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Agency

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Emergency and
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September 1989

EPA

Superfund Record of Decision:

E.H. Schilling Landfill, OH

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R05-89/099	2.	3. Recipient's Accession No.

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SUPERFUND RECORD OF DECISION E.H. Schilling Landfill, OH First Remedial Action - Final	5. Report Date 9/29/89
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7. Author(s)	8. Performing Organization Rept. No.
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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 E.H. Schilling Landfill site is in Hamilton Township, Lawrence County, Ohio. The site is a 2.7-acre landfill on a larger tract of land. The predominantly rural area neighboring the site includes approximately 50 residences, which are between 0.25 mile and 1.5 miles from the site. The landfill was created by constructing a dam across a small valley. Both the landfill cover and dam have been described as inadequate, and leachate containing hazardous substances is being released through and beneath the dam. From 1969 to 1980 the landfill operators accepted both nonhazardous and hazardous wastes including styrene, phenol, acetone, alcohol, wastewater treatment sludge, coal tar compounds, and cumene. Results from a 1988 investigation reveal that soil and sediment contamination is limited to the area immediately adjacent to the dam, and ground water contamination is limited to the monitoring wells immediately surrounding the landfill and the monitoring wells downgradient of the dam. Contamination appears to be due to leachate runoff. The primary contaminants of concern affecting the soil, sediment, and ground water are VOCs including benzene; other organics including PAHs, pesticides, and phenol; and metals including arsenic. (See Attached Sheet)

17. Document Analysis a. Descriptors

Record of Decision - E.H. Schilling Landfill, OH
First Remedial Action - Final
Contaminated Media: soil, sediment, gw
Key Contaminants: VOCs (benzene), other organics (PAHs, pesticides, phenol), metals (arsenic)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 110
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

16. Abstract (continued)

The selected remedial action for this site includes excavation of 500 cubic yards of sediment and 750 cubic yards of surface soil for consolidation in the landfill; construction of a 2.7-acre RCRA cap to contain 100,000 cubic yards of landfill waste; construction of a clay berm to improve dam stability; construction of a perimeter cut-off wall to eliminate the lateral flow of ground water into the landfill waste; construction of an interceptor drain outside the cut-off wall to drain ground water away from the landfill; dewatering the landfill of 7,000,000 gallons of leachate and treating the leachate using metal precipitation, air stripping, and carbon adsorption to remove organics and sulfide precipitation to remove inorganics, followed by discharge to surface water; treatment and discharge of an additional 1,000,000 gallons of wastewater generated during the remedial action; ground water monitoring; and implementation of access and institutional controls. The estimated total present worth cost for this remedial action is $9,412,000, which includes an estimated annual O&M cost of $99,000 for 30 years.

Declaration for the Record of Decision

Site Name and Location

E.H. Schilling Landfill
Hamilton Township, Lawrence County, Ohio

Statement of Basis and Purpose

This decision document presents the selected remedial action for the E.H. Schilling site, in Hamilton Township, Lawrence County, Ohio, 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 Ohio Environmental Protection Agency concurs with the selected remedy. The information supporting this remedial action decision is contained in the administrative record for this site.

Assessment of the Site

The site consists of a landfill created by construction of an inadequate dam across a small valley. The landfill contains hazardous substances beneath an inadequate cover, and leachate containing hazardous substances is being released through and beneath the dam. 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 response action at the E.H. Schilling Landfill addresses the entire site.

A containment with treatment option has been chosen and will require long term management. The major components of the selected remedy include the following:

- Dewatering the landfill of approximately 7,000,000 gallons of leachate. The collected liquids will be treated with air stripping and carbon adsorption to remove organics, and sulfide precipitation to remove inorganics, and then discharged to surface water. An additional 1,000,000 gallons of wastewater generated during the project will also be treated and discharged. The effluent will meet the effluent requirements of the National Pollution Discharge Elimination System (NPDES).

- Construction of a 2.7 acre cap that complies with Subtitle C of RCRA over the approximately 100,000 cubic yards of waste. The cap will extend over the dam face.
- Construction of a perimeter cut-off wall, consisting of 15 feet of slurry wall and 40 feet of grout curtain, to prevent lateral flow of groundwater into the waste.
- Construction of a clay berm to obtain the required factor of safety of greater than 1.5 for long term stability of the earthen dam.
- Long term maintenance, security and restrictions on future use.
- Quarterly monitoring of all monitoring wells. If groundwater exceeds action based levels, it will be collected and treated in the leachate treatment plant on-site via carbon adsorption, air stripping and metal precipitation.

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. A waiver pursuant to CERCLA Section 121(d)(4)(c) of Section 3745-27-10(c)(3) of the Ohio Administrative Code, regarding land surface slope requirements, is being implemented because of technical impracticability. This remedy utilizes permanent solutions and treatment technologies, to the maximum extent practicable, for this site. The principal threats posed by the site to human health and the environment are landfill liquid waste and leachate, which are being treated on-site. However, the source will remain and is not being treated. Since contaminant migration is limited to the area below the earthen dam, containment with leachate treatment will prevent the surrounding soil, surface water, groundwater, and air from becoming contaminated.

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

Valdas V. Adamkus
Regional Administrator

Sept. 29th, 1989
Date

Decision Summary for the Record of Decision

1. **Site Name, Location, and Description**

The E.H. Schilling Landfill is located approximately four miles southwest of the city of Ironton in Hamilton Township, Lawrence County, Ohio. See Figure 1.

The landfill occupies approximately three acres of land on a larger tract owned by Mr. Earl H. Schilling. The landfill is situated in a valley draw incised into the west slope of a ridge separating Winkler Hollow (west of the site) and Schilling Hollow (east of the site), 0.8 miles north of the Ohio River and approximately 0.5 miles north of U.S. Route 52. The Wayne National Forest extends north-south about 400 feet east of the site. An earthen dam contains the waste in the valley draw. Figure 2 depicts the landfill in relation to other features within the study area.

The area surrounding the Schilling site is rural, with the nearest population to the site being approximately 50 homes on Rock Hollow Road. The houses are between .25 miles and 1.5 miles from the site and orientated in a northwest to southwest direction from the site. Approximately 23,000 persons live within a four mile radius (50 square miles) from the site.

2. Site History and Enforcement Activities

The E.H. Schilling Landfill, began operation in 1969 and was used mainly by USS Chemicals (now Aristech Chemical Corporation) Haverhill plant and Dow Chemical Company's Hanging Rock plant. The landfill was permitted in 1971 for disposal of dry, non-hazardous industrial waste. After a series of permit violations, the site ceased operation in July, 1980. The waste deposited includes the following hazardous substances:

1. Styrene monomer
2. Phenol
3. Acetone
4. Alcohol
5. Wastewater treatment sludge
6. Coal tar compounds
7. Cumene

The waste also includes polystyrene and other foam materials. In 1982, the E.H. Schilling Landfill was proposed for inclusion for the National Priorities List (NPL). The site's NPL status was finalized in September, 1983.

On March 31, 1987, Aristech Chemical and E.H. Schilling & Son, Inc., with the U.S. EPA and OEPA, signed an Administrative Order by Consent to perform the Remedial Investigation and Feasibility

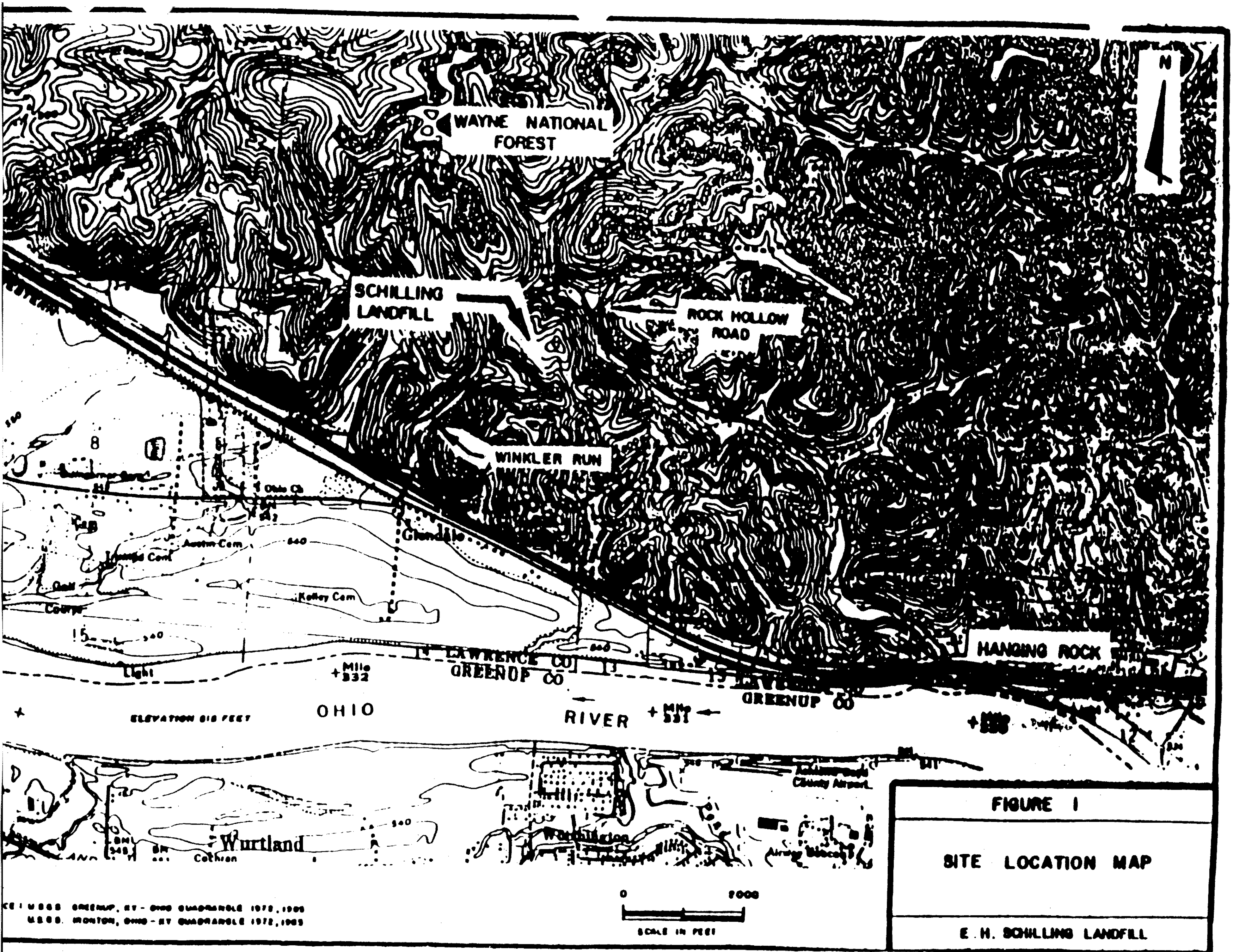

FIGURE 1

SITE LOCATION MAP

E. H. SCHILLING LANDFILL

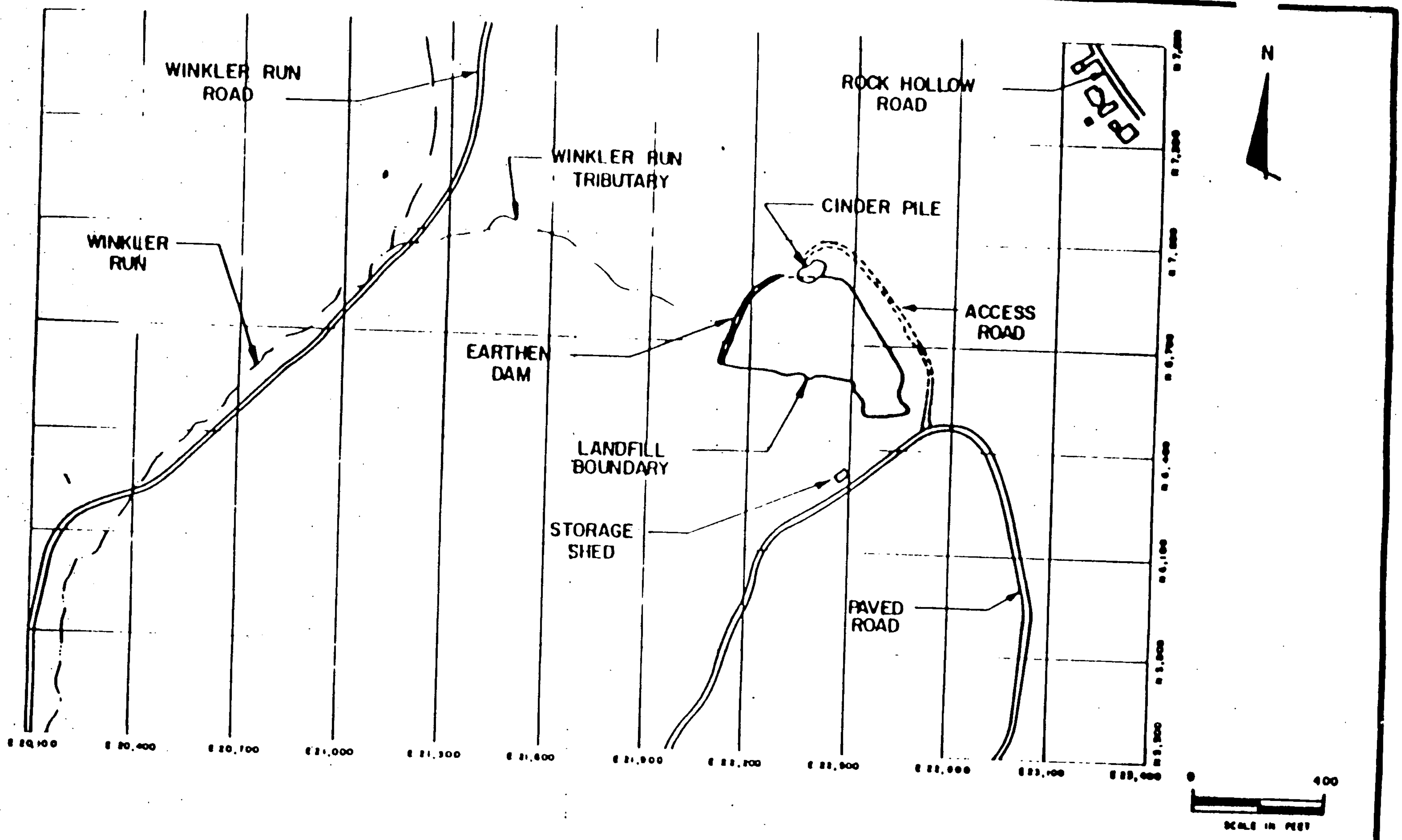

FIGURE 2

STUDY AREA FEATURES

E H SCHILLING LANDFILL

Studies (RI/FS) under CERCLA Section 122. The remaining potentially responsible parties (PRPs), Dow Chemical Company, Ashland Oil Co., Matlack, Inc., and Gulf Chemical and Metallurgical, refused to participate. General Notice letters to the six PRPs for Remedial Design/Remedial Action (RD/RA) have been sent. A Special Notice letter will be sent once the ROD is signed.

3. Highlights of Community Participation

The RI/FS Reports and the Proposed Plan for the E.H. Schilling site were released to the public for comment on August 25, 1989. These three documents were made available to the public in the administrative record and information repository at the Briggs Lawrence County Library. The notice of availability of these documents was published in an Ironton, Ohio newspaper. A public comment period on the documents was held from August 25, 1989 to September 23, 1989. On September 7, 1989, a public meeting was held in Ironton. At this meeting, representatives from EPA and OEPA 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.

4. Scope and Role of Response Action Within Site Strategy

The Remedial Action will address the entire E.H. Schilling site and the contamination present.

5. Summary of Site Characteristics

The Remedial Investigation field work began in February, 1988 and consisted of two phases. Phase one included the following investigations:

1. Radiological Investigation
2. Geophysical Investigation
3. Earthen Dam Investigation
4. Cap Integrity Study
5. Benthic-Macro Invertebrate Study
6. Sampling of monitoring wells (2 rounds), soil samples surrounding the landfill, leachate (2 rounds), surface water (2 rounds), sediments, landfill waste including earthen dam borings and air monitoring
7. Geology and Hydrogeology Study

Phase two included additional soil sampling extending out from the landfill. Selected monitoring wells were resampled as well. Phase two was completed in March, 1989.

The major results of the RI are as follows:

1. **Radioactive emissions were not detected.**

2. **Geophysical studies revealed four areas of buried metallic objects, which in high probability are drums.**

3. The earthen dam is structurally stable, but does not meet the required factor of safety for earthen dams of this type. A factor of safety of 1.5 or greater should be achieved.

4. The present landfill cap does not meet the RCRA Subtitle C performance standards and OEPA regulations.

5. The data results show that the Benthic organisms are stressed at stations nearest to the dam and on-site.

6. a) Thirteen landfill waste and boring samples were taken from eleven sampling points. Thirteen volatile organic, thirteen semi-volatile organic, twenty metal, and four pesticide compounds, plus cyanide, were detected. Tentatively identified compounds were also found. See Table 1.

   b) Leachate samples were obtained from seven locations. Fifteen volatile organic, four semi-volatile organic, one pesticide, and twenty metal compounds, plus cyanide, were detected. Tentatively identified compounds were also discovered. See Table 2.

   c) Air monitoring detected no organic constituents, but twenty metals were identified.

   d) Groundwater sampling detected four volatile organic and one semi-volatile organic compounds, and fifteen dissolved metals. Dissolved metal concentrations are lower than total metal. See Table 3.

   e) Surface water and sediment samples were taken from six locations, and identified two volatile and seven semi-volatile organic compounds and fourteen metal compounds. See Tables 4 and 5.

f) **Surface soil samples were obtained from thirty-five locations surrounding the landfill. Three volatile and thirteen semi-volatile organic compounds and seventeen metal compounds plus cyanide were detected. See Table 6.**

Extent of Contamination

The extent of contamination at the site is limited to the landfill and the area immediately surrounding it. Landfill waste samples compared to other site samples indicate that the contamination has not migrated far beyond the interpreted limits of the landfill as the relative concentrations of chemicals detected in these samples are generally an order of magnitude greater than the chemicals identified in the other media types and sample locations.

Groundwater data also shows that contamination at the site is limited to monitoring wells immediately surrounding the landfill and monitoring wells downhill of the dam. Surface water is presently unaffected by landfill activities. Stream sediment and surface soil contamination is limited to the area immediately adjacent the earthen dam. Leachate from the landfill appears to be the cause.

6. Summary of Site Risks

A. Contaminant Identification

To evaluate potential risks to human health and the environment for existing site conditions, a risk assessment was conducted using site analytical data and site characteristics.

The media affected by the E.H. Schilling site's contamination include groundwater, surface water, sediments, leachate, landfill waste, soils and air. Since a diverse number (74) of chemicals were detected at the E.H. Schilling site, a subset of indicator chemicals which represent the highest risk potential to human health and the environment was used. The following is a list and the reasoning behind selecting each of the indicator chemicals:

1,2 Dichloroethane was selected as a indicator chemical because:

Based upon analysis of landfill waste and landfill boring samples, 1,2 Dichloroethane is a constituent of the chemical waste in the landfill.

Toxicity - 1,2 Dichloroethane is carcinogenic.

