenter noted that a ditch along the north boundary contains leachate and leaks at the northwest corner of the property. The commenter suggested that this situation needs to be addressed soon.

Response The remedial investigation conducted to determine conditions at the site found that some leachate is escaping the landfill to the north. The remedy selected will collect and treat leachate and will prevent further releases. The remedy also includes continued monitoring of site conditions. The U.S. EPA considers monitoring of the site conditions as a priority and intends to employ the monitoring as soon as possible. If conditions on the release of leachate change and warrant early action to protect human health and the environment U.S. EPA will use its authority to conduct necessary action.

13. Comment A comment was received asking how we will know that the job is finished.

Response The selected remedy is estimated to clean-up contaminated ground water to protective levels in 9 years. The progress of the ground-water remediation will be monitored closely during the years required to reach protective levels. Other conditions at the site will also be monitored. The ground-water clean-up program will continue until the remediation standards have been met, longer than the estimated 9 years if necessary. Because hazardous substances will be left on-site, within the improved landfills, U.S. EPA is required by law to review conditions at the landfill at least every five years after remediation goals are met. The ground water will be monitored for at least 30 years after the remediation goals for the ground-water clean-up are met. U.S. EPA will continue to monitor the effectiveness of the remedy for a long time.

14. Comment A comment was received requesting that one person be identified who is responsible for the addressing public concerns for the site.

Response The U.S. EPA contact for this site is:

Mr. Phillip Schutte
Community Relations Coordinator
Office of Public Affairs
(5PA-14)
U.S. EPA, Region 5
230 S. Dearborn St.
Chicago, Illinois 60604
(800) 621-8431
(312) 353-866-8515.

15. Comment One comment received requested the locations of methane releases that are outside of the boundary of the Kentwood Landfill property.

Response During the remedial investigation no releases of methane gas have been found in areas outside of the Kentwood Landfill property.

16. Comment One commenter had a number of suggestions concerning community involvement on issues concerning the Kentwood Landfill site including volunteer activities on the site, fund-raising, education of the community, etc.

Response The U.S. EPA encourages community involvement concerning the Kentwood Landfill site. Representatives of the U.S. EPA are available to participate in community meetings should significant interest in such participation be expressed by the community. The U.S. EPA has a number of resources that can be accessed by the community for community education.

17. Comment Several comments concerning the effects of the selected remedy on the environment were received. These concerns included the amount of noise created by equipment including ground-water extraction wells, disruption of wildlife, disruption of vegetation at the Site, and effects on wetlands in the vicinity of the Site.

Response The purpose of conducting a remedy for the site is to protect human health and the environment. During the conduct of the remedy, laws protecting human health and the environment must be adhered to by parties doing the work. This includes State and Federal regulations concerning noise pollution, siltation of surface water, protection of wetlands and others.

Comments from Kent County and the City of Kentwood

Kent County and the City of Kentwood provided comments on the Proposed Plan through oral and written comments written by elected officials, appointed officials, and consultants. Significant comments from this group generally concerned the appropriateness of the preferred alternative compared to the risks posed by the site.

18. Comment A commenter stated that in his opinion (a) conditions present on and around the site are in no way as hazardous to persons in the vicinity of the landfill as the U.S. EPA maintains, (b) circumstances by which significant human exposures to site contaminants are very improbable, and (c) the U.S. EPA's representation that "actual or threatened releases of hazardous substances from this site, if not addressed by the preferred alternative or one of the other active measures considered, may present an imminent and substantial endangerment to public health, welfare, or the environment" was greatly over-stating the risks posed by the site.

Another commenter raised similar comments on the justification of conducting a remedial action at this site.

Response The U.S. EPA disagrees with the commenter's opinion. The U.S. EPA has characterized risks posed by the site accurately in public documents, including the Proposed Plan.

The U.S. EPA assesses the risks posed by a site by conducting a baseline risk assessment. The baseline risk assessment 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. 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 baseline risk assessment includes an evaluation of lifetime excess cancer risks posed by a site. Lifetime excess cancer risks are cancer risks posed by the site which are in addition to those normally posed to a population. Where the baseline risk assessment indicates that a cumulative site risk to an individual using reasonable maximum exposure assumptions for either current or future land use exceeds the 1×10^{-4} (1 in 10000) lifetime excess cancer risk end of the risk range, a site is determined to pose an unacceptable risk to human health and action under CERCLA is warranted.

The U.S. EPA's determination that a CERCLA clean-up at this site is warranted is based in part, but not limited to, the following. The landfills at the site have contaminated ground water within and outside of the boundary of the landfill property. The U.S. EPA determined that since the Site is in a residential area and since a land developer owns land that contains contaminated ground water immediately to the north, it is reasonable to assume that the land that exists over the contaminated ground water at this site could be developed for residential use. This residential land use scenario includes the conservative, yet reasonable assumption that ground water would be used for drinking and bathing. The baseline risk assessment estimated that the excess lifetime cancer risk posed by residential consumption of the contaminated ground water alone was 1.7×10^{-2} (17 in 1000). 1.7×10^{-2} is a greater risk than 1×10^{-4}, that means that the site poses an unacceptable risk and warrants remediation under CERCLA.

Based on the Baseline Risk Assessment, the U.S. EPA has determined that the Site may pose imminent and substantial endangerment of human health of the environment if the Site is not addressed by the selected remedy.

19. Comment A commenter noted that leachate releases to the land surface and ground water as well as the concentration of hazardous substances had been reduced in the past years, endangerment of the public had therefore already peaked and the magnitude of a response should therefore be less than that proposed in the preferred alternative.