Table 1 **Constituents Identified in Landfill Waste Samples at Concentrations Greater than or Equal to Contract Required Quantitation Limit (CRQL)**

CONSTITUENT	SAMPLING LOCATION	CRQL* (mg/kg)
Volatile Organics		
1,2-Dichloroethane	BO1-02	0.005
2-Butanone	LW-02; BO1-02	0.010
4-Methyl-2-pentanone	LW-02; BO1-02	0.010
Acetone	LW-02, 05, 06, 09; BO1-02	0.010
Benzene	BO1-02	0.005
Chlorobenzene	BO1-02	0.005
Chloroethane	BO1-02	0.010
Dichloromethane	LW-02, 05, 09; BO1-02	0.005
Ethylbenzene	LW-02, 03, 06, 07, 08, 09; All BC Locations	0.005
Styrene	LW-06, 07, 09; BO1-02, BO5-02	0.005
Tetrachloroethene	LW-02	0.005
Toluene	BO1-02	0.005
Xylenes (NOS)	LW-02; BO1-02	0.005
Semi-volatile Organics		
Anthracene	LW-01	0.33
Benzo(a)anthracene	LW-01; All BO Locations	0.33
Benzo(a)pyrene	LW-01; All BO Locations	0.33
Benzo(b,k)fluoranthene	LW-01; All BC Locations	0.33
Benzo(g,h,i)perylene	LW-01; BO1-01, BO1-02, BO5-01	0.33
Chrysene	LW-01; All BO Locations	0.33
Dibenzo(a,h)anthracene	BO5-01	0.33
Fluoranthene	LW-01; BO1-02, BO5-01, BO5-02	0.33
Indeno(1,2,3-cd)pyrene	LW-01; BO5-01	0.33
Phenanthrene	LW-01; All BO Locations	0.33
Phenol	LW-01, 02, 03, 08; BO1-01	0.33
Pyrene	LW-01; All BO Locations	0.33
bis(2-Ethylhexyl)phthalate	LW-01; BO5-02	0.33

*Quantitation limits listed for soil/sediment are based on wet weight. The Quantitation Limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Table 1 (CONTINUED) Constituents Identified in Leachate Sample at Concentrations Greater than or Equal to Contract Required Quantitation Limit (CRQL)

CONSTITUENT	SAMPLING LOCATION	CRQL (ug/l)
Inorganics (continued)		
Chromium	LS-02, 03, 04, 07	10
Cobalt	LS-04 05, 06	50
Copper	LS-01, 02, 03, 04, 05, 06	25
Iron	All LS Locations	100
Lead	All LS Locations	5
Magnesium	All LS Locations	5000
Manganese	All LS Locations	15
Mercury	LS-04	0.2
Nickel	LS-01, 03, 04	40
Potassium	All LS Locations	5000
Silver	LS-06	10
Sodium	All LS Locations	5000
Vanadium	LS-02, 03, 04	50
Zinc	All LS Locations	20
Cyanide	LS-06, 07	10

Table 1 (CONTINUED) Constituents Identified in Landfill Waste Samples at Concentrations Greater than or Equal to Contract Required Quantitation Limit (CRQL)

CONSTITUENT	SAMPLING LOCATION	CRQL* (mg/kg)
Pesticides		
Aldrin	LW-07	0.008
Heptachlor	LW-09	0.005
4,4-DDD	LW-02, 03, 07, 08, 09	0.016
4,4-DDE	LW-02, 03, 07, 08, 09	0.016
Inorganics**		
Aluminum	All LW and BO Locations	3.2
Antimony	LW-06	5.4
Arsenic	All LW and BO Locations	0.6
Barium	All LW Locations; BC1-01	0.4
Beryllium	LW-01, 02, 03, 04, 06, 07, 08, 09; BC1-01	0.2
Calcium	LW-01, 02, 03, 06, 07, 08, 09; BC1-01, BO1-02, BC5-02	2.0
Chromium	All LW and BC Locations	0.6
Cobalt	All LW Locations; BC1-01, BC5-01, BC5-02	1.2
Copper	All LW and BC Locations	0.6
Iron	All LW and BC Locations	0.8
Lead	All LW and BC Locations	0.2
Magnesium	LW-03, 06, 07; BC5-02	0.2
Manganese	All LW and BC Locations	0.4
Mercury	LW-02, 07	0.1
Nickel	LW-01, 02, 03, 06, 07, 08, 09; BC1-01, BC5-01	2.2
Selenium	LW-07	0.6
Silver	LW-06	0.8
Sodium	LW-06, 07	6.8
Vanadium	LW-02, 03, 04, 06, 07, 09	0.6
Zinc	All LW and BC Locations	0.4
Cyanide	BC1-02, BC5-01	0.5

*Quantitation limits listed for soil/sediment are based on wet weight. The Quantitation Limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

**Detection limits for an extract of 1 gram of solid in 200 mL of extractant based upon current Instrument Detection Levels (IDL's).

Table 2 **Constituents Identified in Leachate Samples at Concentrations Greater than or Equal to Contract Required Quantitation Limit (CRQL)**

CONSTITUENT	SAMPLING LOCATION	CRQL (ug/l)
Volatile Organics		
1,1-Dichloroethane	LS-01, 04, 06	5
1,2-Dichloroethane	LS-01, 02, 03, 04, 06, 07	5
1,2-Dichloroethenes (total)	LS-04	5
2-Butanone	LS-01, 04	10
4-Methyl-2-pentanone	LS-03, 04, 05	10
Acetone	All LS Locations	10
Benzene	LS-01	5
Carbon disulfide	LS-01	5
Chloroethane	LS-02, 03, 07	10
Methylene Chloride	LS-01, 04, 07	5
Ethylbenzene	LS-01, 02, 03, 05, 06, 07	5
Tetrachloroethene	LS-04, 05, 06	5
Toluene	LS-02, 03, 07	5
Trichloromethane	LS-01	10
Xylenes (NOS)	LS-05	5
Semivolatile Organics		
2-Methylphenol	LS-03	10
4-Methylphenol	LS-02, 03, 07	10
Benzoic Acid	LS-02, 03, 07	50
Phenol	LS-01, 02, 03, 04, 05, 06, 07	10
Pesticides		
Heptachlor	LS-03	0.05
Inorganics		
Aluminum	All LS Locations	200
Antimony	LS-04	60
Arsenic	LS-02, 03, 04, 07	10
Barium	LS-01, 02, 03, 04, 06, 07	200
Beryllium	LS-03, 04, 05, 06	5
Calcium	All LS Locations	5000

Table 3 Maximum Concentrations of Constituents Reported in Monitoring Wells at Concentrations Greater than or Equal to Contract Required Quantitation Limit (CRQL)

CONSTITUENT	CONCENTRATION (ug/l)	SAMPLING LOCATION	CRQL (ug/l)
Volatile Organics			
Acetone	12	MW-03B	10
Benzene	5	MW-02B	5
Carbon Disulfide	13	MW-07B	5
Chloroethane	17	MW-06A	10
Semi-volatile Organics			
1,4-Dichlorobenzene	10	MW-06A	10
Dissolved Metals			
Aluminum	9480	MW-07A	200
Arsenic	5.2	MW-01A	10
Barium	428	MW-07A	200
Beryllium	3.8	MW-07A	5
Calcium	58,300	MW-01B	5000
Cobalt	81.5	MW-07A	50
Copper	5.3	MW-01B	25
Iron	13,100	MW-03A	100
Magnesium	24,700	MW-07A	5000
Manganese	2,610	MW-07A	15
Nickel	108	MW-07A	40
Potassium	8,380	MW-01B	5000
Sodium	16,400	MW-01B	5000
Vanadium	5.5	MW-03A	50
Zinc	378	MW-07A	20

Table 3 **Concentrations of Total and Dissolved Metal Results for Selected Ground Water (MW) Sampling Locations**

Location	Parameter	Total (ug/l)	Dissolved (ug/l)
MW-01B	Aluminum	207	ND
MW-03A	Aluminum	26000	ND
MW-03A	Aluminum	27500	ND
MW-07A	Aluminum	46300	9480
MW-07A	Arsenic	3.1	3
MW-01B	Barium	377	379
MW-03A	Barium	136	23.1
MW-03A	Barium	122	23.1
MW-07A	Barium	428	10.3
MW-03A	Beryllium	5.7	ND
MW-03A	Beryllium	4.8	ND
MW-07A	Beryllium	7.2	3.8
MW-01B	Calcium	60500	58300
MW-03A	Calcium	10500	6200
MW-03A	Calcium	10300	6110
MW-07A	Calcium	26400	26800
MW-01B	Chromium	130	ND
MW-03A	Chromium	67	ND
MW-03A	Chromium	58.8	ND
MW-07A	Chromium	131	ND
MW-01B	Cobalt	8.5	ND
MW-03A	Cobalt	31.3	10.2
MW-03A	Cobalt	29.5	ND
MW-07A	Cobalt	103	81.5
MW-01B	Copper	10.3	5.3
MW-03A	Copper	51.5	3.3
MW-03A	Copper	50.7	ND
MW-07A	Copper	68	ND
MW-01B	Iron	3210	576
MW-03A	Iron	131000	13100
MW-03A	Iron	121000	11400
MW-07A	Iron	232000	8030
MW-01B	Lead	1.3	ND
MW-03A	Lead	15.9	ND
MW-03A	Lead	20.2	ND
MW-07A	Lead	55.4	ND

ND: Not Detected in Concentrations Greater Than CRQL

Table 3 **Concentrations of Total and Dissolved Metal Results (Continued) for Selected Ground Water (MW) Sampling Locations**

Location	Parameter	Total (ug/l)	Dissolved (ug/l)
MW-01B	Magnesium	10400	10100
MW-03A	Magnesium	14300	5640
MW-03A	Magnesium	13600	5550
MW-07A	Magnesium	29400	24700
MW-01B	Manganese	203	222
MW-03A	Manganese	1420	659
MW-03A	Manganese	1380	654
MW-07A	Manganese	3050	2610
MW-07A	Mercury	0.34	ND
MW-01B	Nickel	98.4	ND
MW-03A	Nickel	99.9	ND
MW-03A	Nickel	88.3	ND
MW-07A	Nickel	163	108
MW-01B	Potassium	10400	8380
MW-03A	Potassium	9390	5340
MW-03A	Potassium	7620	ND
MW-07A	Potassium	17500	5890
MW-01B	Sodium	18000	16400
MW-03A	Sodium	9240	7580
MW-03A	Sodium	7240	5860
MW-07A	Sodium	12400	10400
MW-01B	Vanadium	7.4	ND
MW-03A	Vanadium	32.9	5.5
MW-03A	Vanadium	32.9	ND
MW-07A	Vanadium	101	5.3
MW-01B	Zinc	376	240
MW-03A	Zinc	388	48.2
MW-03A	Zinc	347	36
MW-07A	Zinc	912	378

ND: Not Detected in Concentrations Greater Than CRQL

Table 4 Maximum Concentrations of Constituents Reported in Surface Water at Concentrations Greater than or Equal to Contract Required Quantitation Limit

CONSTITUENT	CONCENTRATION (ug/l)	SAMPLING LOCATION	CRQL (ug/l)
Total Metals			
Aluminum	20,400	SW-03	200
Beryllium	9.5	SW-03	5
Calcium	53,300	SW-03	5000
Cobalt	67	SW-03	50
Iron	27,800	SW-03	100
Lead	329	SW-05	5
Magnesium	43,700	SW-02	5000
Manganese	4,350	SW-03	15
Nickel	94	SW-03	40
Sodium	112,000	SW-02	5000
Zinc	270	SW-03	20

Table 5 Maximum Concentrations of Constituents Reported in Surface Soil at Concentrations Greater than or Equal to Contract Required Quantitation Limit (CRQL)

CONSTITUENTS	CONCENTRATION (mg/kg)	SAMPLING LOCATION	CRQL* (mg/kg)
Volatile Organics			
Acetone	0.041	SS-08	0.01
Dichloromethane	0.051	SS-18	0.005
Trichloromethane	0.003	SS-04	0.005
Semi-volatile Organics			
Anthracene	2.1	SS-32	0.33
Benzo(a)anthracene	11	SS-32	0.33
Benzo(b)fluoranthene	9.5	SS-32	0.33
Benzo(k)fluoranthene	7.8	SS-32	0.33
Benzo(g,h,i)perylene	3.9	SS-32	0.33
Benzo(a)pyrene	11	SS-32	0.33
bis(2-Ethylhexyl)phthalate	0.45	SS-33	0.33
Chrysene	[illegible]	SS-32	0.33
Dibenzo(a,h)anthracene	1.2	SS-32	0.33
Fluoranthene	16	SS-32	0.33
Indeno(1,2,3-cd)pyrene	4.8	SS-32	0.33
Phenanthrene	[illegible]	SS-32	0.33
Pyrene	13	SS-32	0.33
Inorganics**			
Aluminum	11,700	SS-08	3.2
Arsenic	22.1	SS-32	0.6
Barium	132	SS-32	0.4
Beryllium	67	SS-08	0.02
Calcium	29,800	SS-32	2000
Chromium	19.7	SS-20	0.6
Cobalt	27.3	SS-20	1.2
Copper	175	SS-08	0.6
Iron	35,900	SS-04	0.8
Lead	27.3	SS-20	0.2
Magnesium	1,210	SS-31	0.4
Manganese	4,160	SS-32	0.4
Mercury	1.7	SS-21	0.1
Nickel	17.1	SS-32	2.2
Selenium	0.41	SS-22	0.6
Vanadium	22	SS-08	0.6
Zinc	75.6	SS-32	0.4
Cyanide	0.74	SS-28	0.5

*Quantitation limits listed for soil/sediment are based on wet weight. The Quantitation Limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

**Detection limits for an extract of 1 gram of solid in 200 ml of extractant based upon current Instrument Detection Levels (IDL's).

Table 6 Maximum Concentrations of Constituents Reported in Sediment at Concentrations Greater than or Equal to the Contract Required Quantitation Limit

CONSTITUENT	CONCENTRATION (mg/kg)	SAMPLING LOCATION	CRQL* (ug/kg)
Volatile Organics			
Acetone	0.024	SD-04	0.010
Dichloromethane	0.084	SD-05	0.005
Semi-volatile Organics			
Benzo(a)anthracene	0.62	SD-01	0.33
Benzo(b,k)fluoranthene	0.72	SD-01	0.33
Benzo(a)pyrene	0.60	SD-01	0.33
Chrysene	0.70	SD-01	0.33
Fluoranthene	1.2	SD-01	0.33
Phenanthrene	0.54	SD-01	0.33
Pyrene	0.94	SD-01	0.33
Inorganics**			
Aluminum	5,460	SD-01	3.2
Arsenic	7.0	SD-01	0.6
Barium	68	SD-01	0.4
Beryllium	2.9	SD-01	0.02
Chromium	12	SD-03	0.6
Cobalt	17	SD-01	1.2
Copper	20	SD-03	0.6
Iron	33,600	SD-03	0.8
Lead	14	SD-01	0.2
Manganese	895	SD-02	0.4
Mercury	1.4	SD-03	0.1
Nickel	17	SD-04	2.2
Vanadium	17	SD-03	0.6
Zinc	69	SD-01	0.4

*Quantitation limits listed for soil/sediment are based on wet weight. The Quantitation Limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

**Detection limits for an extract of 1 gram of solid in 200 ml of extractant based upon current Instrument Detection Levels (IDL's).

Frequency of occurrence - 1,2 Dichloroethane was identified in leachate at relatively high concentrations and in the ground water.

1,2, Dichloroethane is a relatively mobile constituent based upon the physical chemical data available.

Benzene was selected as a indicator chemical because:

Toxicity - Benzene is carcinogenic.

Occurrence - **Benzene** was identified in the leachate and ground-water **samples.**

Benzene is environmentally mobile based upon available physical chemical data.

Benzo(a)pyrene was selected as a indicator chemical because:

Toxicity - Benzo(a)pyrene is carcinogenic.

Benzo(a)pyrene was identified in the landfill waste samples.

Benzo(a)pyrene is representative of the heavy PAH's also identified in the various media at the site.

Ethylbenzene was selected as a indicator chemical because:

Ethylbenzene was identified in the landfill waste samples including the landfill waste, borings, and the leachate.

Ethylbenzene is a landfill waste constituent.

Ethylbenzene is non-carcinogenic though highly toxic.

Ethylbenzene is a member of the volatile organic subgroup.

Heptachlor was selected as a indicator chemical because:

Toxicity - Heptachlor is carcinogenic.

Heptachlor is a pesticide and therefore, was selected to represent the pesticide/herbicide chemicals identified at the site.

Phenol was selected as a indicator chemical because:

Phenol has been identified in the landfill waste, borings, and leachate samples.

Phenol is a waste constituent within the landfill.

Phenol was chosen as the representative chemical for all the phenolics at the site, due to the fact that Phenol is known to be deposited in the landfill.

Styrene (monomer) was identified as a indicator chemical because:

Even though Styrene (monomer) has not been identified in any of the eight media identified at the site, styrene (monomer) is known to have been deposited in the landfill.

Arsenic was selected as a indicator chemical because:

Toxicity - arsenic is carcinogenic.

Frequency - arsenic was detected in all media at the site.

Manganese was identified as a indicator chemical because:

Frequency - Manganese has been detected in all media at the site.

Nickel was selected as a indicator chemical because:

Frequency - Nickel was identified in all media at the site.

To be the most conservative, the maximum concentration of each indicator chemical was used detected in each of the seven media.

B. Exposure Assessment

An exposure assessment was used to identify the potential environmental pathways and to estimate the contamination at the exposure point based on available data.

Four factors were used to identify exposure pathways and are as follows:

1. Chemical source and release mechanisms to the environment.

2. The environmental transport medium for the released chemical.

3. Exposure point or the point of potential receptor contact with the contaminated media.

4. The receptor exposure route (e.g., ingestion of drinking water).

The Schilling Landfill represents the release source to the environment with the previously mentioned seven media as transport medium for the released chemical. The media are broken down as follows:

- Soils represent a potential transport medium because direct contact with contaminated soils by human and environmental receptors may result in dermal, inhalation, or oral exposure.
- Stream sediments are a potential transport medium because direct content by humans and environmental receptors may result in dermal or oral exposure
- Landfill waste including borings within the dam are not a potential transport medium to humans since they are beneath the landfill cap. Environmental receptors, especially burrowing animals, would be affected by dermal or oral exposure.
- Leachate represents a transport medium since direct contact by humans and environmental receptors may result in dermal, inhalation, or oral exposure.
- Surface water represents potential transport medium because direct contact by humans and environmental receptors may result in dermal or oral exposure.
- Ground water through direct contact may result in dermal or oral exposure. However, no one is using the contaminated groundwater at present.
- Air is considered a transport medium because direct inhalation by humans and environmental receptors may result in exposure.

Potential Receptors

A four mile radius surrounding the site was used to determine potential human receptors. The area is primarily undeveloped land and the area immediately surrounding the site is rural. It is estimated that 23,000 persons, including Earl Schilling and his family, live within the four mile radius, of which 18,692 reside in towns and 4,308 reside in rural areas. Near the Schilling site, approximately 50 homes are present, (approximately 200 people) on Rock Hollow Road. Potentially sensitive subgroups of the population are children, (0-14 yrs.), women of child-bearing age (15-34 yrs.), and elderly (65 yrs. and greater).

A potential risk to environmental receptors exists since track, scat, and other sign indicate deer, rabbits, raccoons and other small mammals frequent the site area.

Exposure Routes

An exposure route is that mechanism by which a chemical within an environmental transport medium at an exposure point can enter the receptor. For example, an exposure route would be ingestion of water from a contaminated well. Exposure route potential, quantified as high, moderate, or low, is presented in Table 7. The relative accessibility of the chemicals identified in each media type and concentrations at which the chemicals were detected, were considered to assign a high, moderate, or low exposure route potential.

Exposure Pathways

A complete exposure pathway consists of four components:

1. A source and mechanism of chemical release to the environment.

2. An environmental transport medium (groundwater, surface water etc.).

3. A point of potential receptor contact with the contaminated medium.

4. A receptor exposure route (ingestion, inhalation and dermal contact).

If any of these four components is not present, the pathway is incomplete. Table 7 summarizes the results of the exposure evaluation. Based upon this review of the exposure route potential, a human/environmental pathway analysis was conducted for each media type. Table 8 summarizes the pathways evaluation for both human and environmental receptors.

C. Toxicity Assessment

Cancer potency factors (CPFs) have been developed by EPA's Carcinogen 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.

Table 8 Complete Exposure Pathway Analysis by Media and Receptor Type

INDICATOR CHEMICAL	RECEPTOR	MEDIA TYPE							
		Surface Soil	Sediment	Landfill Waste	Soil Boring	Leachate Sample	Surface Water	Ground Water	Air
1,2-Dichloroethane	Human	ND	ND	I	I	C	ND	C	ND
	Env.	ND	ND	ND	I	C	ND	C	ND
Benzene	Human	ND	ND	I	I	C	ND	C	ND
	Env.	ND	ND	ND	I	C	ND	C	ND
Benzo(a)pyrene	Human	C	C	I	I	ND	ND	ND	ND
	Env.	C	C	C	I	ND	ND	ND	ND
Ethylbenzene	Human	ND	C	I	I	C	ND	ND	C
	Env.	ND	C	C	I	C	ND	ND	C
Heptachlor	Human	ND	ND	I	I	C	ND	ND	ND
	Env.	ND	ND	C	I	C	ND	ND	ND
Phenol	Human	C	ND	I	I	C	ND	C	ND
	Env.	C	ND	C	I	C	ND	C	ND
Styrene (Monomer)	Human	ND	ND	I	I	ND	ND	ND	ND
	Env.	ND	ND	C	I	ND	ND	ND	ND
Arsenic	Human	C	C	I	I	C	ND	C	C
	Env.	C	C	C	I	C	ND	C	C
Manganese	Human	C	C	I	I	C	C	C	C
	Env.	C	C	C	I	C	C	C	C
Nickel	Human	C	C	I	I	C	C	C	C
	Env.	C	C	C	I	C	C	C	C

ND - Incomplete; chemical not detected
C - Complete
I - Incomplete; no exposure route exists because the site is covered by a cap, and soil boings were obtained from depths of 10.5 feet below the ground surface.
Env. - Environmental receptor

NOTE: Surficial soil sample SS-32 and Sediment Sample SD-01 are not evaluated as these data points are impacted by sources other than Shilling Landfill.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting non-carcinogenic effects. RfDs, which are exposure in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals, that is not likely to be without an appreciable risk of adverse health effects. 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 human). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse non-carcinogenic effects to occur.

D. **Risk Characterization**

The potential risks to human health were determined for dermal exposure, oral ingestion and inhalation on a media-specific basis for each of the indicator chemicals.

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site related exposure to a carcinogen over a 70 year lifetime under the specific exposure conditions at the site. The Agency has determined that the upper bound acceptable risk for exposure to carcinogens at this site is 1×10^{-6}.

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 '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. The Agency has determined that the upper bound acceptable risk for exposure to non-carcinogens at this site is a Hazard Index of less than 1.

Estimated daily intakes were calculated for adults and children at both long term (20 days) and short term (1 day) exposure durations. Site specific intake values included; frequency of exposure, duration of exposure, body weight, ingestion and inhalation rates.

The following assumptions were incorporated in characterizing the potential risk to human health:

- **The calculation of estimated daily intakes assumed that the receptors (adults and children) would frequent the site 1 to 20 days per year out of 365 days per year. The fraction of lifetime exposed was 1/70 of a lifetime.**
- The ground-water medium pathway calculations assumed that the receptor would drink and/or bathe in the water daily.
- It was assumed that the average weight and life expectancy of an adult was 70 kg and 70 years, respectively.
- The average weight of a child was assumed to be 20 to 40 kg, while it was assumed that a receptor would be considered a child for five years (i.e. child's "lifetime" was five years).
- Information presented in Table 9.

Tables 10A through 21B summarize the calculated intakes and risks to children and adults. Two of the indicator chemicals (arsenic and Heptachlor) have both carcinogenic and non-carcinogenic effects were evaluated as both. The daily intakes for non-carcinogens were summed over each route of exposure and compared to the reference dose. The daily intakes for carcinogens were multiplied by the carcinogenic potency factor and summed over each exposure route. Tables 22 through 27. Except for ingestion of nickel in groundwater by adults, the most conservative risk was to children.

<u>Non-carcinogenic Risk</u>

Ingestion Exposure Route

The estimated daily intakes for a child for ingestion were summed over all media types and compared to allowable intakes. The results from calculations for the non-carcinogens indicate that manganese is the only indicator chemical which poses an unacceptable risk to human health. See Table 23. The manganese concentrations in surface soil samples from the site ranged from 4.1 to 1210 mg/kg with an average of 560 mg/kg. The average concentration throughout the United States is 560 mg/kg. ~~The highest value on-site is still within normal natural ranges.~~ ✓

Inhalation Exposure Route

The inhalation exposure route analysis for non-carcinogenic indicator chemicals show that there would be <u>no</u> unacceptable risks as a result of exposure. Tables 10A through 21B.

through this pathway

Dermal Exposure Route

The dermal exposure route analysis for non-carcinogenic chemicals indicate there would be no unacceptable risks as a result of exposure. Tables 10A through 21B.

Carcinogenic Risk

Ingestion Exposure Route

A total incremental risk was calculated for a child for ingestion for the carcinogenic indicator chemicals over all media. the results show three indicator chemicals (arsenic (8.92×10^{-3}), benzene (7.32×10^{-6}) and 1,2-dichloroethane (1.4×10^{-5})) pose an unacceptable risk. The calculated incremental risks indicate that both benzene and 1,2 dichloroethane exceed the 1×10^{-6} risk level in groundwater beneath and adjacent to the site. However, the maximum concentrations detected in the groundwater do not exceed the MCLs for these compounds. This, coupled with the low potential of this groundwater to be used as a drinking water source, poses little risk to nearby populations. Use restrictions will be implemented to insure that groundwater at the site will not be used for human consumption.

Arsenic exceeds the 1×10^{-6} risk level in four of the site-specific media (groundwater (7.19×10^{-3}), leachate (1.73×10^{-3}), surface soils (5.44×10^{-6}) and sediment (2.42×10^{-6})). The arsenic concentrations in surface soils from the site ranged from 0 to 11 mg/kg for a mean concentration of 4.0 mg/kg. The background concentrations of sediment was from 4.5 mg/kg to non detected for a mean concentration of 3.4 mg/kg. The calculated risk for arsenic at the site is comparable for risks computed for natural occurring concentrations throughout the United States.

Dermal Exposure Route

A total incremental risk for a child via dermal exposure was calculated for the carcinogenic indicator chemicals over all media. The calculations show two indicator chemicals (benzene (8.03×10^{-6}) and 1,2-dichloroethane (1.88×10^{-5})) pose an unacceptable risk. Again the potential for drinking groundwater is low and maximum concentrations are below the MCLs. In leachate, 1,2-dichloroethane at 14 mg/l exceeds the MCLs.

Inhalation Exposure Route

The inhalation exposure route indicates there would be no unacceptable risk as a result of exposure to existing conditions. Tables 10A through 21B.

E. Conclusion

The risk assessment for the E.H. Schilling site evaluated the site specific physical and analytical data in characterizing potential risks to human health and the environment in the absence of any remedial action at the site. The risk assessment may also serve as the baseline against which proposed remediation alternatives may be evaluated.

Twenty-nine complete human receptor and thirty-seven complete environmental receptor exposure pathways exist based on the ten indicator chemicals.

The risk characterization has been based on a worst case assumption that the same child will be exposed to all media types over an extended period of time (i.e. five years) or adult for 70 years.

The risk characterization exposure via inhalation was evaluated by summing over all media (i.e. most conservative approach). The results indicated that inhalation did not currently present an unacceptable risk to human health.

Exposure via ingestion and dermal contact was also summed over all media (i.e. most conservative approach). The results indicated that exposure via ingestion and dermal contact potentially posed an unacceptable risk. The non-carcinogenic indicator chemical present with an unacceptable hazard index (266) was manganese. The carcinogenic indicator chemicals present at unacceptable risk levels were benzene (7.32×10^{-6}, ingestion; 8.03×10^{-6}, dermal), 1,2-dichloroethane (1.41×10^{-5}, ingestion; 1.88×10^{-5}, dermal), and arsenic (8.92×10^{-5}, ingestion). However, if ground water was considered separate from the other seven media types, the risk to human health due to exposure via ingestion or dermal contact is very low. Evaluating the ground-water pathway separately is entirely appropriate as the exposure assessment conservatively indicates that a low potential for exposure exists via the ground-water pathway. This was supported by analytical data from the ground-water source nearest the landfill which showed the absence of site-specific chemicals. In addition, the maximum concentrations for benzene (0.005 mg/l) and 1,2-dichloroethane (0.005 mg/l) detected in the ground water do not exceed the ground-water ARARs, (0.005 mg/l) and (0.005 mg/l) respectively.

The site-specific and national average natural background concentrations of arsenic and manganese, the two inorganic indicator chemicals which exceed ground-water ARARs, are well within the expected ranges for those metals in all media types at the site.

the conservative assumptions that were used throughout the risk calculation process, unacceptable risks are present. Detailed risk calculations were not developed for the environmental receptors because it was assumed that the risks determined for human exposure would be protective for both receptor types.

Unchecked erosion of the diversion ditches and landfill cap, as well as any increased seepage through the earthen dam will increase the future potential for risk from exposure to groundwater, surface water, leachate, sediment, and surface soil. Alternate site use such as residential and agriculture (with associated installation of groundwater supply wells on the landfill), or the excavation and removal of materials from the site would also increase the risk of exposure to human receptors.

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

7. Description of Alternatives

Five alternatives of the original eight were analyzed in detail for remediation of the E.H. Schilling Landfill. The following is a list of the five alternatives:

1. Alternative 1 - No Action
2. Alternative 4 - Containment with Leachate Treatment
3. Alternative 5 - Excavation with On-site Treatment/On-site Disposal
4. Alternative 7 - Excavation with On-site Treatment/Off-site Disposal
5. Alternative 8 - Excavation with Partial Treatment/On-site Disposal

Alternative 1 - No Action

Used as a base line for comparative analysis, this alternative would leave the site as is.

Alternative 4 - Containment with Leachate Treatment

Alternative 4, the selected alternative for this Record of Decision includes the following:

- Construct a cap that complies with Subtitle C of RCRA and equivalent State regulations over the 3-acre landfill thereby containing 100,000 cubic yards of landfill waste. The cap will extend over the landfill face and consist of clay with a permeability of 1 X 10^{-7} cm/s or less.

- Improve dam stability by adding a clay berm to increase the factor of safety to greater than 1.5.

- Install a perimeter cut-off wall consisting of 15 feet of slurry wall and 40 feet of grout curtain. Lateral flow of groundwater into the landfill waste will be eliminated.

- Install a perimeter interceptor drain outside the cut-off wall to control overtopping of the cut-off wall and drain groundwater away from the landfill.

- Excavate 500 cubic yards of sediment and 750 cubic yards of surface soils adjacent to the landfill and located down from the earthen dam. The excavated material will be consolidated into the landfill. Soils will be excavated and consolidated to achieve a cumulative risk of less than 1x10^{-6} carcinogenic risk and a cumulative non-carcinogenic hazard index of less than or equal to 1.. The soil and sediment does not contain RCRA regulated wastes.

- Install wells upstream of the dam to collect and treat leachate. The landfill will be dewatered of approximately 7,000,000 gallons of leachate. Treatment on-site will consist of metal precipitation, air stripping of organics, and carbon adsorption. Approximately 1,000,000 gallons of project generated wastewater will also be treated in the on-site treatment plant. NPDES effluent limitations will be met for any discharge.

- Quarterly sampling of all monitoring wells. If the results exceed action levels which are a cumulative cancer risk of less than 1 X 10^{-6} and a cumulative non-carcinogenic hazard index less than or equal to one, treatment of groundwater will occur in the on-site leachate treatment plant.

- A maintenance and inspection program will be implemented.

- Security measures such as a fence and security guard will be implemented to limit access. A deed restriction will be filed with the county court.

- Estimated capital cost would be $6,444,000 for this remedy with an annual C & M cost of $99,000. Operation would be for 30 years for a total cost of $9,412.000. The time to implement the construction phase of this remedy would be one year.

Alternative 5 - Excavation with On-site Treatment/Disposal

Alternative 5 consists of the following:

- **Excavate 100,000 cubic yards of landfill waste including the earthen dam.**
- **Exhume all drums,** estimated to be 5000.
- Excavate 750 cubic yards surface soils and 500 cubic yards of sediment.
- Drums, the remaining uncontainerized waste, contaminated sediments, **earthen dam** fill material and surface soils will be treated on-site in accordance with RCRA Subpart O standards using a thermal destruction unit. The unit would be mobilized, operated, and closed according to the requirements of RCRA Subpart O, 40 CFR 264.340. These requirements, though not applicable because the hazardous substances to be treated are neither RCRA listed nor RCRA characteristic waste, have been determined to be relevant and appropriate. Specific operating practices necessary to meet performance objectives including a 99.99 percent destruction and removal efficiency (DRE) of stack emissions as required by Subpart O of RCRA, would be determined through a trial burn at the site after installation of the thermal destruction unit.
- Residue waste including ash will be solidified and deposited in a secure cell on-site. Delisting of ash is possible.
- The estimated capital cost for this alternative is $46,831,000 with annual costs of $9,000 for 30 years for a total cost of $47,104,000. The time needed to implement this remedy is 3 years.

Alternative 7 (Excavation with On-site Treatment and Off-site Disposal)

- Excavate 100,000 cubic yards of landfill waste including the earthen dam.
- Exhume all drums, estimated to be 2000.
- Excavate 750 cubic yards surface soils and 500 cubic yards of sediment.
- Drums, the remaining uncontainerized waste, contaminated sediments, earthen dam fill material and surface soils will

be treated on-site in accordance with RCRA Subpart O standards using a thermal destruction unit. The unit would be mobilized, operated, and closed according to the requirements of RCRA Subpart O, 40 CFR 264.340. These requirements, though not applicable because the hazardous substances to be treated are neither RCRA listed nor RCRA characteristic waste, have been determined to be relevant and appropriate. Specific operating practices necessary to meet performance objectives including a 99.99 percent destruction and removal efficiency (DRE) of stack emissions as required by Subpart O of RCRA, would be determined through a trial burn at the site after installation of the thermal destruction unit.

- Residue waste will be deposited off-site in a secure cell.
- Monitoring will not be necessary since the alternative will be a clean closure.
- The estimated capital cost is $45,611,000 with no annual cost for this remedy. The time needed to implement this remedy is 3 years.

Alternative 8 (Excavation with Partial Treatment and On-Site Disposal)

This Alternative consists of the following:

- Excavate all drums (approximately 2000) and 14,000 cubic yards of highly contaminated waste material.
- Thermally destroy the excavated material as in Alternative 5 and 7.
- Excavate 750 cubic yards surface soil and 500 cubic yards of sediment and consolidate into the secure cell.
- Build a secure cell on-site and deposit the remaining waste (70,000 cubic yards).
- Leachate will be treated on-site as in alternative 4.
- Monitoring per 40 CFR Part 264.
- The estimated capital cost for this remedy is $22,951,000 with annual cost of $9,000 for 30 years. The time needed to complete this remedy is 3 years.

8. <u>Summary of Comparative Analysis of Alternatives</u>

To evaluate each alternative, nine criteria are used to determine the best balance of tradeoffs between the alternatives. The nine evaluation criteria are as follows:

1. **Overall Protection of Human Health and the Environment**
2. **Compliance with ARARs**
3. **Long-Term Effectiveness** and Permanence
4. Reduction of Toxicity, Mobility, or Volume through Treatment
5. Short-Term Effectiveness
6. Implementability
7. Cost
8. State Acceptance
9. Community Acceptance

Overall Protection

Excluding the No-Action alternative, the remaining four alternatives are protective of human health and the environment. Alternative 7 removes all waste from the site and is the most protective. Alternative 5 removes all organic material, but leaves metal-laden ash on-site in a secure cell. Alternative 8 destroys drums and highly contaminated waste on-site and the remaining waste is placed in a secure cell on-site. Institutional measures will be implemented to control exposure pathways. Alternative 4 uses treatment, engineering controls and institutional measures to control the exposure pathways.

Compliance with ARAR's

All Federal and State regulations will be met by Alternative 4, 5, 7 and 8, excluding OAC 3745-27-10(c)(3). U.S. EPA hereby waives Ohio Administrative Code (OAC) requirement 3745-27-10(c)(3) concerning the landfill slope down from the earthen dam through CERCLA Section 121(d)(4)(C) because of the technical impracticability of complying with this OAC requirement. U.S. EPA and OEPA determined that compliance with OAC 3745-27-10(C)(3) cannot reasonably be accomplished because of the unique topography of the area adjacent to the earthen dam, is illogical from an engineering perspective, and is not as reliable a method of controlling drainage as the selected alternative. The slope of the cap over the landfill, between the dam and the highwall, will be between 1 percent and 25 percent.

Long-term Effectiveness and Permanence (LEP)

Alternatives 4,5 and 8 have an on-site secure landfill in common. All three will require routine maintenance and monitoring to confirm long-term effectiveness and permanence. Alternative 7 is a clean closure which will be permanent if achieved.

Alternatives 4,5, and 8 do not eliminate long-term management needs, because each Alternative has an on-site landfill for residual waste. A clean closure for Alternative 7 may eliminate long-term management.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 5 and 7 are identical considering the extent of reduction achieved for waste toxicity, mobility or volume. Both Alternatives reduce the toxicity, volume or mobility of the waste (solid and liquid) significantly. Alternative 8 destroys drums and highly contaminated waste and controls mobility of the remaining waste through a secure cell. Alternatives 4 will address the statutory preference for reduction of toxicity, mobility or volume of waste by treating leachate and controlling mobility.

Short-Term Effectiveness

Alternatives 5 and 7 are almost identical in short-term effectiveness. Both Alternatives require excavation and on-site treatment of the entire landfill contents, which will require about 3 years. Alternative 7 involves a higher short-term risk of exposure to the public than Alternative 5 due to off-site transportation of residual waste.

The uncertainties associated with excavation are the same for Alternative 8, as excavation of the landfill waste is proposed. However, the intensity and extent of exposure are considerably less for Alternative 8 as compared to Alternatives 5 and 7. This is because Alternative 8 proposes to treat only highly toxic waste, which will require less time for treatment and less time for potential exposure during remediation.

The short-term risk of public exposure for Alternative 4 is minimum compared to the other three Alternatives because the landfill disturbance and excavation of solid waste are avoided. Considering the short-term effectiveness, Alternative 4 is the best of the four alternatives because the severity, extent and duration of potential short-term exposure risk to the public are minimized.

Implementability

Conventional and proven technologies will be required to implement Alternative 4. No uncertainties of solid waste excavation are associated with Alternative 4 as with the other **alternatives. Adequacy and reliability of controls can be** easily **verified by compliance monitoring wells. NPDES effluent limitations will be met for any discharge.** Furthermore, all other **Alternatives have this component (leachate treatment)** in **common.** Alternatives 5, 7 and 8 can be implemented, but with somewhat more difficulty in comparison to Alternative 4.

Cost Analysis

The cost of each alternative was determined based on 1989 dollars with a zero discount rate. The following formula was used to calculate the cost:

Capital Cost X (Annual Cost X Operational Years) = Total Cost

Alternative 4 = 6,444,000 X (99,000 X 30) = $9,412,000

Alternative 5 = 46,831,000 X (9,000 X 30) = $47,104,000

Alternative 7 = 45,611,000 X (0 X 30) = $45,611,000

Alternative 8 = 22,951,000 X (9,000 X 273,000) = $23,224,000

State Acceptance

The State of Ohio concurs with the selected remedy.

Community Acceptance

Specific comments and concerns are addressed in the Responsiveness Summary.

9. <u>Selected Remedy</u>

The remedy which provides the best trade off between the nine criteria is alternative 4. The containment with leachate treatment remedy uses engineering controls such as a RCRA Subtitle C cap, a cut-off wall, dam improvements, interceptor drains, consolidation within the landfill of 500 cubic yards of sediment and 750 cubic yards of surface soils adjacent to the landfill, and treatment of 7,000,000 gallons of liquid waste and leachate through dewatering the landfill. Institutional controls consisting of a fence surrounding the site, quarterly monitoring of all monitoring wells, and restrictions on use of the property will be implemented. The site will undergo a five year review per the requirements of SARA.

The clean-up levels attained at the conclusion of the response action will correspond to the elimination of all cumulative carcinogenic risks greater than $1x10^{-6}$ and a remaining cumulative non-carcinogenic hazard index of less than or equal to 1. Background levels of inorganics will be taken into consideration. Ground water will be monitored and if it exceeds action levels will be treated in the leachate system.

The following is a breakdown of the cost associated with each component of the remedy:

a)	Dam Improvement	$ 202,000
b)	Cap	310,000
c)	Slurry Wall	105,000
d)	Grout Curtain	1,960,000
e)	Interceptor Trench	140,000
f)	Grading	60,000
g)	Wells or Sumps	133,000
h)	Excavate Soil & Sediment	5,000
i)	Treatment (30 years)	2,608,000
j)	Security	25,000
k)	Contract Documents	235,000
l)	QA/QC	560,000
m)	Inspection (30 years)	23,000
n)	Monitoring	1,174,000
o)	O & M	134,000
p)	Contingency (15%)	1,128,000

Total Cost = Capital Cost + Annual Cost x operational years

= 6,444,000 + (99,000) (30) = $9,412,000

The estimates use the following data and assumptions:

a) Total volume of solid waste within the landfill is estimated at approximately 70,000 cubic yards based on the geophysical survey data.

b) Contaminated soil and sediment are assumed to have the following volumes for estimating purposes.

(i) 30,000 cubic yards of contaminated soil beneath landfill
(ii) 750 cubic yards of contaminated surface soil adjacent to landfill
(iii) 500 cubic yards of contaminated sediment.

c) Total leachate volume in the landfill is estimated at 7 million gallons assuming the landfill waste is 70,000 cubic yards, it is fully saturated and has a porosity of 50%.

d) **The volume of contaminated water, to be produced from decontamination of excavation equipment and personnel, is assumed at about 1 million gallons.**

e) **Dam Improvement: approximately 17,000 cubic yards of clay.**

f) **Cap, multi-layer consisting of two feet of soil, one foot of sand, synthetic liner and two feet of clay.**

g) Slurry Wall; 1,400 feet long, 15 feet deep.

h) Grout Curtain; 1,400 feet long, 70 feet deep.

i) Interceptor Trench; 1,400 feet long, 15 feet deep.

j) Grading with concrete ditches and landscaping around the cap.

k) Collection, treatment and discharge of leachate with an initial volume of 7 million gallons and additional volume of 5 GPM for a 30-year period.

l) Excavation of contaminated soil and sediment, and placement in existing landfill.

m) Monitoring of wells surrounding site.

n) Inspection and O & M for a 30-year period.

o) A site review every five years.

Minor changes to the remedy may occur as a result of the remedial design and construction processes.

10. Statutory Determination

The remedy will control and eliminate risks associated with the E.H. Schilling Landfill. The statutory requirements of CERCLA Section 121 are satisfied with this remedy. The statutory requirements include the following:

1. Protection of Human Health and the Environment.

2. Compliance with Applicable or Relevant and Appropriate Requirements.

3. Cost Effectiveness.

4. Utilization of Permanent Solutions and Alternative Treatment (or resource recovery) Technologies to the Maximum Extent Practicable.

5. **Preference for Treatment as a Principal Element.**

Protection of Human Health and the Environment

The containment with leachate treatment uses engineering controls, treatment, and institutional controls to protect human health and the environment. The landfill will be dewatered and the leachate will be treated. The RCRA Subtitle C cap and improvements to the dam will prevent leachate generation and keep the waste in place. The cut-off wall will prevent lateral flow of groundwater into the landfill and the soils and sediments adjacent to the dam that have been exposed to leachate will be consolidated. Quarterly monitoring, maintenance, security and deed restrictions will be implemented.