Response U. S. EPA disagrees, as discussed in the comment above, a baseline risk assessment of current and future risks posed by the Site indicates that endangerment of human health or the environment will continue if action at the Site is not taken. Based on data collected concerning the Site and evaluation of that data against U.S. EPA's criteria, U.S. EPA has identified the preferred alternative as an appropriate remedy for the Site.

20. Comment A commenter stated that construction of fencing around the Site itself is probably the most appropriate action proposed for the site. The commenter further stated that regulations which prevent installation of drinking water wells into areas of known ground water contamination would prevent human exposure.

Response Restricting access to Site contaminants by erecting fences, posting signs and promulgating regulations preventing drinking water well installation as well as deed restrictions are all components of the selected remedy for the Site. These components are classified as institutional controls. The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) is the body of regulations that govern responses under CERCLA. The NCP states that U.S. EPA expects to use institutional controls to supplement engineering controls as appropriate for short- and long-term management to prevent or limit exposure to hazardous substances at sites. The NCP clearly states that the use of institutional controls shall not substitute for active response measure as the sole remedy unless such active measures are determined not to be practicable (Title 40 of the Code of Federal Regulation (40 CFR) Section 300.430 (a)(1)(iii)(D)).

Based on data and studies of the Site, U.S. EPA has determined that active measures are practicable for the Site. These active measures include extracting and treating contaminated ground water.

The U.S. EPA does not normally substitute institutional controls for active measures, when active measures are practicable, because institutional controls can not be considered permanent and do nothing to prevent non-human species exposure to contaminants.

21. Comment One commenter stated that Alternative 3 was identical to preferred alternative (Alternative #4) with the exception that Alternative #3 limited the installation of ground-water extraction wells to within the boundary of the Kentwood Landfill Property. The commenter also stated that the feasibility study indicated that Alternative #3 would also clean-up the contaminated ground water in the vicinity of the site.

Response The U.S. EPA believes that this comment relates to how a selection was made between Alternative #3 and Alternative #4.

As described in more detail in the Record of Decision, U.S. EPA found the selected alternative, Alternative #4, provided the best balance of trade-offs as evaluated against the nine criteria U.S. EPA uses to make remedy selections. The basis for U.S. EPA's selection of Alternative #4 includes, but is not limited to, information presented in the feasibility study report. As written in the Feasibility Study Report, Alternative #4 is estimated to reach remediation standards for ground water in 9 years; Alternative #3 is estimated to reach the standards in 19 years. Clearly, Alternative 4 is estimated to achieve the protective ground-water remediation standards in less than half the time estimated for Alternative #3.

Remedy alternatives which provide more rapid attainment of protective remediation goals are preferred.

The selected remedy, Alternative #4, provides U.S. EPA the flexibility of installation of ground-water extraction wells in areas where the wells will be most effective.

22. Comment One commenter had concerns that the Alternative #4 would not remediate ground water faster than Alternative #3.

Response The feasibility study report estimated that Alternative #4 would attain remediation standards for ground water in 9 years; and that Alternative #3 would attain the standards in 19 years. Clearly, Alternative 4 is estimated to achieve the protective ground-water remediation standards in less than half the time estimated for

Alternative #3.

In order to protect human health and the environment, the U.S. EPA has selected a remedy, Alternative #4, that allows for installation of ground-water extraction wells in locations that will attain ground-water remediation standards as quickly as possible.

23. Comment One commenter pointed out that the feasibility study report recommended that ground-water extraction wells installed outside of the Kentwood Landfill property would be installed after wells installed within the property boundary were evaluated. Further, that the feasibility study report recommended proper evaluation of the effectiveness of the wells on the property prior to installation of wells off of the property.

Response The exact location, depth, design, pumping rate, timing of installation, etc. of the ground-water extraction wells and all other value engineering decisions will be made during the Remedial Design stage of this project. Recommendations, estimates, etc. made during the feasibility study phase of a project are to provide sufficient preliminary information for the U.S. EPA to select a type of remedy for a site. The selection of a remedy is memorialized in the Record of Decision. The Remedial Design is used to plan in detail how the selected remedy will be implemented in accordance with the Record of Decision.

24. Comment One commenter indicated that installation of wells outside of the Kentwood Landfill property without evaluation of wells installed within the property boundary may draw higher levels of ground-water contaminants into less contaminated areas thus requiring longer to meet the remediation standards.

Response During the Remedial Design phase of the project the placement of wells will be designed to minimize this possibility. During the Remedial Action phase the actual performance of the extraction of ground water will be monitored and adjustments will be made should undesirable effects be discovered.

25. Comment One comment received indicated that both Alternative #3 and #4 attain the protective ground water remediation standards for ground water.

Response The feasibility study report indicates that both Alternatives #3 and #4 attain remediation standards. The Record of Decision also indicates that the threshold criteria of Overall Protection of Human Health and the Environment is satisfied by both Alternative #3 and #4.

Overall Protection of Human Health and the Environment is only one of nine criteria that the U.S. EPA uses to make a selection of a remedy. As detailed in the Record of Decision, U.S. EPA selected a remedy that provides the best balance of "trade-offs" between all nine criteria.

26. Comment One commenter requested clarification on whether the proposed caps over the landfills are to comply with proposed or existing Michigan Act 641 requirements.

Response The caps on the landfills shall comply with MI. Act 641 as promulgated (signed into law) by the signature date of the Declaration for the Record of Decision.

27. Comment One commenter requested clarification on whether pretreatment of extracted leachate and contaminated ground water to be accepted by the POTW is necessary.

Response The remedy selected requires compliance with all applicable or relevant and appropriate requirements. This includes any pretreatment requirements of an accepting POTW. The Record of Decision also indicates that if, for any reason, treatment of these liquids can not be technically or legally done by a POTW, including but not limited to, non-attainment of POTW pretreatment requirements, these liquids shall be completely treated on-site.