The exposure levels will be reduced to a cumulative cancer risk of less than 1×10^{-6} and a cumulative non-carcinogenic hazard index of less than or equal to 1. Background conditions will be taken into consideration. Since excavation of the landfill waste is avoided, short-term risks to workers and surrounding public will be avoided.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative 4, Containment with Leachate Treatment will comply with all applicable or relevant and appropriate chemical-, action-, and location specific requirements, excluding one State of Ohio regulation, OAC 3745-27-10(c)(3) which is being waived through CERCLA Section 121(d)(4)(C). To comply with the requirement OAC 3745-27-10(C)(3) is technically not feasible considering the unique topography at the site, is illogical from an engineering perspective, and is not as reliable a method of controlling drainage as selected alternative 4. The slope of the cap between the highwall and the dam will be between 1 percent and 25 percent.

Chemical Specific ARARs:

- Maximum Contaminant Levels promulgated under the Safe Drinking Water Act will be achieved.
- Requirements of the National Pollution Discharge Elimination System (NPDES) and Ohio Administrative Code through OAC 3745-33 will be met.
- Fugitive dust subject to OAC 3745-17-08 will be controlled.

Action Specific ARARs:

- **Landfill closure requirements per 40 CFR 264.310 and OAC 3745-66.**

- **Post closure care through 40 CFR 264.310(b) and OAC 3745-27 will be met.**

- Use restrictions through 40 CFR 264.116 and 264.117(c) and OAC 3745-66-17.

- Monitoring of Groundwater through 40 CFR 264.92 through 264.99 and the revisions to the solid waste regulations contained in OAC 3745-27-10.

- Waste transported off-site such as spent carbon must comply with 40 CFR 262 and OAC 3745-52 and 3745-53.

- Equipment decontamination in accordance with 40 CFR 264 and OAC 3745-66-14.

Cost-Effectiveness

Alternative 4 is cost effective and overall effectiveness is proportionate to its costs. Alternatives 5,7 and 8 are substantially more expensive and perform additional treatment, which is unnecessary.

Utilization of Permanent Solutions and Alternative Treatment (or resource recovery) Technologies to the Maximum Extent Practicable.

Alternative 4, Containment with Leachate Treatment provides the best balance of trade-offs among the nine criteria. Since contamination is limited to areas immediately adjacent to the landfill, alternative 4 will control contamination and prevent off-site migration. Leachate and liquid waste treatment utilizes permanent solutions and treatment technologies to the maximum extent practicable. Long-term effectiveness and permanence is maintained through treatment of leachate which limits migration. Hazards associated with excavation are avoided and the technology used in alternative 4 is proven and effective, therefore making this remedy cost-effective.

Preference for Treatment as a Principal Element

The principal threat is eliminated by treating liquid waste and leachate, while a majority of the source waste remains on-site.

Table 10 A Estimated Daily Intakes for Surficial Soils
Exposure to Children
E.H. Schilling Landfill

Constituent	Maximum Concentration (mg/kg)	Estimated Daily Intake: Dermal Exposure (1)		Estimated Daily Intake: Ingestion (2)		Estimated Daily Intake: Inhalation of Fugitive Dust (3)	
		Low	High	Low	High	Low	High
1,2-Dichloroethane	ND	NA	NA	NA	NA	NA	NA
Arsenic	11	1.08E-11	6.60E-09	2.15E-09	3.44E-07	1.88E-12	7.54E-11
Benzene	ND	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.54	5.28E-13	3.24E-10	1.06E-10	1.69E-08	9.23E-14	3.70E-12
Ethylbenzene	ND	NA	NA	NA	NA	NA	NA
Heptachlor	ND	NA	NA	NA	NA	NA	NA
Manganese	1210	1.18E-09	7.26E-07	2.37E-07	3.79E-05	2.07E-10	8.29E-09
Nickel	16.3	1.59E-11	9.78E-09	3.19E-09	5.10E-07	2.79E-12	1.12E-10
Phenol	0.35	3.42E-13	2.10E-10	6.85E-11	1.10E-08	5.98E-14	2.40E-12
Styrene	ND	NA	NA	NA	NA	NA	NA

ND = Not Detected
NA = Not applicable

Table 10 A continued

1) calculated using the following equation:

DEX = f x v(days/yr/365 days/yr) x DA(mg/cm^2/day) x S(cm^2) x P(%)/100 x Cs(mg/kg)/W(kg) x 1E-06(kg/mg)

where DEX = dermal exposure (mg/kg/day)
f = fraction of lifetime exposed = 1/70
v = visits = 1 - 20 days/year per 365 days/year
DA = dust adherence = 1.0 mg/cm^2/day
S = surface area of exposed skin = 1000 - 1500 cm^2
P = percent absorbed = 0.1 - 1 %
Cs = soil concentration
W = body weight = 20 - 40 kg

2) calculated using the following equation:

Exp = f x v(days/yr/365 days/yr) x Is(kg/day) x Cs(mg/kg)/W(kg)

where Exp = exposure via ingestion (mg/kg/day)
f = fraction of lifetime exposed = 1/70
v = visits = 1 - 20 days/year per 365 days/year
Is = soil intake = 0.0002 - 0.0008 kg/day
Cs = soil concentration
W = body weight = 20 - 40 kg

3) calculated using following equation:

IEX = f x v(days/yr/365 days/yr) x Cf(ug/m^3) x Ia(m^3/day) x Cs(mg/kg)/W(kg) x 1E-09(kg/ug)

where IEX = exposure via inhalation (mg/kg/day)
f = fraction of lifetime exposed = 1/70
v = visits = 1 - 20 days/year per 365 days/year
Cf = concetration of fugitive dust from resuspended soil = 35 ug/m^3
Ia = air intake = 5 m^3/day
Cs = soil concentration

Source: Equations 1 and 2 modified from Endangerment Assessment for the Westinghouse Plant Site, Bloomington, Indiana

Equation 3 modified from Superfund Exposure Assessment and Endangerment Assessment for the Westinghouse Plant Site, Bloomington, Indiana

Table 10 A Continued

1) calculated using the following equation:

DEX = f x v(days/yr/365 days/yr) x DA(mg/cm^2/day) x
S(cm^2) x P(%)/100 x Cs(mg/kg)/W(kg) x 1E-06(kg/mg)

where DEX = dermal exposure (mg/kg/day)
f = fraction of lifetime exposed = 1/70
v = visits = 1 - 20 days/year per 365 days/year
DA = dust adherence = 1.0 mg/cm^2/day
S = surface area of exposed skin = 1000 - 1500 ^{2}cm
P = percent absorbed = 0.1 - 1 %
Cs = soil concentration
W = body weight = 20 - 40 kg

2) calculated using the following equation:

Exp = f x v(days/yr/365 days/yr) x Is(kg/day) x
Cs(mg/kg)/W(kg)

where Exp = exposure via ingestion (mg/kg/day)
f = fraction of lifetime exposed = 1/70
v = visits = 1 - 20 days/year per 365 days/year
Is = soil intake = 0.0002 - 0.0008 kg/day
Cs = soil concentration
W = body weight = 20 - 40 kg

3) calculated using following equation:

IEX = f x v(days/yr/365 days/yr) x Cf(ug/m^3) x
Ia(m^3/day) x Cs(mg/kg)/W(kg) x 1E-09(kg/ug)

where IEX = exposure via inhalation (mg/kg/day)
f = fraction of lifetime exposed = 1/70
v = visits = 1 - 20 days/year per 365 days/year
Cf = concetration of fugitive dust from
resuspended soil = 35 ug/m^3
Ia = air intake = 5 m^3/day
Cs = soil concentration

Source: Equations 1 and 2 modified from Endangerment Assessment for the Westinghouse Plant Site, Bloomington, Indiana

Equation 3 modified from Superfund Exposure Assessment and Endangerment Assessment for the Westinghouse Plant Site, Bloomington, Indiana

Table 10 B Estimated Daily Intakes for Surficial Soils:
Exposure to Adults
E.H. Schilling Landfill

Constituent	Maximum Concentration (mg/kg)	Estimated Daily Intakes: Dermal Exposure (1)		Estimated Daily Intakes: Ingestion (2)		Estimated Daily Intakes: Inhalation of Fugitive Dust (3)	
		Low	High	Low	High	Low	High
1,2-Dichloroethane	ND	NA	NA	NA	NA	NA	NA
Arsenic	11	1.05E-11	2.09E 09	1.05E 10	2.09E-08	4.30E-12	8.61E-11
Benzene	ND	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.54	5.13E-13	1.03E-10	5.13E-12	1.03E-09	2.11E-13	4.23E-12
Ethylbenzene	ND	NA	NA	NA	NA	NA	NA
Heptachlor	ND	NA	NA	NA	NA	NA	NA
Manganese	1210	1.15E-09	2.30E 07	1.15E-08	2.30E-06	4.73E 10	9.47E-09
Nickel	16.3	1.55E-11	3.10E 09	1.55E-10	3.10E 08	6.37E 12	1.28E-10
Phenol	0.35	3.32E-13	6.65E 11	3.32E 12	6.65E-10	1.37E 13	2.74E-12
Styrene	ND	NA	NA	NA	NA	NA	NA

ND = Not detected
NA = Not applicable

Table 10 B continued

1) calculated using the following equation:

DEX = f x v(days/yr/365 days/yr) x DA(mg/cm^2/day) x S(cm^2) x P(%)/100 x Cs(mg/kg)/W(kg) x 1E-06(kg/mg)

where DEX = dermal exposure (mg/kg/day)
f = fraction of lifetime exposed = 1/70
v = visits = 1 - 20 days/year per 365 days/year
DA = dust adherence = 1.0 mg/cm^2/day
S = surface area of exposed skin = 1700 cm^2
P = percent absorbed = 0.1 - 1 %
Cs = soil concentration
W = body weight = 70 kg

2) calculated using the following equation:

Exp = f x v(days/yr/365 days/yr) x Is(kg/day) x Cs(mg/kg)/W(kg)

where Exp = exposure via ingestion (mg/kg/day)
f = fraction of lifetime exposed = 1/70
v = visits = 1 - 20 days/year per 365 days/year
Is = soil intake = 1.7E-05 - 1.7E-04 kg/day
Cs = soil concentration
W = body weight = 70 kg

3) calculated using following equation:

IEX = f x v(days/yr/365 days/yr) x Cf(ug/m^3) x Ia(m^3/day) x Cs(mg/kg)/W(kg) x 1E-09(kg/ug)

where IEX = exposure via inhalation (mg/kg/day)
f = fraction of lifetime exposed = 1/70
v = visits = 1 - 20 days/year per 365 days/year
Cf = concetration of fugitive dust from resuspended soil = 35 ug/m^3
Ia = air intake = 20 m^3/day
Cs = soil concentration

Source: Equations 1 and 2 modified from Endangerment Assessment for the Westinghouse Plant Site, Bloomington, Indiana

Equation 3 modified from Superfund Exposure Assessment and Endangerment Assessment for the Westinghouse Plant Site, Bloomington, Indiana

Table 11 A Estimated Daily Intakes for Sediments
Exposure to Children
E.H. Schilling Landfill

Constituent	Maximum Concentration (mg/kg)	Estimated Daily Intakes: Dermal Exposure		Estimated Daily Intakes: Ingestion	
		Low	High	Low	High
1,2-Dichloroethane	ND	NA	NA	NA	NA
Arsenic	4.9	4.79E-12	2.88E-09	4.23E-20	6.77E-15
Benzene	ND	NA	NA	NA	NA
Benzo(a)pyrene	ND	NA	NA	NA	NA
Ethylbenzene	0.003	2.94E-15	1.76E-12	3.24E-30	5.18E-28
Heptachlor	ND	NA	NA	NA	NA
Manganese	895	8.76E-10	5.25E-07	1.41E-15	2.26E-13
Nickel	17	1.66E-11	9.98E-09	1.82E-17	2.91E-15
Phenol	ND	NA	NA	NA	NA
Styrene	ND	NA	NA	NA	NA

ND = Not detected

1) calculated using the following equation:

DEX = f x v(days/yr/365 days/yr) x DA(mg/cm^2/day) x
S(cm^2) x P(%)/100 x Ca(mg/kg)/W(kg) x 1E-06(kg/mg)

where DEX = dermal exposure (mg/kg/day)
f = fraction of lifetime exposed = 1/70
v = visits = 1 - 20 days/year per 365 days/year
DA = dust adherence = 1.0 mg/cm^2/day
S = surface area of exposed skin = 1000 - 1500 cm^2
P = percent absorbed = 0.1 - 1 %
Ca = soil concentration
W = body weight = 20 - 40 kg

2) calculated using the following equation:

Exp = f x v(days/yr/365 days/yr) x Is(kg/day) x
Ca(mg/kg)/W(kg)

where Exp = exposure via ingestion (mg/kg/day)
f = fraction of lifetime exposed = 1/70
v = visits = 1 - 20 days/year per 365 days/year
Is = soil intake = 0.0002 - 0.0008 kg/day
Ca = soil concentration
W = body weight = 20 - 40 kg

Table 11 b Estimated Daily Intakes for Sediments
Exposure to Adults
E.H. Schilling Landfill

Constituent	Maximum Concentration (mg/kg)	Estimated Daily Intakes: Dermal Exposure		Estimated Daily Intakes: Ingestion	
		Low	High	Low	High
1,2-Dichloroethane-	ND	NA	NA	NA	NA
Arsenic	4.9	4.66E-12	9.31E-10	4.66E-11	9.31E-09
Benzene	ND	NA	NA	NA	NA
Benzo(a)pyrene	ND	NA	NA	NA	NA
Ethylbenzene	0.003	2.85E-15	5.70E-13	2.85E-14	5.70E-12
Heptachlor	ND	NA	NA	NA	NA
Manganese	895	8.50E-10	1.70E-07	8.50E-09	1.70E-06
Nickel	17	1.62E-11	3.23E-09	1.61E-10	3.23E-08
Phenol	ND	NA	NA	NA	NA
Styrene	ND	NA	NA	NA	NA

ND = Not Detected
NA = Not applicable

1) calculated using the following equation:

DEX = f x v(days/yr/365 days/yr) x DA(mg/cm^2/day) x
S(cm^2) x P(%)/100 x Cs(mg/kg)/W(kg) x 1E-06(kg/mg)

where DEX = dermal exposure (mg/kg/day)
f = fraction of lifetime exposed = 1/70
v = visits = 1 - 20 days/year per 365 days/year
DA = dust adherence = 1.0 mg/cm^2/day
S = surface area of exposed skin = 1700 cm^2
P = percent absorbed = 0.1 - 1 %
Cs = soil concentration
W = body weight = 70 kg

2) calculated using the following equation:

Exp = f x v(days/yr/365 days/yr) x Is(kg/day) x
Cs(mg/kg)/W(kg)

where Exp = exposure via ingestion (mg/kg/day)
f = fraction of lifetime exposed = 1/70
v = visits = 1 - 20 days/year per 365 days/year
Is = soil intake = 1.7E-05 - 1.7E-04 kg/day
Cs = soil concentration
W = body weight = 70 kg

Table 12A Estimated Daily Intakes for Leachate
Exposure to Children
E.H. Schilling Landfill

Constituent	Maximum Concentration (mg/L)	Estimated Daily Intakes: Dermal Exposure (1)		Estimated Daily Intakes Ingestion (2)	
		Low	High	Low	High
1,2-Dichloroethane	0.014	1.02E-06	6.08E-05	1.04E-07	[illegible]
Arsenic	0.368	6.55E-10	3.90E-08	2.73E-06	1.09E-04
Benzene	0.008	5.84E-07	3.48E-05	5.94E-08	2.38E-06
Benzo(a)pyrene	ND	NA	NA	NA	NA
Ethylbenzene	8	1.42E-06	8.48E-05	5.94E-05	2.38E-03
Heptachlor	0.00027	4.81E-11	2.86E-09	2.00E-09	8.02E-08
Manganese	7.88	1.40E-08	8.35E-07	5.85E-05	2.34E-03
Nickel	0.42	7.48E-10	4.45E-08	3.12E-06	1.25E-04
Phenol	0.52	7.61E-06	4.53E-04	3.86E-06	1.54E-04
Styrene	ND	NA	NA	NA	NA

ND = not detected
NA = not applicable

(1) calculated using following equation:

DEX = te(hr/day) x F(days/lifetime) x S (cm^2) x PC(cm/hr) x Cw(mg/L)/W(kg) x (lifetime/1825 days) x (1 L/1000 cm^3)

where DEX = dermal exposure (mg/kg/day)
te = duration of exposure = 2.6 hrs/day
F = frequency of exposure = 5 - 100 days/lifetime
S = exposed skin surface area = 1000 - 1500 cm^2
PC = dermal permeability constant
Cw = water concentration
W = body weight = 20 - 40 kg

2) calculated using following equation

Exp = te(hrs/day) x F(days/lifetime) x Iw(L/day) x Cw(mg/L)/W(kg) x (lifetime/1825 days) x (1 day/24 hours)

where Exp = exposure via ingestion
te = duration of exposure = 2.6 hrs/day
F = frequency of exposure = 5 - 100 days/lifetime
Iw = water intake = 1 L/day
Cw = water concentration
W = body weight = 20 - 40 kg

Source: Modified from Superfund [illegible]

Table 12B Estimated Daily Intakes for Leachate
Exposure to Adults
E.H. Schilling Landfill

Constituent	Maximum Concentration (mg/kg)	Estimated Daily Intakes: Dermal Exposure (1) Low	High	Estimated Daily Intakes: Ingestion (2)	
1,2-Dichloroethane	0.016	9.93E-07	1.99E-05	1.18E-07	2.37E-06
Arsenic	0.368	6.37E-10	1.27E-08	3.11E-06	6.22E-05
Benzene	0.008	5.67E-07	1.13E-05	6.77E-08	1.35E-06
Benzo(a)pyrene	ND	NA	NA	NA	NA
Ethylbenzene	8	1.38E-06	2.77E-05	6.77E-05	1.35E-03
Heptachlor	0.00027	4.67E-11	9.34E-10	2.28E-09	4.56E-08
Manganese	7.88	1.36E-08	2.73E-07	6.67E-05	1.33E-03
Nickel	0.42	7.27E-10	1.45E-08	3.55E-06	7.10E-05
Phenol	0.52	7.39E-06	1.48E-04	4.40E-06	8.79E-05
Styrene	ND	NA	NA	NA	NA

ND = Not detected
NA = Not applicable

1) calculated using following equation:

DEX = te(hr/day) x F(days/lifetime) x S (cm^2) x
PC(cm/hr) x Cw(mg/L)/W(kg) x
(lifetime/2.56E+04 days) x (1 L/1000 cm^3)

where DEX = dermal exposure (mg/kg/day)
te = duration of exposure = 2.6 hrs/day
F = frequency of exposure = 70 - 1400 days/lifetime
S = exposed skin surface area = 1700 cm^2
PC = dermal permeability constant
Cw = water concentration
W = body weight = 70 kg

2) calculated using following equation:

Exp = te(hrs/day) x F(days/lifetime) x Iw(L/day) x
Cw(mg/L)/W(kg) x (lifetime/2.56E+04 days) x (1 day/24 hours)

where Exp = exposure via ingestion
te = duration of exposure = 2.6 hrs/day
F = frequency of exposure = 70 - 1400 days/lifetime
Iw = water intake = 2 L/day

Table 13A Estimated Daily Intakes for Surface Water
Exposure to Children
E.H. Schilling Landfill

Constituent	Maximum Concentration (mg/L)	Estimated Daily Intakes: Dermal Exposure (1)		Estimated Daily Intakes: Ingestion (2)	
		Low	High	Low	High
1,2-Dichloroethane	ND	NA	NA	NA	NA
Arsenic	ND	NA	NA	NA	NA
Benzene	ND	NA	NA	NA	NA
Benzo(a)pyrene	ND	NA	NA	NA	NA
Ethylbenzene	ND	NA	NA	NA	NA
Heptachlor	ND	NA	NA	NA	NA
Manganese	6.35	7.76E-09	4.61E-07	3.23E-05	1.29E-03
Nickel	0.096	1.67E-10	9.96E-09	6.97E-07	2.79E-05
Phenol	ND	NA	NA	NA	NA
Styrene	ND	NA	NA	NA	NA

ND = Not detected
NA = Not applicable

1) calculated using following equation:

DEX = te(hr/day) x F(days/lifetime) x S (cm^2) x
PC(cm/hr) x Cw(mg/L)/W(kg) x
(lifetime/1825 days) x (1 L/1000 cm^3)

where DEX = dermal exposure (mg/kg/day)
te = duration of exposure = 2.6 hrs/day
F = frequency of exposure = 5 - 100 days/lifetime
S = exposed skin surface area = 1000 - 1500 cm^2
PC = dermal permeability constant
Cw = water concentration
W = body weight = 20 - 40 kg

2) calculated using following equation:

Exp = te(hrs/day) x F(days/lifetime) x Iw(L/day) x
Cw(mg/L)/W(kg) x (lifetime/1825 days) x (1 day/24 hours)

where Exp = exposure via ingestion
te = duration of exposure = 2.6 hrs/day
F = frequency of exposure = 5 - 100 days/lifetime
Iw = water intake = 1 L/day
Cw = water concentration
W = body weight = 20 - 40 kg

Table 13B Estimated Daily Intakes of Surface Water
Exposure to Adults
E.H. Schilling Landfill

Constituent	Maximum Concentration (mg/kg)	Estimated Daily Intakes: Dermal Exposure (1)		Estimated Daily Intakes Ingestion (2)	
		Low	High		
1,2-Dichloroethane	ND	NA	NA	NA	NA
Arsenic	ND	NA	NA	NA	NA
Benzene	ND	NA	NA	NA	NA
Benzo(a)pyrene	ND	NA	NA	NA	NA
Ethylbenzene	ND	NA	NA	NA	NA
Heptachlor	ND	NA	NA	NA	NA
Manganese	4.35	7.53E-09	1.51E-07	3.68E-05	7.35E-04
Nickel	0.094	1.63E-10	3.25E-09	7.95E-07	1.59E-05
Phenol	ND	NA	NA	NA	NA
Styrene	ND	NA	NA	NA	NA

ND = Not detected
NA = Not applicable

1) calculated using following equation:

$$DEX = te(hr/day) \times F(days/lifetime) \times S\ (cm^2) \times PC(cm/hr) \times Cw(mg/L)/W(kg) \times (lifetime/2.56E{+}04\ days) \times (1\ L/1000\ cm^3)$$

where DEX = dermal exposure (mg/kg/day)
te = duration of exposure = 2.6 hrs/day
F = frequency of exposure = 70 - 1400 days/lifetime
S = exposed skin surface area = 1700 cm^2
PC = dermal permeability constant
Cw = water concentration
W = body weight = 70 kg

2) calculated using following equation:

$$Exp = te(hrs/day) \times F(days/lifetime) \times Iw(L/day) \times Cw(mg/L)/W(kg) \times (lifetime/2.56E{+}04\ days) \times (1\ day/24\ hours)$$

where Exp = exposure via ingestion
te = duration of exposure = 2.6 hrs/day
F = frequency of exposure = 70 - 1400 days/lifetime
Iw = water intake = 2 L/day
Cw = water concentration
W = body weight = 70 kg

Table 14A Estimated Daily Intakes for Ground Water Exposure to Children
E.H. Schilling Landfill

Constituent	Maximum Concentration (mg/L)	Estimated Daily Intakes: Dermal Exposure (1)		Estimated Daily Intakes Ingestion (2)	
		Low	High	Low	High
1,2-Dichloroethane	0.003	7.23E-05	1.45E-04	7.50E-05	1.50E-04
Arsenic	0.0091	5.35E-09	1.07E-08	2.28E-04	4.55E-04
Benzene	0.005	1.21E-04	2.42E-04	1.25E-04	2.50E-04
Benzo(a)pyrene	ND	NA	NA	NA	NA
Ethylbenzene	ND	NA	NA	NA	NA
Heptachlor	ND	NA	NA	NA	NA
Manganese	7.53	4.43E-06	8.89E-06	1.88E-01	[illegible]
Nickel	0.372	2.19E-07	4.39E-07	9.30E-03	1.86E-02
Phenol	0.008	3.87E-05	7.76E-05	2.00E-04	4.00E-04
Styrene	ND	NA	NA	NA	NA

ND = not detected
NA = not applicable

1) calculated using following equation:

DEX = te(hrs/event) x S(cm^2) x PC(cm/hr) x F(events/lifetime) x Cw(mg/L)/W(kg) x lifetime/1825 days x 1 L/1000 cm^3

where DEX = dermal exposure (mg/kg/day)
te = duration of exposure (hrs/event)
S = exposed skin surface area = 1000 - 1500 cm^2
PC = dermal permeability constant
F = frequency of events per lifetime = 1825 baths/lifetime
Cw = water concentration
W = body weight = 20 - 40 kg

2) calculated using following equation:

Exp = Iw(L/day) x F(days/lifetime) x Cw(mg/L)/W(kg) x lifetime/1825 days

where Exp = exposure via ingestion (mg/kg/day)
Iw = water intake = 1 L/day
F = frequency of events per lifetime = 1825 days/lifetime
Cw = water concentration
W = body weight = 20 - 40 kg

Table 14B Estimated Daily Intakes for Ground water
Exposure to Adults
E.H. Schilling Landfill

Constituent	Maximum Concentration (mg/L)	Estimated Daily Intakes: Dermal Exposure (1) Low	Estimated Daily Intakes: Dermal Exposure (1) High	Estimated Daily Intakes: Ingestion (2) Low	Estimated Daily Intakes: Ingestion (2) High
1,2-Dichloroethane	0.003	NA	7.98E-05	NA	[illegible]
Arsenic	0.0091	NA	5.91E-09	NA	[illegible]
Benzene	0.005	NA	1.33E-04	NA	3.25E-04
Benzo(a)pyrene	ND	NA	NA	NA	NA
Ethylbenzene	ND	NA	NA	NA	NA
Heptachlor	ND	NA	NA	NA	NA
Manganese	7.53	NA	4.89E-06	NA	[illegible]
Nickel	0.372	NA	2.61E-07	NA	2.41E-02
Phenol	0.008	NA	4.27E-05	NA	5.19E-04
Styrene	ND	NA	NA	NA	NA

ND = Not detected
NA = Not applicable

1) calculated using following equation:

DEX = te(hrs/event) x S(cm^2) x PC(cm/hr) x
F(events/lifetime) x Cw(mg/L)/W(kg) x
lifetime/ 2.56E+04 days x 1 L/1000 cm^3

where DEX = dermal exposure (mg/kg/day)
te = duration of exposure (hrs/event
S = exposed skin surface area = 1700 cm^2
PC = dermal permeability constant
F = frequency of events per lifetime = 2.56+04 baths/lifetime
Cw = water concentration
W = body weight = 70 kg

2) calculated using following equation:

Exp = Iw(L/day) x F(days/lifetime) x Cw(mg/L)/W(kg) x
lifetime/2.56E+04 days

where Exp = exposure via ingestion (mg/kg/day)
Iw = water intake = 2 L/day
F = frequency of events per lifetime = 2.56E+04 days/lifetime
Cw = water concentration
W = body weight = 70 kg

Table 15A Estimated Daily Intakes for Air Exposure to Children
E.M. Schilling Landfill

Constituent	Maximum Concentration (mg/m^3)	Estimated Daily Intakes: Inhalation (1) Low	High
1,2-Dichloroethane	ND	NA	NA
Arsenic	ND	NA	NA
Benzene	ND	NA	NA
Benzo(a)pyrene	ND	NA	NA
Ethyl benzene	ND	NA	NA
Heptachlor	ND	NA	NA
Manganese	1.00E-05	4.89E-11	1.96E-09
Nickel	2.00E-05	9.78E-11	3.92E-09
Phenol	ND	NA	NA
Styrene	ND	NA	NA

ND = Not detected
NA = Not applicable

1) calculated using the following equation:

$$IEX = f \times v(\text{days/year}/365\ \text{days/year}) \times Ia(m^3/\text{day}) \times Ca(mg/m^3)/W(kg)$$

where f = fraction of lifetime exposed = 1/70
v = number of visits = 1 - 20 days/yr per 365 days/yr
Ia = air intake = 5 m^3/day
Ca = air concentration (mg/m^3)
W = body weight = 20 - 40 kg

Source : Modified from Endangerment Assessment for the Westinghouse Site, Bloomington, Indiana

Table 15B Estimated Daily Intakes for Air Exposure to Adults
E.H. Schilling Landfill

Constituent	Maximum Concentration (mg/m^3)	Estimated Daily Intakes: Inhalation (1) Low	Estimated Daily Intakes: Inhalation (1) High
1,2-Dichloroethane	ND	NA	NA
Arsenic	ND	NA	NA
Benzene	ND	NA	NA
Benzo(a)pyrene	ND	NA	NA
Ethylbenzene	ND	NA	NA
Heptachlor	ND	NA	NA
Manganese	1.00E-05	1.12E-10	2.24E-09
Nickel	2.00E-05	2.24E-10	4.48E-09
Phenol	ND	NA	NA
Styrene	ND	NA	NA

ND = Not detected
NA = Not applicable

(1) calculated using the following equation:

$$IEX = f \times v(days/year/365\ days/year) \times Ia(m^3/day) \times Ca(mg/m^3) / W(kg)$$

where f = fraction of lifetime exposed = 1/70
v = number of visits = 1 - 20 days/yr per 365 days/yr
Ia = air intake = 20 m^3/day
Ca = air concentration (mg/m^3)
W = body weight = 70 kg

Source : Modified from Endangerment Assessment for the Westinghouse Site, Bloomington, Indiana

Table 16A Estimated Carcinogenic Risks and Hazard Indices for Surficial Soils
Exposure to Children
E.B. Schilling Landfill

Constituent	Dermal Exposure: Calculated Carcinogenic Risk (1)		Dermal Exposure: Hazard Indices (2) (Non-Carcinogenic Risk)		Ingestion: Calculated Carcinogenic Risk (1)		Ingestion: Hazard Indices (Non-Carcinogen [illegible]	
	Low	High	Low	High	Low	High	Low	High
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	1.70E-10	1.02E-07	5.27E-07	3.16E-04	3.40E-08	5.44E-06	1.05E-04	.69E
Benzene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	6.08E-12	3.65E-09	NA	NA	1.22E-09	1.94E-07	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	5.80E-05	3.48E-02	NA	NA	1.16E-02	.56E
Nickel	NA	NA	5.58E-08	3.35E-05	NA	NA	1.12E-05	[illegible]
Phenol	NA	NA	5.99E-10	3.60E-07	NA	NA	1.20E-07	1.92E-
Styrene	NA	NA	NA	NA	NA	NA	NA	NA

NA = not applicable

1) Carcinogenic Risk calculated using following equation:

$$Risk = CPF(mg/kg/day)^{-1} \times EDI(mg/kg/day)$$

where Risk = calculated carcinogenic risk
CPF = carcinogen potency factor for chemical
EDI = estimated daily intake for chemical

2) Hazard Index calculated using following equation:

$$HI = EDI(mg/kg/day)/RfD(mg/kg/day)$$

where HI = hazard index for chemical
EDI = estimated daily intake for chemical
RfD = reference doses for chemical

Source: Superfund Public Health Evaluation Manual

Table 168 Estimated Carcinogenic Risks and Hazard Indices for Surficial Soils
Exposure to Adults
E.H. Schilling Landfill

	Dermal Exposure				Ingestion			
	Calculated Carcinogenic Risk (1)		Hazard Indices (2) (Non-Carcinogenic Risk)		Calculated Carcinogenic Risk (1)		Hazard Indices (Non-Carcinogenic R	
Constituent	Low	High	Low	High	Low	High	Low	High
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	1.65E-10	3.30E-08	7.37E-09	1.46E-06	1.65E-09	3.30E-07	7.70E-08	[illegible]
Benzene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	5.90E-12	1.18E-09	NA	NA	5.90E-11	1.18E-08	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	8.11E-07	1.61E-06	NA	NA	8.47E-06	1.61E
Nickel	NA	NA	7.80E-10	1.55E-07	NA	NA	8.15E-09	1.55E
Phenol	NA	NA	8.38E-12	1.66E-09	NA	NA	8.75E-[illegible]	1.66E
Styrene	NA	NA	NA	NA	NA	NA	NA	NA

NA = not applicable

1) Carcinogenic Risk calculated using following equation:

Risk = CPF(mg/kg/day)$^{-1}$ x EDI(mg/kg/day)

where Risk = calculated carcinogenic risk
CPF = carcinogen potency factor for chemical
EDI = estimated daily intake for chemical

2) Hazard Index calculated using following equation:

HI = EDI(mg/kg/day)/RfD(mg/kg/day)

where HI = hazard index for chemical
EDI = estimated daily intake for chemical
RfD = reference doses for chemical

Source: Superfund Public Health Evaluation Manual

Table 17A Estimated Carcinogenic Risks and Hazard Indices for Sediments
Exposure to Children
E.H. Schilling Landfill

	Dermal Exposure				Ingestion			
	Calculated Carcinogenic Risk (1)		Hazard Indices (2) (Non-carcinogenic Risk)		Calculated Carcinogenic Risk (1)		Hazard Indices (2) (Non-carcinogenic Risk)	
Constituent	Low	High	Low	High	Low	High	Low	High
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7.58E-11	6.54E-08	3.34E-08	2.01E-06	1.52E-08	2.42E-06	6.71E-07	[illegible]
Benzene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	2.94E-13	1.76E-11	NA	NA	5.87E-12	[illegible]
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	6.13E-06	3.68E-06	NA	NA	1.23E-06	[illegible]
Nickel	NA	NA	5.82E-05	3.49E-03	NA	NA	1.66E-07	[illegible]
Phenol	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA

NA = not applicable

(1) Carcinogenic Risk calculated using following equation:

$$Risk = CPF(mg/kg/day)^{-1} \times EDI(mg/kg/day)$$

where Risk = calculated carcinogenic risk
CPF = carcinogen potency factor for chemical
EDI = estimated daily intake for chemical

(2) Hazard Index calculated using following equation:

$$HI = EDI(mg/kg/day)/RFD(mg/kg/day)$$

where HI = hazard index for chemical
EDI = estimated daily intake for chemical
RFD = reference doses for chemical

Source: Superfund Public Health Evaluation Manual

Table 17B Estimated Carcinogenic Risks and Hazard Indices for Sediments
Exposure to Adults
E.H. Schilling Landfill

	Dermal Exposure				Ingestion			
	Calculated Carcinogenic Risk (1)		Hazard Indices (2) (Non-carcinogenic Risk)		Calculated Carcinogenic Risk (1)		Hazard Indices (2) (Non-carcinogenic Risk)	
Constituent	Low	High	Low	High	Low	High	Low	High
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7.35E-11	1.47E-08	3.28E-09	6.52E-07	7.35E-10	1.47E-07	2.40E-06	[illegible]
Benzene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	2.87E-14	5.75E-12	NA	NA	2.10E-[illegible]	[illegible]
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	6.00E-07	[illegible]	NA	NA	6.39E-06	[illegible]
Nickel	NA	NA	[illegible]	[illegible]	NA	NA	5.95E-07	[illegible]
Phenol	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA

NA = not applicable

(1) Carcinogenic Risk calculated using following equation:

Risk = CPF(mg/kg/day)$^{-1}$ x CDI(mg/kg/day)

where Risk = calculated carcinogenic risk
CPF = carcinogen potency factor for chemical
CDI = estimated daily intake for chemical

(2) Hazard index calculated using following equation:

HI = CDI(mg/kg/day)/RFD(mg/kg/day)

where HI = hazard index for chemical
CDI = estimated daily intake for chemical
RFD = reference doses for chemical

Source: Superfund Public Health Evaluation Manual

Table 18A Estimated Carcinogenic Risk and Hazard Indices for Leachate Exposure to Children
E.H. Schilling Landfill

Constituent	Dermal Exposure: Calculated Carcinogenic Risk (1) Low	Dermal Exposure: Calculated Carcinogenic Risk (1) High	Dermal Exposure: Hazard Indices (2) (Non-carcinogenic Risk) Low	Dermal Exposure: Hazard Indices (2) (Non-carcinogenic Risk) High	Ingestion: Calculated Carcinogenic Risk (1) Low	Ingestion: Calculated Carcinogenic Risk (1) High	Ingestion: Hazard Indices (2) (Non-carcinogenic Risk) Low	Ingestion: Hazard Indices (2) (Non-carcinogenic Risk) High
1,2-Dichloroethane	9.32E-08	3.73E-06	NA	NA	9.47E-09	3.79E-07	NA	NA
Arsenic	1.03E-08	4.14E-07	4.59E-07	1.83E-05	4.31E-05	1.73E-03	1.91E-03	[illegible]
Benzene	1.69E-08	6.77E-07	NA	NA	1.72E-09	6.89E-08	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	1.42E-05	5.70E-04	NA	NA	5.94E-04	2.3[illegible]
Heptachlor	2.16E-10	8.65E-09	9.61E-08	3.84E-06	9.02E-09	3.61E-07	4.01E-06	[illegible]
Manganese	NA	NA	9.82E-06	3.93E-04	NA	NA	4.09E-02	[illegible]
Nickel	NA	NA	3.74E-08	1.50E-06	NA	NA	1.56E-04	[illegible]
Phenol	NA	NA	1.90E-06	7.61E-03	NA	NA	9.65E-05	[illegible]
Styrene	NA	NA	NA	NA	NA	NA	NA	NA

NA = Not applicable

(1) Carcinogenic Risk calculated using following equation:

$$Risk = CPF(mg/kg/day)^{-1} \times EDI(mg/kg/day)$$

where Risk = calculated carcinogenic risk
CPF = carcinogen potency factor for chemical
EDI = estimated daily intake for chemical

(2) Hazard Index calculated using following equation:

$$HI = EDI(mg/kg/day)/RfD(mg/kg/day)$$

where HI = hazard index for chemical
EDI = estimated daily intake for chemical
RfD = reference doses for chemical

Source: Superfund Public Health Evaluation Manual

Table 188 Estimated Carcinogenic Risks and Hazard Indices for Leachate
Exposure to Adults
E.H. Schilling Landfill

	Dermal Exposure				Ingestion			
	Calculated Carcinogenic Risk (1)		Hazard Indices (2) (Non-carcinogenic Risk)		Calculated Carcinogenic Risk (1)		Hazard Indices (Non-carcinogenic	
Constituent	Low	High	Low	High	Low	High	Low	High
1,2-Dichloroethane	9.08E-08	1.81E-06	NA	NA	1.08E-08	2.16E-07	NA	NA
Arsenic	1.01E-08	2.01E-07	4.44E-07	8.91E-06	4.92E-05	9.83E-04	2.18E-03	4.35E
Benzene	1.65E-08	3.29E-07	NA	NA	1.96E-09	3.92E-08	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	1.38E-05	2.77E-04	NA	NA	6.77E-06	1.35E
Heptachlor	2.10E-10	4.20E-09	9.34E-08	1.87E-06	1.03E-08	2.05E-07	4.57E-06	9.13E
Manganese	NA	NA	9.54E-06	1.91E-04	NA	NA	4.67E-02	9.33E
Nickel	NA	NA	3.63E-08	7.27E-07	NA	NA	1.78E-04	3.55E
Phenol	NA	NA	1.85E-04	3.70E-03	NA	NA	1.10E-04	2.20E
Styrene	NA	NA	NA	NA	NA	NA	NA	NA

NA = Not applicable

1) Carcinogenic Risk calculated using following equation:

$$Risk = CPF(mg/kg/day)^{-1} \times EDI(mg/kg/day)$$

where Risk = calculated carcinogenic risk
CPF = carcinogen potency factor for chemical
EDI = estimated daily intake for chemical

2) Hazard Index calculated using following equation:

$$HI = EDI(mg/kg/day)/RfD(mg/kg/day)$$

where HI = hazard index for chemical
EDI = estimated daily intake for chemical
RfD = reference doses for chemical

Source: Superfund Public Health Evaluation Manual

Table 19A Hazard Indices for Surface Water Exposure to Children
E.H. Schilling Landfill

Constituent	Dermal Exposure Hazard Indices (1) (Non-Carcinogenic Risk) Low	High	Ingestion Hazard Indices (1) (Non-Carcinogenic Risk) Low	High
1,2-Dichloroethane	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA
Benzene	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA
Ethyl benzene	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA
Manganese	5.42E-06	2.17E-04	2.26E-02	9.04E-01
Nickel	8.37E-09	3.35E-07	3.49E-05	1.40E-03
Phenol	NA	NA	NA	NA
Styrene	NA	NA	NA	NA

NA = not applicable

1) Hazard Index calculated using following equation:

HI = EDI(mg/kg/day)/RfD(mg/kg/day)

where HI = hazard index for chemical
EDI = estimated daily intake for chemical
RfD = reference doses for chemical

Source: Superfund Public Health Evaluation Manual

Table 19B Hazard Indices for Surface Water Exposure to Adults
E.H. Schilling Landfill

Constituent	Dermal Exposure Hazard Indices (1) (Non-Carcinogenic Risk)		Ingestion Hazard Indices (1) (Non-Carcinogenic Risk)	
	Low	High	Low	High
1,2-Dichloroethane	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA
Benzene	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA
Manganese	5.27E-06	1.05E-04	2.58E-02	5.15E-01
Nickel	8.13E-09	1.63E-07	3.98E-05	7.94E-04
Phenol	NA	NA	NA	NA
Styrene	NA	NA	NA	NA

NA = Not applicable

1) Hazard Index calculated using following equation:

HI = EDI(mg/kg/day)/RfD(mg/kg/day)

where HI = hazard index for chemical
EDI = estimated daily intake for chemical
RfD = reference doses for chemical

Source: Superfund Public Health Evaluation Manual

Table 20A. Estimated Carcinogenic Risk and Hazard Indices for Ground Water Exposure to Children
E.H. Schilling Landfill

Constituent	Dermal Exposure: Calculated Carcinogenic Risk (1) Low	Dermal Exposure: Calculated Carcinogenic Risk (1) High	Dermal Exposure: Hazard Indices (2) (Non-Carcinogenic Risk) Low	Dermal Exposure: Hazard Indices (2) (Non-Carcinogenic Risk) High	Ingestion: Calculated Carcinogenic Risk (1) Low	Ingestion: Calculated Carcinogenic Risk (1) High	Ingestion: Hazard Indices (2) (Non-Carcinogenic Risk) Low	Ingestion: Hazard Indices (2) (Non-Carcinogenic Risk) High
1,2-Dichloroethane	6.60E-06	1.32E-05	NA	NA	6.84E-06	1.37E-05	NA	NA
Arsenic	8.45E-08	1.70E-07	3.75E-06	7.52E-06	3.59E-03	7.19E-03	1.59E-01	[illegible]
Benzene	3.50E-06	7.02E-06	NA	NA	3.63E-06	7.25E-06	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	3.10E-03	6.22E-03	NA	NA	1.32E-02	[illegible]
Nickel	NA	NA	1.09E-05	2.19E-05	NA	NA	4.65E-01	[illegible]
Phenol	NA	NA	9.67E-06	1.94E-05	NA	NA	5.00E-03	[illegible]
Styrene	NA	NA	NA	NA	NA	NA	NA	NA

NA = Not applicable

1) Carcinogenic Risk calculated using following equation:

$$Risk = CPF (mg/kg/day)^{-1} \times EDI (mg/kg/day)$$

where Risk = calculated carcinogenic risk
CPF = carcinogen potency factor for chemical
EDI = estimated daily intake for chemical

2) Hazard Index calculated using following equation:

$$HI = EDI (mg/kg/day) / RfD (mg/kg/day)$$

where HI = hazard index for chemical
EDI = estimated daily intake for chemical
RfD = reference doses for chemical

Source: Superfund Public Health Evaluation Manual

Table 208 Estimated Carcinogenic Risks and Hazard Indices for Ground Water
Exposure to Adults
E.C. Schilling Landfill

Constituent	Dermal Exposure: Calculated Carcinogenic Risk (1) Low	Dermal Exposure: Calculated Carcinogenic Risk (1) High	Dermal Exposure: Hazard Indices (2) (Non-Carcinogenic Risk) Low	Dermal Exposure: Hazard Indices (2) (Non-Carcinogenic Risk) High	Ingestion: Calculated Carcinogenic Risk (1) Low	Ingestion: Calculated Carcinogenic Risk (1) High	Ingestion: Hazard Indices (2) (Non-Carcinogenic Risk) Low	Ingestion: Hazard Indices (2) (Non-Carcinogenic Risk) High
1,2-Dichloroethane	NA	7.28E-06	NA	NA	NA	1.78E-05	NA	NA
Arsenic	NA	9.33E-08	NA	6.13E-06	NA	9.33E-03	NA	[illegible]
Benzene	NA	3.86E-06	NA	NA	NA	9.41E-06	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	3.42E-03	NA	NA	NA	3.42E[illegible]
Nickel	NA	NA	NA	1.21E-05	NA	NA	NA	[illegible]
Phenol	NA	NA	NA	1.07E-03	NA	NA	NA	[illegible]E-03
Styrene	NA	NA	NA	NA	NA	NA	NA	NA

NA = not applicable

1) Carcinogenic Risk calculated using following equation:

$$Risk = CPF(mg/kg/day)^{-1} \times EDI(mg/kg/day)$$

where Risk = calculated carcinogenic risk
CPF = carcinogen potency factor for chemical
EDI = estimated daily intake for chemical

2) Hazard Index calculated using following equation:

$$HI = EDI(mg/kg/day)/RfD(mg/kg/day)$$

where HI = hazard index for chemical
EDI = estimated daily intake for chemical
RfD = reference doses for chemical

Source: Superfund Public Health Evaluation Manual

Table 21A . Estimated Carcinogenic Risks and Hazard Indices for Air Exposure to Children
E.H. Schilling Landfill

Constituent	Calculated Carcinogenic Risk		Hazard Indices (Non-Carcinogenic Risk)	
	Low	High	Low	High
1,2-Dichloroethane	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA
Benzene	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA
Manganese	NA	NA	3.42E-08	1.37E-06
Nickel	NA	NA	4.89E-09	1.96E-07
Phenol	NA	NA	NA	NA
Styrene	NA	NA	NA	NA

NA = Not applicable

1) Carcinogenic Risk calculated using following equation:

$$Risk = CPF(mg/kg/day)^{-1} \times EDI(mg/kg/day)$$

where Risk = calculated carcinogenic risk
CPF = carcinogen potency factor for chemical
EDI = estimated daily intake for chemical

2) Hazard Index calculated using following equation:

$$HI = EDI(mg/kg/day)/RfD(mg/kg/day)$$

where HI = hazard index for chemical
EDI = estimated daily intake for chemical
RfD = reference doses for chemical

Source: Superfund Public Health Evaluation Manual

Table 21B. Estimated Carcinogenic Risk and Hazard Indices for Air Exposure to Adults
E.H. Schilling Landfill

Constituent	Calculated Carcinogenic Risk (1) Low	Calculated Carcinogenic Risk (1) High	Hazard Indices (2) (Non-Carcinogenic Risk) Low	Hazard Indices (2) (Non-Carcinogenic Risk) High
1,2-Dichloroethane	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA
Benzene	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA
Manganese	NA	NA	7.84E-08	1.57E-06
Nickel	NA	NA	1.12E-08	2.24E-07
Phenol	NA	NA	NA	NA
Styrene	NA	NA	NA	NA

NA = not applicable

1) Carcinogenic Risk calculated using following equation:

Risk = CPF(mg/kg/day)$^{-1}$ x EDI(mg/kg/day)

where Risk = calculated carcinogenic risk
CPF = carcinogen potency factor for chemical
EDI = estimated daily intake for chemical

2) Hazard Index calculated using following equation:

HI = EDI(mg/kg/day)/RfD(mg/kg/day)

where HI = hazard index for chemical
EDI = estimated daily intake for chemical
RfD = reference doses for chemical

Source: Superfund Public Health Evaluation Manual

Table 22

Total Chronic Daily Intakes
E.H. Schilling Landfill

Constituent	Total Daily Intake (1) Ingestion		Total Daily Intake (1) Dermal Contact		Total Daily Intake (1) Inhalation	
	Children	Adult	Children	Adult	Children	Adult
1,2-Dichloroethane	1.54E-04	1.97E-04	2.06E-04	9.97E-05	NA	NA
Arsenic	5.64E-04	6.53E-04	5.92E-08	2.14E-08	7.54E-11	8.61E-11
Benzene	2.52E-04	3.26E-04	2.77E-04	1.44E-04	NA	NA
Benzo(a)pyrene	1.69E-08	1.03E-09	3.24E-10	1.03E-10	3.70E-12	4.23E-12
Ethylbenzene	2.38E-03	1.35E-03	8.48E-05	2.77E-05	NA	NA
Heptachlor	8.02E-08	4.56E-08	2.56E-09	9.34E-10	NA	NA
Manganese	3.81E-01	4.91E-01	1.14E-05	5.71E-06	1.03E-08	1.17E-08
Nickel	1.88E-02	2.42E-02	5.13E-07	2.45E-07	4.03E-09	4.61E-09
Phenol	5.54E-04	6.07E-04	5.31E-04	1.91E-04	2.40E-12	2.74E-12
Styrene	NA	NA	NA	NA	NA	NA

NA = Not applicable

(1) Total Daily Intake (TDI) for each exposure route is calculated using following equation:

$$TDI_i = \sum_j EDI_{ij}$$

where TDI_i = total daily intake ith exposure route
EDI_{ij} = estimated daily intake for ith exposure route and jth medium (e.g., soil, sediments, etc.)

23 Hazard Indices and Calculated Carcinogenic Risks
Based on Total Daily Intakes for Ingestion
E.H. Schilling

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tuent	Total Daily Intake (1) Ingestion[a]		Reference Dose (RfD) (mg/kg/day)	Carcinogen Potency Factor (CPF) (mg/kg/day) 1 Ingestion	Hazard Indices (2)		Calculated Carcinogenic Risks (3)	
	Children	Adult			Children	Adult	Children	Adult
chloroethane	1.54E-04	1.97E-04	NA	9.12E 02	NA	NA	1.41E-05	1.80E-05
c	5.64E-04	6.53E-04	1.43E-03	1.58E+01	3.95E-01	4.57E-01	8.92E-03	1.03E-02
e	2.52E-04	3.26E-04	NA	2.90E 02	NA	NA	7.32E-06	9.46E-06
a)pyrene	1.69E-08	1.03E-09	NA	1.15E+01	NA	NA	1.94E-07	1.18E-08
enzene	2 30E-03	1.35E-03	1.00E-01	NA	2.30E-02	1.35E-02	NA	NA
hlor	8 02E-08	4.56E-08	5.00E-04	4.50E+00	1.60E-04	9.12E-05	3.61E-07	2.05E-07
ese	3 81E-01	4.91E-01	1.43E-03	NA	2.66E+02	3.44E+02	NA	NA
	1 88E-02	2.42E-02	2.00E-02	NA	9.38E-01	1.21E+00	NA	NA
	5.54E-04	6.07E-04	4.00E-02	NA	1.39E-02	1.52E-02	NA	NA
e	NA	NA	1.43E-01	NA	NA	NA	NA	NA

ot applicable
otal Daily Intake (TDI) for each exposure route
calculated using following equation:

$$TDI_i = \sum_j EDI_{ij}$$

here TDI_i = total daily intake ith exposure route
EDI_{ij} = estimated daily intake for ith exposure route
and jth medium (e.g., soil, sediments, etc.)

azard Index = Total Daily Intake/Reference Dose

e 24 **Hazard Indices and Carcinogenic Risks**
Based on Total Daily Intakes for Dermal Contact
E.N. Schilling

stituent	Total Daily Intake (1) Dermal Contact		Reference Dose (RfD) (mg/kg/day)	Carcinogen Potency Factor (CPF) (mg/kg/day)-1 Ingestion	Hazard Indices (2)		Calculated Carcinogenic Risks (3)	
	Children	Adult			Children	Adult	Children	Adult
-Dichloroethane	2.06E-04	9.97E-05	NA	9.12E-02	NA	NA	1.00E-05	9.09E-06
enic	5.92E-08	2.16E-08	1.43E-03	1.50E+01	4.16E-05	1.51E-05	9.35E-07	3.41E-07
zene	2.77E-04	1.44E-04	NA	2.90E 02	NA	NA	8.03E-06	4.10E-06
zo(a)pyrene	5.24E 10	1.03E-10	NA	1.15E+01	NA	NA	3.73E-09	1.10E-09
ylbenzene	8.48E-05	2.77E-05	1.00E-01	NA	8.48E-04	2.77E-04	NA	NA
tachlor	2.86E-09	9.34E-10	5.00E-04	4.50E+00	5.72E-06	1.87E-06	1.29E-08	4.20E-09
ganese	1.14E-05	5.71E-06	1.43E-03	NA	8.01E-03	4.00E-03	NA	NA
kel	5.13E-07	2.65E-07	2.00E-02	NA	2.57E-05	1.33E-05	NA	NA
nol	5.31E 04	1.91E-04	4.00E-02	NA	1.33E-02	4.77E-03	NA	NA
rene	NA	NA	1.43E-01	NA	NA	NA	NA	NA

Not applicable
Total Daily Intake (TDI) for each exposure route
is calculated using following equation:

$$TDI_i = \sum_j EDI_{ij}$$

where TDI_i = total daily intake ith exposure route
EDI_{ij} = estimated daily intake for ith exposure route
and jth medium (e.g., soil, sediments, etc.)

) Hazard Index = 1. Daily Intake/Reference Dose

e 25 · Hazard Indices and Calculated Carcinogenic Risks
Based on Total Daily Intakes for Inhalation
E.H. Schilling Landfill

onstituent	Total Daily Intake (1) Inhalation		Reference Dose (RfD) (mg/kg/day)	Carcinogen Potency Factor (CPF) (mg/kg/day)-1 Inhalation	Hazard Indices (2)		Calculated Carcinogenic Risks (3)	
	Children	Adult			Children	Adult	Children	Adult
,2-Dichloroethane	NA	NA	NA	9.12E-02	NA	NA	NA	NA
rsenic	7.54E-11	8.61E-11	1.43E-03	5.00E+01	5.28E-08	6.03E-08	3.77E-09	4.31E-09
enzene	NA	NA	NA	2.90E-02	NA	NA	NA	NA
enzo(a)pyrene	3.70E-12	4.23E-12	NA	1.15E+01	NA	NA	4.25E-11	4.86E-11
thylbenzene	NA	NA	1.00E-01	NA	NA	NA	NA	NA
eptachlor	NA	NA	5.00E-04	NA	NA	NA	NA	NA
anganese	1.03E-08	1.17E-08	1.43E-03	NA	7.18E-06	8.22E-06	NA	NA
ickel	4.03E-09	4.61E-09	2.00E-02	NA	2.02E-07	2.30E-07	NA	NA
henol	2.40E-12	2.74E-12	4.00E-02	NA	6.00E-11	6.85E-11	NA	NA
yrene	NA	NA	1.43E-01	NA	NA	NA	NA	NA

A Not applicable

(1) Total Daily Intake (TDI) for each exposure route is calculated using following equation:

$$TDI_i = \sum_j EDI_{ij}$$

where TDI_i = total daily intake ith exposure route
EDI_{ij} = estimated daily intake for ith exposure route and jth medium (e.g., soil, sediments, etc.)

(2) Hazard Index = Total Daily Intake/Reference Dose

(3) Calculated Carcinogenic Risk = Total Daily Intake x Carcinogen Potency Factor

Table 26 **Cumulative Carcinogenic Risks**
Based on Calculated Carcinogenic Risks
for Ingestion, Dermal Exposure, and Inhalation
E.M. Schilling

	Calculated Carcinogenic Risks							
	Ingestion		Dermal Contact		Inhalation		Cumulative (1)	
onstituent	Children	Adults	Children	Adults	Children	Adults	Children	Adults
,2-Dichloroethane	1.41E-05	1.80E-05	1.88E-05	9.09E-06	NA	NA	3.29E-05	1.80E-05
rsenic	8.92E-03	1.03E-02	9.35E-07	3.41E-07	3.77E-09	4.31E-09	8.92E-03	1.03E-02
enzene	7.32E-06	9.46E-06	8.03E-06	4.18E-06	NA	NA	1.54E-05	9.46E-06
enzo(a)pyrene	1.94E-07	1.18E-08	3.73E-09	1.18E-09	4.25E-11	4.86E-11	1.98E-07	1.18E-08
thylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
eptachlor	3.61E-07	2.05E-07	1.29E-08	4.20E-09	NA	NA	3.74E-07	2.05E-07
anganese	NA	NA	NA	NA	NA	NA	NA	NA
ickel	NA	NA	NA	NA	NA	NA	NA	NA
henol	NA	NA	NA	NA	NA	NA	NA	NA
tyrene	NA	NA	NA	NA	NA	NA	NA	NA

A - Not Applicable
1) Cumulative Carcinogenic Risks is the sum of the calculated carcinogenic risks for ingestion, dermal exposure, and inhalation.

ource: Superfund Public Health Evaluation Manual, October 1986

Table 27 Cumulative Hazard Indices
Based on Calculated Hazard Indices
for Ingestion, Dermal Contact, and Inhalation
E.M. Schilling

Constituent	Hazard Indices (1) Ingestion		Hazard Indices (1) Dermal Contact		Hazard Indices (1) Inhalation		Total Hazard Indices (2)	
	Children	Adult	Children	Adult	Children	Adult	Child	Adult
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	3.95E-01	4.57E-01	4.14E-05	1.51E-05	5.28E-08	6.03E-08	3.95E-01	4.57E-01
Benzene	NA	...	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	2.38E-02	1.35E-02	8.48E-04	2.77E-04	NA	NA	2.46E-02	1.38E-02
Heptachlor	1.60E-04	9.12E-05	5.72E-06	1.87E-06	NA	NA	1.66E-04	9.31E-05
Manganese	2.66E+02	3.44E+02	8.01E-03	6.00E-03	7.18E-06	8.22E-06	2.66E+02	3.44E+02
Nickel	9.38E-01	1.21E+00	2.57E-05	1.33E-05	2.02E-07	2.30E-07	9.38E-01	1.21E+00
Phenol	1.39E-02	1.52E-02	1.33E-02	4.77E-03	6.00E-11	6.85E-11	2.72E-02	2.00E-02
Styrene	NA	NA	NA	NA	NA	NA	NA	NA
Cumulative HI (3):	2.67E+02	3.46E+02	2.22E-02	9.08E-03	7.43E-06	8.51E-06	2.67E+02	3.46E+02

NA Not applicable
(1) Hazard Index = Total Daily Intake/Reference Dose
(2) Total Hazard Index calulcated by summing across the exposure routes. This assumes that each exposure route is present at each exposure point.
(3) Cumulative Hazard Index is calculated by summing the hazard index of each chemical. This is a conservative approach as it assumes the same toxicological mode of [illegible]

E.H. SCHILLING LANDFILL SUPERFUND SITE
HAMILTON TOWNSHIP, LAWRENCE COUNTY, OHIO

RESPONSIVENESS SUMMARY

A. OVERVIEW

U.S. EPA had identified a preferred alternative for the E.H. Schilling Landfill site by the time of the public comment period. U.S. EPA's recommended alternative addressed the soil, leachate, groundwater, and sediment contamination problems at the site. The preferred alternative, as specified in the Record of Decision (ROD), involved: excavation of contaminated soils and sediment; placement of the soils and sediments in the landfill; construction of a slurry wall and grout curtain; improvements to the landfill dam; construction of an hazardous waste landfill cap; installation of a leachate collection and treatment system; quarterly groundwater monitoring; a review every five years; and deed and site restrictions.

The public, including one environmental group submitted four public comments. Concerns at leaving waste on-site were voiced. The State of Ohio commented and is concerned that the Feasibility Study is not in final form, but they do concur with the remedy. The Potentially Responsible Parties (PRPs) did not submit comments.

These sections follow:

- o Background on Community Involvement.
- o Summary of Comments Received During the Public Comment Period and Agency Responses.
- o Attachment: Community Relations Activities at the E.H. Schilling Landfill Site.

B. BACKGROUND ON COMMUNITY INVOLVEMENT

The E.H. Schilling Landfill site has generated very little public interest. There are several reasons for the low level of public interest with the E.H. Schilling Landfill site: 1) the site is not visible from the road and is only accessible from Schilling's private property; 2) the landfill was never used by the general public and the location is not generally known by residents of the Ironton area; 3) the Ohio River valley has been home to several large chemical companies over the years and residents have grown accustomed to pollution, [There are two other Superfund sites in the immediate Ironton area.]; and 4) these same chemical companies have been a major employment force in the local economy and have cultivated extensive good will.

The E.H. Schilling Landfill site has generated relatively little media coverage. In 1971 several articles were published in the Ironton Tribune concerning approval of E.H. Schilling's application

to establish a landfill. Several articles also appeared in 1980 **concerning closure of the site. A one-paragraph article appeared in the local newspaper after announcement of the landfill** as a **Superfund site. Huntington, West Virginia, television** and radio **covered the public meetings held on May 14, 1987 and on** September **7, 1989 respectively. In 1989, the Huntington, West** Virginia **Herald-Dispatch contained two site-related articles** summarizing the **RI findings and the public meeting held** on September 7, 1989.

The major concerns expressed by the community during the remedial planning and investigation activities at the E.H. Schilling site focused on possible health effects from site contamination and the slow pace of Superfund cleanup activities. These concerns and U.S. EPA and Ohio EPA responses are described below:

1. A resident expressed the concern that the area has a high rate of cancer, which may be related to chemical plants and how waste is disposed of at sites like the E.H. Schilling landfill.

   U.S. **EPA Response:** To provide the community with accurate, up-to-date information on potential health effects related to contaminants found at or near the E.H. Schilling Landfill site, U.S. EPA prepared and distributed a fact sheet concerning the site's RI endangerment assessment. Potential health risks associated with the site was a major topic of U.S. EPA presentations at the public meeting held on September 7, 1989.

2. The Sierra Club expressed the concern that area residents were unaware of the extent of hazardous waste disposal at the site.

   U.S. **EPA Response:** U.S. EPA conducted extensive public awareness efforts which featured information regarding the nature, extent, and sources of wastes disposed of at the site. These activities included: two public meetings (May 14, 1989 and September 7, 1989); three fact sheets (March 1989, August 14, 1989, and August 25, 1989); and one letter to residents (March 1989).

3. The Sierra Club expressed the concern that Superfund Activities are slow.

   U.S. EPA Response: U.S. EPA prepared and distributed a fact sheet describing the remedial process and the time required for remedial activities. The fact sheet outlined the remedial investigation activities planned for the site, described the site history and the available information concerning the nature and extent of site contamination.

4. Residents of Rock Hollow, located east of the landfill,

expressed concern that their private water wells were contaminated by the landfill.

U.S. EPA Response: The RI included a private water well survey and ground-water sampling to determine the nature and extent of contaminant migration in area ground water. The survey and sampling did not indicate site related contamination of area private water wells.

5. Residents were concerned by the non-participation of Dow Chemical as a party to the consent order.

   U.S. EPA Response: U.S. EPA was unable to address this since Dow's participation in the RI/FS and remedial action are subject to negotiations and potential litigation involving other PRPs and U.S. EPA.

6. Several residents complained that Dow Chemical dumps chemicals illegally, spill cleanup measures taken by the company were inadequate, and Dow used questionable practices to "prepare" for RCRA site inspections.

   U.S. EPA Response: Issues regarding the Dow Chemical plant operations, except those involving disposal practices at the landfill, are not related to the Superfund remedial process. These concerns represent potential RCRA issues and, consequently, were referred to that program.

C. Summary of Comments Received During the Public Comment Period

The following is a summary of the public comments received and the U.S. EPA response.

Citizen Groups

1. **Comment:** Ronald Goodwin of the Ohio Valley Environmental Coalition.

   Alternative 4 is not good enough because eventually the present dam will break or wash out, releasing poison into Winkler Run and the Ohio River. Eventually toxic leachate will migrate into private well water and elsewhere. Therefore, we urge that a new landfill site be purchased nearby, and state-of-the-art techniques utilized in the construction of the landfill with appropriate techniques for monitoring, etc. Then, excavate Schilling and move the contents to the new nearby site. This then will contain the waste until new technology is developed to eliminate this threat to public health.

   U.S. EPA Response: The U.S. EPA has determined that Alternative 4 will protect human health and the

environment. Using treatment, engineering and institutional controls the risk associated with the landfill is controlled. Quarterly monitoring in addition to a review of the remedy every five years will trigger whether further mitigation is necessary. Moving the landfill contents to a secure cell is unnecessary.

Individual Citizens

1. **Comment: Ms. Gholson**

   You are telling me that in four months the Superfund will take care of this problem we have.

   U.S. EPA Response: Once the Record of Decision is signed, a Special Notice Letter will be sent to the six responsible parties which will start a 120 day negotiation period. In this time frame, the responsible parties will all have to agree that they are willing to perform the design studies and implement the selected remedy. If they choose not to perform the design studies and implement the remedy, then enforcement action by U.S. EPA may be taken, or it is possible that the U.S. EPA will fund the work and see reimbursement from responsible parties at a later date. Completion of the remedy should take approximately one year.

2. Comment, **Ms. Wilson:** It is kind of silly to excavate hazardous waste. I would think on-site incineration and off-site disposal would be the intelligent alternative.

   The U.S. EPA is in the opinion that Containment with Leachate Treatment provides the best balance of tradeoffs between the nine criteria. Incineration would involve excavating the landfill contents which would increase short term risks to people living near the site and to workers on-site.

3. Comment, **Mr. Addis:**

   Why can't we go down there and haul the waste to Michigan. If it was hauled in there it can be hauled [illegible]

   U.S. EPA Response: It is not feasible to excavate and truck the waste to another location. The site, once remediation is completed, will be protective of human health and the environment.

OEPA Comments

Comments on the Proposed Plan

Comment

1 **Compliance with ARAR's:** It should be noted that U.S EPA's proposed alternative #4 does not meet all state ARAR's. The Ohio Administrative Code (OAC) regulation 3745-27-10(C)(3) stipulates that all land surfaces must be graded to slopes of no less than 1% and no greater than 25% in order to promote proper drainage. The present slope of the face of the dam is greater than 25%, and although the dam is structurally stable at this time, presently the dam does not have an acceptable factor of safety. The proposed alternative #4 includes a blanket drain and two toe drains underneath a clay berm on the face of the dam in order to promote proper drainage and to structurally support the dam to attain an acceptable factor of safety greater than 1.5. If the proposed alternative #4 addresses OAC 3745-27-10(C)(3), a considerable quantity of fill material would be required downhill of the dam. Also, if this area was filled with soil material to comply with this ARAR, provisions would have to be made in the remedy to collect the stream water which would underlie this fill material. Therefore, the Ohio EPA finds that compliance with OAC 3745-27-10(C)(3) is not technically justifiable considering the above factors. The Ohio EPA recommends that US EPA, pursuant to CERCLA Sec. 121(d)(4)(D), find that compliance with the requirements of OAC 3745-27-10(C)(3) can attain an equivalent performance standard through the use of the clay berm and drainage features as specified in proposed alternative #4. This finding should be embodied in the record of decision for the Schilling Landfill site.

2 On page 10 it is stated that "All alternatives would meet their respective relevant and appropriate requirements of Federal and State environmental laws." Alternative 1 (no action) does not meet all State ARAR's.

3 Implemetability: On page 11 it should be noted that the slurry wall/grout curtain associated with alternative #4 may be difficult to implement at this site. Also, incineration, along with the technologies comprising alternative 4 has been used at other Superfund sites and should be pointed out in this section.

General Comments on the FS

1 1. The cleanup goals section on page 22 does not specify what cleanup levels will be achieved after remediation. The contaminated media must be cleaned up to risk levels indicative of a cumulative 10-6 increased cancer risk or less, and a hazard index of less than or equal to 1.

2 2. The asphalt cap included in Table 7 for alternatives 3 and 4 does not meet the requirements contained in the Ohio Administrative Code (OAC) Section 3745-27-10, Closure of Sanitary Landfills. This requirement specifies that at least 2 feet of well compacted cover material and a vegetative layer be used upon closure of landfills.

Further, OAC rule 3745-27-09(F)(4) specifies that appropriate soils be used in the construction of this cover. As US EPA knows from the Miami County Incinerator site, the revisions to the solid waste regulations contained in OAC 3745-27 will specify that the soils used in the construction of a cap have a permeability of 1 x 10-7 cm/sec or less. When these regulations become promulgated, this ARAR will be an applicable requirement for the cap in alternative #4.

3 3. POTW disposal of leachate should not be considered an automatic treatment alternative. Approvals must first be obtained from the Ohio EPA Division of Water Pollution Control and the city which treats the leachate.

4 4. Using the criteria of a PRP for the off-site disposal alternatives is not appropriate. This criteria is not specified in the Interim final RI/FS guidance, and may not be used.

5 5. The ARAR section of the FS is poorly developed and no attempt is made to compare the alternatives to the ARAR's. There is a lack of detail in the discussion of ARAR's. More information is needed on <u>how</u> each of the ARAR's will be met. The Ohio ARAR's listed in Table A5 should be read in detail to fully understand the meaning of each ARAR. Many of the ARAR's seem to have been misinterpreted. Detailed comments on the ARAR's is presented in the specific comments section below.

6. US EPA's proposed alternative #4 does not meet the existing OAC 3745-27-10(C)(3) regulation concerning grading of <u>all land surfaces</u> to no less than 1% and no greater than 25%. The earthen dam face is greater than 25% in slope (refer to compliance with ARAR's comments on the proposed plan on page 1).

7 7. The cap in alternative #4 should extend over the top of the dam to cover the surface of the dam face not covered by the clay berm.

<u>Specific Comments on the FS</u>

	Page	Line	Section	Comments
1	List of figures			A conceptual design of the incinerator should be included in the FS.
2	2	9-10	1.2.1	It should be stated that <u>specific</u> construction details are unknown. Mr. Schilling has some knowledge of how the landfill was constructed.

3	**Table 2A**			**The concentrations of each of the contaminants detected above the CRQL detected during the RI should be placed in this table.**
4	**11**	16-17	1.2.3.2	Provide the basis for assuming that one-half acre is the horizontal extent of contaminated surface soils. "For the purpose of the FS" is not appropriate.
5	12,13	17-18	1.2.3.3	Provide the basis for assuming that eight inches is the depth of contaminated sediment. "For the purpose of the FS" is not appropriate. Likewise, provide the basis for assuming that the horizontal extent of contamination is estimated to be no more than about half an acre.
6	15	8	1.2.4.1	Leachate should be added as a potential exposure pathway at the landfill.
7	Table 3C & pg.54			The groundwater recovery system is screened out prematurely. There is groundwater contamination at the site, and as determined in the Risk Assessment, benzene, 1,2-Dichloroethane, and arsenic exceed the 1 x 10-6 risk level in groundwater. Thus, a groundwater recovery system should be carried forth into detailed analysis. Also, explain how temporary contaminated groundwater can be handled as leachate.
8	31	19-20	2.4.1.1	The drawbacks of this particular technology are stated in this section. Also list the positive aspects of this technology.
9	32	5-6	2.4.1.1	Note that with the proper controls and safety measures, puncturing drums and spreading waste into the environment can be minimized.

10	34	11-12	2.4.1.2	The sentence restricts the form of solids fed to the incinerator to only bales or drums. The sentence should be stated in more generic terms, for example, "Solids may be fed in raw form or processed form (e.g. shredded to reduce size to enhance combustion) to a materials handling system used to feed the incinerator".
11	35	10-12	2.4.1.2	It appears to be impractical to remove ash and residue from the secondary combustion chamber. Any ash or residue from this chamber is usually removed via the air pollution control system.
12	35	19-22	2.4.1.2	The disadvantages of incinerators such as operational problems, replacement of refractory lining, problems with chamber seals, and moving parts exposed to high temperatures can all be taken care of through normal operation and maintenance procedures. These are not specific disadvantages for the incineration alternatives.
13	37	5-6	2.4.1.2	As well as being used experimentally, this process is currently being utilized commercially and full scale to generate electrical power.
14	37	19	2.4.1.2	Problems associated with increased particulate emissions may be overemphasized. Full-scale commercial applications of this technology should not have a disproportionate amount of resulting air pollution control problems compared to other combustion technologies.
15	40	6-8	2.4.1.2	Problems associated with the escape of air, gas, and particulate matter are overstated. If the hood system is designed properly, only an insignificant amount of air, gas, or particulate matter may escape through cracks in the soil.

16	41	8-9	2.4.1.2	**Difficulties with on-site treatment of rotary kiln incineration are singled out; all on-site thermal treatment technologies will present difficulties. Mobilizing a rotary kiln incinerator in the field is not disproportionately difficult.**
17	44	9	2.4.1.3	The residuals from air stripping may require further treatment before being discharged.
18	46	7-10	2.4.1.3	Are metal ions both cationic and anionic?
19	50	15-20	2.4.1.4	Where would "appropriate fill material" be obtained from?
20	51	16	2.4.1.4	Deep slurry walls are prematurely screened out because of costly and difficult rock excavation. Such a technique may be very effective and less costly than other alternatives.
21	53	15-16	2.4.1.4	Excavation in deeper rock, although time-consuming and difficult to implement may be a less expensive alternative, especially if subsurface water flow is determined to be deeper than the proposed trench depth with a resultant potential for contact of the groundwater with the landfill waste.
22	54	6-7	2.4.1.4	This sentence needs clarification. It may be a typographical error.
23	55	17-18	2.4.1.4	Please clarify/explain "safety risk".
24	56	14-15	2.4.1.4	Briefly outline why wastes are hauled on-site. For example, wastes are transported from the point of excavation to the point where on-site treatment takes place.
25	59	5-6	2.4.2.3	How do chemical technologies "...actually increase the amount of material to be treated..."? Cite an example of a specific chemical technology that increases the amount of material to be treated.
26	59	11-12	2.4.2.3	Please clarify that the liquid effluent can also be incinerated.

27	**65**	15	3.2.5.1	**The bottom liner should be a double liner with a leachate collection system. Please specify this.**
28	**73**	17-19	4.2.1.1	**Where was the average total annual precipitation obtained from?**
29	**83**	1-4	4.2.2.2	The text at the end of the sentence, "...and the remediation program is modified.", does not make sense with the rest of the sentence. Please reword.
30	89	6-7	4.3.2	It is not clear which alternatives are being referred to when the text states "The other three alternatives...".
31	90		4.3.3	The rating system of <u>best to worst</u> does not accurately reflect the overall ratings of each of the alternatives. Please use a more objective rating system.
32	93	1-8	4.3.6	Compliance problems associated with on-site incineration are overstated here. Compliance requirements are no more or no less stringent for air permits as opposed to water discharge (NPDES or POTW) permits.

<u>Table A5</u>

1 1. The comments section under 6111.042 of the Ohio Revised Code (ORC) reflects a misunderstanding of the focus of this particular ARAR. ORC 6111.042 requires compliance with NPDES standards for discharges of wastestreams into waters of the state, not groundwater discharges into surface water. Also, the second comment under this ARAR is incorrect. There <u>has been</u> contamination of groundwater at the site.

2 2. OAC 3701-28 may be an applicable ARAR if <u>nearby</u> private water systems have to be abandoned due to site related degradation of those water systems.

3 3. OAC 3745-1-05(A) is misinterpreted. This ARAR stipulates that no <u>further</u> degradation of surface water is allowable, not the infiltration of groundwater into surface water as stated in the comments section.

4 4. OAC-3745-3 establishes <u>pre-treatment</u> standards, restrictions, and reporting requirements for discharges to a POTW, not a receiving stream. OAC 3745-3-04: Prohibited discharges to a POTW-

This ARAR stipulates that pollutants introduced into POTW's shall not interfere with the operation or performance of a POTW. The comment under this ARAR only says that the selected alternative will not discharge untreated water into a POTW.

5 5. OAC 3745-15-07 prohibits air pollution nuisances. This ARAR does not set levels for pollutants.

6 6. OAC 3745-17-11 restricts particulate emissions from industrial processes and is applicable to incineration alternatives in the FS. This rule applies to any operation, process, or activity which releases particulate emissions into the ambient air.

7 7. OAC 3745-21-07 and 08 are applicable requirements to all new stationary sources regardless of location.

8 8. The OAC 3745-27 regulations should have been reviewed in the FS for each alternative to determine if the alternatives meet these ARAR's. The revisions to the solid waste regulations contained in OAC 3745-27-10(B)(1) stipulate that a groundwater monitoring system shall consist of a sufficient number of wells, installed at appropriate locations and depths in the aquifer. Additional monitoring wells are needed downhill from MW-7. The concentrations of aluminum (50 ug/l), manganese (50 ug/l), and iron (300 ug/l) exceeded their respective secondary MCL's. In addition, the concentrations of these same three metals in MW-7A during the March 7, 1989 sampling event exceeded greatly the concentrations detected in the background well.

9 OAC 3745-31-02 stipulates that a permit is required for both an air contaminant source and a disposal system. Under this rule, an NPDES permit would be required for the off-site discharge of treated leachate.

10 OAC 3745-50-48 requires all monitoring results to be submitted, not just monitoring results of the incinerator.

11 OAC 3745-54-90 thru 99 not only stipulates that groundwater must be protected, but the groundwater must also be monitored, a compliance boundary must be established, and concentration limits must be met.

12 OAC 3745-57-01 thru 18- Both the applicable and the relevant and appropriate regulations must be met.

13 OAC 3745-66-11 & 12 must be met at all RCRA TSD's, even those operating without a permit. These requirements are relevant and appropriate for this site.

14 OAC 3745-66-13- Within 90 days of approval of the closure plan, what will be met? Specify.

15 Specify how the regulations contained in OAC 3745-66-14 and 3745-66-19(c) will be met.

Response to OEPA Comments

Comments on the Proposed Plan

U.S. EPA Response to Comment 1: We agree and the Record of Decision (ROD) will reflect the waiver through CERCLA Section 121(a)(4)(C) of OAC 3745-27-10(c)(3).

U.S. EPA Response to Comment 2: The no-action alternative is used as a baseline and was not considered as a viable option at the E.H. Schilling site.

U.S. EPA Response to Comment 3: We agree that it may be difficult to implement, but as with incineration, it has been used and proven at other sites.

General Comments on the FS

U.S. EPA Response to Comment 1: The ROD reflects these cleanup goals and they are also stated in the U.S. EPA FS addendum.

U.S. EPA Response to Comment 2: We agree with your comment and the ROD reflects OAC 374-27-10 (c)(3).

U.S. EPA Response to Comment 3: We agree with your comment.

U.S. EPA Response to Comment 4: This comment is addressed by the U.S. EPA FS addendum.

U.S. EPA Response to Comment 5: The chosen remedy will meet all ARARs except OAC 3745-27-10(c)(3). The U.S. EPA is in the opinion that enough detail was given to make an accurate decision for the site remedy.

U.S. EPA Response to Comment 6: Your comment has been reflected in the ROD.

U.S. EPA Response to Comment 7: Your comment has been reflected in the ROD.

Specific Comments on the FS

U.S. EPA response to Comment 1: The U.S. EPA is of the opinion that the text provides enough background to carry through the incineration option into detailed analysis. If incineration was chosen, the design would be part of the Remedial Design phase.

U.S. EPA Response to Comment 2: Mr. Schilling was interviewed by the Law Environmental and the U.S. EPA and does not remember exactly how the landfill was constructed.

U.S. EPA Response to Comment 3: For completeness, it would have been nice to have the concentrations located in Table 2A, but the RI and Technical memorandums contain all the presented data.

U.S. EPA Response to Comment 4: The one-half acre was based on sampling during the RI. Additional sampling will occur in the design phase.

U.S. EPA Response to Comment 5: The eight-inches and one-half acre was determined from sampling and analysis during the RI. Additional sampling will occur in the design phase.

U.S. EPA Response to Comment 6: The U.S. EPA agrees, but leachate as a potential pathway was addressed in the risk assessment section of the RI.

U.S. EPA Response to Comment 7: The groundwater recovery system was screened out by agreement of both U.S. EPA and OEPA. Since the groundwater at present was not being used as a drinking water source, it was not put in to detailed analysis. It is stated in ROD that if action levels are exceeded then the groundwater will be treated in the leachate treatment plant. The groundwater will be pumped through extraction wells to the treatment plant.

U.S. EPA Response to Comment 8: The advantages are stated in the 1st paragraph under Spray Irrigation. In addition, cost is minimal.

U.S. EPA Response to Comment 9: The U.S. EPA agrees, but contamination of the environment can be a disadvantage.

U.S. EPA Response to Comment 10: The U.S. EPA agrees.

U.S. EPA Response to Comment 11: Removing ash from the secondary combustion chamber is practicable and is being done.

U.S. EPA Response to Comment 12: We agree that the mentioned problems do not limit incineration, but they are inherent problems which can cause delay.

U.S. EPA Response to Comment 13: Fluidized bed technology is being used presently by utilities, but in small numbers.

U.S. EPA Response to Comment 14: The U.S. EPA agrees and that is one of the reasons thermal treatment was carried into detailed analysis. All Federal and State regulations will be met with thermal treatment.

U.S. EPA Response to Comment 15: The U.S. EPA agrees.

U.S. EPA Response to Comment 16: The U.S. EPA agrees that a rotary kiln incinerator can be mobilized and that all on-site thermal treatment technologies can present difficulties.

U.S. EPA Response to Comment 17: Comment is addressed in line 10 of the FS. It is stated that air stripping may be implemented in conjunction with other processes...

U.S. EPA Response to Comment 18: The U.S. EPA does not understand the question.

U.S. EPA Response to Comment 19: This will be addressed in the design phase.

U.S. EPA Response to Comment 20: The deep slurry wall was screened out due to the grout curtain being a more feasible option.

U.S. EPA Response to Comment 21: The U.S. EPA is in the opinion that the slurry wall/grout curtain system will be effective in preventing internal groundwater flow.

U.S. EPA Response to Comment 22: The U.S. EPA agrees.

U.S. EPA Response to Comment 23: A safety risk is associated with excavating the landfill contents.

U.S. EPA Response to Comment 24: The U.S. EPA does not understand the comment.

U.S. EPA Response to Comment 25: Stabilization will increase the amount of material to be treated.

U.S. EPA Response to Comment 26: Please see page 34 of the FS.

U.S. EPA Response to Comment 27: The liner will meet all state ARARs.

U.S. EPA Response to Comment 28: The precipitation value was obtained from the Schilling site data and Huntington W.V.

U.S. EPA Response to Comment 29: The U.S. EPA is of opinion that the sentence does not need to be reworded.

U.S. EPA Response to Comment 30: The other three alternatives in that sentence refer to 5, 7, 8 which deal with excavation.

U.S. EPA Response to Comment 31: The U.S. EPA agrees and this is addressed in the FS addendum.

U.S. EPA Response to Comment 32: The U.S. EPA believes that incineration is a viable technology, and can meet air requirements. At the Schilling site, thermal treatment was not chosen as the remedy since it does not provide the best balance of trade-offs concerning the nine criteria.

Table A5

U.S. EPA Response to Comment 1: The U.S. EPA agrees and NPDES requirements will be complied with.

U.S. EPA Response to Comment 2: The U.S. EPA agrees but at present, nearby private water systems have not been degraded.

U.S. EPA Response to Comment 3: The U.S. EPA agrees.

U.S. EPA Response to Comment 4: The U.S. EPA agrees.

U.S. EPA Response to Comment 5: The U.S. EPA agrees.

U.S. EPA Response to Comment 6: The U.S. EPA agrees.

U.S. EPA Response to Comment 7: The U.S. EPA agrees.

U.S. EPA Response to Comment 8: The U.S. EPA does not agree that another monitoring well should be located down from number seven. The U.S. EPA and OEPA agreed that additional field work was not required since the levels in the monitoring wells were within background conditions and the groundwater was not a drinking water source. The present 16 monitoring wells will be monitored quarterly, and if action levels are exceeded, the groundwater will be treated on-site.

U.S. EPA Response to Comment 9: Any discharge of treated leachate will comply with NPDES requirements.

U.S. EPA Response to Comment 10: The U.S. EPA agrees.

U.S. EPA Response to Comment 11: The U.S. EPA agrees.

U.S. EPA Response to Comment 12: The U.S. EPA agrees.

U.S. EPA Response to Comment 13: The U.S. EPA agrees.

U.S. EPA Response to Comment 14: The closure plan is site specific and once received will meet the requirements of the State of Ohio.

U.S. EPA Response to Comment 15: These regulations will be addressed in the design phase.

ATTACHMENT

- **U.S. EPA prepared the community relations plan (April 1989).**

- **U.S. EPA established information repositories at the Briggs Lawrence Public Library and the Lawrence County Court House (April 15, 1987).**

- U.S. EPA issued a press release announcing that E.H. Schilling and Sons, Inc. and Aristech had reached an agreement with the Agency to conduct and pay for the E.H. Schilling Landfill site RI/FS (April 16, 1987).

- U.S. EPA held a public comment period regarding the Consent Agreement. One written comment was received regarding potential site related health concerns (May 4-22, 1987).

- U.S. EPA and Ohio EPA held a public meeting at the Lawrence County Court House to describe the Consent Agreement and the planned remedial investigation, and to respond to citizens' questions and receive their comments. Approximately 25 residents, public officials, representatives of PRPs, an the media attended the meeting (May 14, 1987).

- U.S. EPA prepared and distributed a fact sheet which detailed the RI/FS workplan and the Superfund process (March 1988).

- U.S. EPA revised the community relations plan to reflect site-related developments (May 1988).

- U.S. EPA placed an advertisement in the Ironton Tribune to inform interested parties on the availability of TAG grants (September 7, 1988).

- U.S. EPA prepared and distributed a letter to residents and other parties concerning the progress of the RI (March 7, 1989).

- U.S. EPA released the RI for public review. A fact sheet summarizing the RI was prepared and distributed (August 14, 1989).

- U.S. EPA released the FS and proposed plan for public review and comment (August 25, 1989). An advertisement was placed in the Ironton Tribune summarizing the FS and proposed plan, and announcing the public comment period (August 25, 1989 and September 5, 1989).

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- U.S. EPA issued a press release concerning the FS, proposed plan, public comment period, and a public meeting (September 5, 1989).

- U.S. EPA and Ohio EPA held a public meeting at the Briggs Lawrence County Public Library to record public comments concerning the FS and proposed plan. Approximately 25 people attended the meeting including residents, public officials, representatives of the PRPs, and the media. A transcript of the meeting is available in the information repositories (September 7, 1989).

ADMINISTRATIVE RECORD INDEX
E.H. Schilling Landfill
Hamilton Township, Ohio

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
2 A1	1	00/00/00	Letter re: Submittal of analytical data from phase I, round II, for QA/QC review	USEPA	Aristech Chemical	Correspondence	1
2 A2	1	00/00/00	Letter re: Several contractor-related matters	USEPA, OEPA	Aristech Chemical	Correspondence	2
2 A3	1	00/00/00	Letter re: Computer modeling of groundwater on site	USEPA, OEPA	Aristech Chemical	Correspondence	3
2 A4	6	85/09/06	Letter requesting info. about the release of hazardous substances	Constantelos, USEPA	see document	Correspondence	4
2	2	86 03 19	Letters inviting Pettmeyer of US Steel and Slagle, Schilling atty to 4-22-86 meeting to be held at OEPA	Gould, USEPA	Slagle and US Steel	Correspondence	5
2 A12	1	86 04 08	Letter re: Waste disposal at the site	Leathers, Dow Chemical	McPhee, USEPA	Correspondence	6
2 A13	2	86.06/12	Letter forwarding invoice of waste removed from Gulf Chemical and Evoya Pipe Co.	Slagle, Schilling atty	Gould, USEPA	Correspondence	7
2 B1	7	86/07/11	Letter re: Waste disposal at the site	Leathers, Dow Chemical	Gould, USEPA	Correspondence	8
2 B8	6	86/07/22	Letter re: The opportunity to perform an investigation at the site and informing addressees of studies to be performed	Constantelos, USEPA	see document	Correspondence	9
B14	2	86/07/29	Letter re: Proposed strategy relative to the AO	Pettmeyer, USS	McPhee, USEPA	Correspondence	10

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E.H. Schilling Landfill
Hamilton Township, Ohio

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
2 C2	1	86/10/28	Letter re: Meeting to be held at OEPA's Columbus office	USEPA	see document	Correspondence	11
2 C3	4	86/12/23	Letter requesting info. about the release of hazardous substances	Constantelos, USEPA	PRPs	Correspondence	12
2 C7	6	87/01/02	Letter re: The opportunity to undertake an investigation at the site and notification of studies planned for the site	Constantelos, USEPA	PRPs	Correspondence	13
2 C13	6	87/01/[illegible]	Letter re: The opportunity to conduct an investigation at the site and informing addressees of studies planned	Constantelos, USEPA	see document	Correspondence	14
2 D5	106	87/02/04	Letter forwarding info. about the release of hazardous substances	Ashland Chemical Co	Dufficy, USEPA	Correspondence	15
3 D6	3	87/02/26	Letter re: Consent Order	Slagle, Schilling atty	McPhee, USEPA	Correspondence	16
3 D9	1	87/03/16	Letter re: Signing the draft Consent Order	Aristech Chemical	Dufficy, USEPA	Correspondence	17
3 D10	2	87/03/16	Letter re: Review of the AO	Slagle, atty	Dufficy, USEPA	Correspondence	18
3 D12	1	87/04/07	Letter re: Wells to be placed in the area of the site	Slagle, Atty.	USEPA	Correspondence	19
3 D13	1	87/04/13	Letter re: Extension of casings of ground water monitoring wells	Aristech Chemical Corp.	Law Environmental	Correspondence	20
3 D14	1	87/05/19	Letter forwarding	USEPA	Law Environmental	Correspondence	21

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E.H. Schilling Landfill
Hamilton Township, Ohio

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			documents containing info. about sampling procedures and protocols (without attachments)				
3 E1	1	87/06/02	Letter re: Arranging a meeting to cover QAPP development	Dufficy, USEPA	Aristech Chemical	Correspondence	22
3 E2	1	87/06/02	Letter re: Receipt of EPA Region V sampling protocol and QA/QC plans	Law Environmental	USEPA	Correspondence	23
3 E3	1	87/06/05	Letter re: AO effective without change	Dufficy, USEPA	Aristech, Slagle	Correspondence	24
3 E4	1	87/06/19	Letter re: Meeting scheduled for 6-25-87	Dufficy, USEPA	Aristech Chemical	Correspondence	25
3 E5	7	87/08/11	Letter commenting on Sampling Plan for Phase I Remedial Investigation	Metcalf & Eddy	USEPA	Correspondence	26
3 E12	13	87/08/18	Letter commenting on the planning documents for the E.H.Shilling RI/FS	USEPA, OEPA	Aristech Chemical Corp	Correspondence	27
3 F11	3	87/08/25	Letter responding to comments to the planning documents	Aristech Chemical	USEPA, OEPA	Correspondence	28
3 F14	1	87/09/08	Letter transmitting E.H. Schilling revised work plan for review	USEPA	Metcalf & Eddy	Correspondence	29
3 G1	4	87/09/29	Letter re: Comments on the Sampling Plan for Phase I RI	M & E	USEPA, OEPA	Correspondence	30
3 G5	6	87/10/01	Letter re: Comments on RI/FS planning documents	USEPA, OEPA	Aristech Chemical	Correspondence	31
3 G11	3	87/10/16	Letter re: RI/FS planning	Aristech Chemical	USEPA, OEPA	Correspondence	32

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R.R. Schilling Landfill
Hamilton Township, Ohio

RANE PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
		documents				
1	87/10/30	Letter re: Agencies' receipt of the final Work Plan	USEPA, OEPA	Aristech Chemical	Correspondence	33
2	87/11/25	Letter re: The Final Work Plan for the site	Aristech Chemical	USEPA, OEPA	Correspondence	34
1	87/11/30	Letter re: Law Environmental, Inc being chosen as contractor	Aristech,Law Environ Inc	USEPA, OEPA	Correspondence	35
1	87/11/30	Letter re: Compuchem Labs, Inc to analyze samples taken at site	Aristech Chemical	USEPA, OEPA	Correspondence	36
[illegible]	87/[illegible]	Letter re: Agencies approval of Law Environmental as contractor for RI/FS activities	USEPA, OEPA	Aristech Chemical	Correspondence	37
3	88/0[illegible]	Letter re: Proposed schedule for field activities	OEPA, USEPA	Aristech Chemical Corp	Correspondence	38
[illegible]	88/03/0[illegible]	Letter re: Closure requirements of the sludge pits on site	OEPA	Slagle, Atty.	Correspondence	39
7	88/03/08	Letter re: Comments on 1-28-88 QAPP	USEPA, OEPA	Aristech Chemical	Correspondence	40
1	88/03/22	Letter re: Follow-up to 3-16-88 meeting on site	Dollicy, USEPA	Aristech Chemical	Correspondence	41
1	88/03/24	Letter re: Monthly progress report for March 88	USEPA, OEPA	Aristech Chemical	Correspondence	42
2	88/03/29	Letter re: Temporary decontamination area	Aristech Chemical Corp.	USEPA, OEPA	Correspondence	43
1	88/04/14	Letter re: Conditional	USEPA, OEPA	Aristech Chemical	Correspondence	44

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E.H. Schilling Landfill
Hamilton Township, Ohio

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			Approval of revised QAPP				
4 B10	1	88/04/22	Letter re: Approval of temporary decontamination area near Winkler Run	USEPA	Aristech Chemical Corp.	Correspondence	45
4 B11	2	88/04/25	Letter re: Monitoring Well Cluster MW-06 Sampling Plan Revision	Aristech	USEPA, OEPA	Correspondence	46
4 B13	2	88/04/25	Letter re: Benthic Organism Life Cycles	Aristech Chemical	USEPA, OEPA	Correspondence	47
4 C1	1	88 04 2[illegible]	Letter re QAPP for Phase I RI	Aristech Chemical	USEPA, OEPA	Correspondence	48
4 C2	1	88 04 2[illegible]	Letter re: Monthly Progress Report for April etc	USEPA, OEPA	Aristech Chemical	Correspondence	49
4 C3	2	88/05/02	Letter re QAPP for Phase I RI	Aristech Chemical	USEPA, OEPA	Correspondence	50
4 C5	2	88/05/05	Letter re: Quality Assurance Project Plan for the Phase I RI	Aristech Chemical	USEPA, OEPA	Correspondence	51
4 C7	2	88/05/05	Letter re Aristech's Project Coordinators	Aristech Chemical	USEPA, OEPA	Correspondence	52
4 C9	1	88/05/13	Letter re: Comments on proposal for obtaining alternate bulk density measurements	USEPA, OEPA	Aristech Chemical	Correspondence	53
4 C10	1	88/05/13	Letter re: benthic organism and waste sampling studies from the RI/FS	USEPA, OEPA	Aristech Chemical	Correspondence	54
4 C11	1	88/05/23	Letter re: Groundwater well sampling	Aristech Chemical	USEPA, OEPA	Correspondence	55

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E.H. Schilling Landfill
Hamilton Township, Ohio

FICHE/FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
4 C12	2	88/06/22	Letter re: Earthen Dam Evaluation, Sampling Plan for the Phase I RI	Aristech Chemical	USEPA, OEPA	Correspondence	56
4 C14	1	88/07/21	Letter re: Change in USEPA Project Managers	Alcamo, USEPA		Correspondence	57
4 D1	1	88/08/03	Letter re: Sludge pits on site	OEPA	Slagle, Atty.	Correspondence	58
4 D2	2	88/08/04	Letter re: Terms of the AO by Consent	USEPA, OEPA	Aristech Chemical	Correspondence	59
4 D4	2	88/08/15	Letter re: Monthly Progress Report submittal	Aristech Chemical	USEPA, OEPA	Correspondence	60
4 D6	1	88/09/02	Letter re: New OEPA Project Coordinator on site	Bergreen, OEPA	Aristech Chemical	Correspondence	61
4 D7	1	88/09/09	Letter re: revised July 88 Progress Report from Seefried	USEPA, OEPA	Aristech Chemical	Correspondence	62
4 D8	2	88/10/04	Letter re: Projected stipulated penalties associated with certain availability dates of the completed site investigation activities	USEPA, OEPA	see document	Correspondence	63
4 D10	2	88/10/20	Letter re: Past correspondence and 8-30-88 letter concerning sludge pits on site	OEPA	Slagle, Atty	Correspondence	64
4 D11	7	88/10/28	Letters re: Response to Agency comments of 10-7-88 concerning TM1	Aristech, Law Environ.	USEPA, OEPA	Correspondence	65
4 E4	1	88/11/30	Letter re: Confirmation of sampling to occur at	USEPA, OEPA	Aristech Chemical	Correspondence	66

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E.H. Schilling Landfill
Hamilton Township, Ohio

FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			the site				
	2	88/12/01	Letter re: Confirmation of conference call discussions 11-28-88	Slagle, Atty.	USEPA, OEPA	Correspondence	67
	2	88/12/05	Letter re: USEPA's position on waste lagoons and sludge deposition area onsite	Alcamo, USEPA	Slagle, Atty.	Correspondence	68
	1	89/00/00	Letter re: Approval of Phase II Work Plan	USEPA, OEPA	Aristech Chemical	Correspondence	69
		89/01/09	Letter re: Comments on TM1-6	USEPA	Aristech Chemical	Correspondence	70
	3	89/01/09	Letter re: Comments on TM1-6	OEPA	Aristech Chemical	Correspondence	71
	30	89/02/08	Letters re: Comments on technical memos 1-6	Aristech, Law Environ	USEPA, OEPA, Aristech	Correspondence	72
	3	89/02/10	Letter re: Comments on TM7	E & E ...	Jacobs	Correspondence	73
	1	89/02/15	Letter forwarding Phase II Work Plan	Aristech Chemical	USEPA, OEPA	Correspondence	74
	1	89/02/15	Letter re: Fulfillment of Phase I Work Plan objectives	Law Environmental, Inc	Aristech Chemical	Correspondence	75
	1	89/02/15	Letter re: Aquifer pump test not producing an accurate characterization of site	USEPA, OEPA	Aristech Chemical	Correspondence	76
	1	89/02/22	Letter re: Performing an Endangerment Assessment	Aristech Chemical	USEPA, OEPA	Correspondence	77
	4	89/03/03	Letter re: Comments on the Earthen Dam Evaluation-Technical Memo No. 7	OEPA, USEPA	Aristech Chemical	Correspondence	78

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E.H. Schilling Landfill
Hamilton Township, Ohio

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B3	2	89/03/17	Letter re: Update on RI activities	USEPA	Burgess, OEPA-SEDO	Correspondence	80
35	1	89/03/29	Letters re: Comments on Law Environmental's 2-6-89 responses to OEPA original comments on TM1-6	OEPA, Jacobs	USEPA	Correspondence	81
36	6	89/04/07	Letters re: Comments on TM3-Benthic Macroinvertebrate Survey and TM5-Geology	M & E, Jacobs	USEPA	Correspondence	82
312	6	89/04/19	Letter re: Disposal of hazardous substances	Niedergang, USEPA	Dow Chemical	Correspondence	83
24	109	89/04/24	Law Environmental's response to OEPA and USEPA comments on Technical Memo No 7-Earthen Dam Evaluation with forwarding letter	Law Environmental	Aristech	Correspondence	84
1	7	89/05/10	Letters re: Response to USEPA comments for technical memo no.6-Diversion Ditch Analysis and technical memo no.7-Earthen Dam Evaluation	Jacobs, M & E	USEPA	Correspondence	85
8	1	89/05/10	Letter re: Responses to Law Environmental's comments on technical memo no.7	OEPA	Alcamo, USEPA	Correspondence	86
9	2	87/08/26	Revised Surface Soil Map with transmittal letter	Law Environmental	USEPA	Maps	87
12	1	86/04/22	Meeting sign-in sheet for 4-22-86 meeting (meeting summary not available)			Meeting Notes	88

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6 E13	5	86/08/20	Meeting Notes from 7-28-86 meeting on site with sign-in sheet	Gould, USEPA	file	Meeting Notes	89
6 F4	2	87/06/29	Memo re: Pre-QAPP meeting	Buffley, USEPA	see document	Meeting Notes	90
6 F6	1	88/04/06	Memo re: QAPP for the RI	Adams, USEPA	Niedergang, USEPA	Memorandum	91
6 F7	2	88/01/13	Memo re: Site Visit	Meschell, OEPA	file	Memorandum	92
6 F9	4	88/06/29	Memo re: Approval of QAPP for oversight of RI activities	Jirka, USEPA	Niedergang, USEPA	Memorandum	93
6 F13	2	88/10/0[illegible]	Memo re: Review of Geophysical Survey Report	Bartlett	Alcamo, USEPA	Memorandum	94
6 G1	3	89/0[illegible]/[illegible]	Memo re: Review of E.H Schilling Landfill Geology	[illegible], USEPA	Alcamo, USEPA	Memorandum	95
6 G5	1	89/0[illegible]/[illegible]	Memo re: Approval of QAPP-Addendum for Additional Soil Sampling and Analysis for the Phase II RI	[illegible], USEPA	Niedergang, USEPA	Memorandum	96
6 G6	2	8[illegible]/04/16	USEPA News Release: EPA Seeks Public Comment on Schilling Landfill Investigation	USEPA		News Releases	97
6 G8	59	00/00/00	Various invoices etc. from Dow Chemical			Other	98
7 E4	21	87/03/31	Administrative Order by Consent	USEPA		Pleadings/Orders	99
8 A3	102	86/05/03	Remedial Action Master Plan	CH2M Hill	USEPA	Reports/Studies	100
9 A12	116	87/10/00	Management Plan for the Phase I RI	Law Environmental	USEPA, OEPA	Reports/Studies	101
10 A8	122	87/10/00	Sampling Plan for the Phase I RI	Law Environmental	USEPA, OEPA	Reports/Studies	102

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12 E4	80	07/10/88	Health and Safety Plan for the Phase I RI	Law Environmental	USEPA, OEPA	Reports/Studies	103
13 D2	13	88/00/00	Technical Memo No. 6-Landfill Diversion Ditch Analysis	Seefried	USEPA	Reports/Studies	104
13 E5	2	88/01/05	Project Progress Report-Phase I RI	Seefried	see document	Reports/Studies	105
13 E7	6	88/02/05	Project Progress Report-Phase I RI	Seefried	see document	Reports/Studies	106
13 E13	230	88/03/00	Quality Assurance Project Plan for the Phase I Remedial Investigation	Law Environmental	USEPA, OEPA	Reports/Studies	107
16 B12	4	88/03/07	Project Progress Report-Phase I RI	Seefried	see document	Reports/Studies	108
16 C2	29	88/04/00	Final Community Relations Plan	[illegible]	USEPA	Reports/Studies	109
16 E2	8	88/04/07	Project Progress Report-Phase I RI	Seefried	see document	Reports/Studies	110
16 E10	5	88/05/05	Project Progress Report-Phase I RI	Seefried	see document	Reports/Studies	111
16 F5	6	88/06/06	Project Progress Report-Phase I RI	Seefried	see document	Reports/Studies	112
16 F11	21	88/06/29	QAPP	Duffley, USEPA		Reports/Studies	113
17 A9	3	88/07/07	Project Progress Report. Phase I RI		see document	Reports/Studies	114
17 A12	53	88/08/03	Technical Memo No. 1-Geophysical Survey	Seefried	USEPA	Reports/Studies	114 a
17 G7	6	88/08/03	Technical Memo No.2-Radiological Investigation	Seefried	USEPA	Reports/Studies	115
18 A3	3	88/08/08	Project Progress Report_ Phase I RI	Seefried	see document	Reports/Studies	116
18 A6	21	88/08/30	Technical Memo No.4-	Seefried	USEPA	Reports/Studies	117

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H.H. Schilling Landfill
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5	29	88/08/30	Technical Memo No. 3-Benthic Macroinvertebrate Survey	Seefried	USEPA	Reports/Studies	118
14	38	88/08/30	Technical Memo No.5-Geology	Seefried	USEPA	Reports/Studies	119
14	30	88/09/07	Project Progress Report-Phase I RI	Seefried	see document	Reports/Studies	120
5	32	88/10/06	Project Progress Report-Phase I RI	Seefried	see document	Reports/Studies	121
11	7	88/11/07	Project Progress Report-Phase I RI	Seefried	see document	Reports/Studies	122
5	88	88/12/00	Field Notes December 12-14, 1988 for HH Schilling Report for RI/FS Oversight	Jacobs Engineering	USEPA	Reports/Studies	123
9	8	88/12/06	Project Progress Report-Phase I RI	Seefried	see document	Reports/Studies	124
3	12	89/01/00	Review Comments on PRFs' Technical Memos 3,5 and 6	Jacobs Engineering	USEPA	Reports/Studies	125
14	37	89/01/11	Technical Memo No.7-Earthen Dam Evaluation	Aristech Chemical Corp	Alcamo, USEPA	Reports/Studies	126
2	8	89/02/00	Quality Assurance Project Plan for the Phase II RI	Law Environmental	USEPA, OEPA	Reports/Studies	127
11	6	89/02/00	Phase II RI	Law Environmental	USEPA, OEPA, Aristech	Reports/Studies	128
4	29	89/02/08	Project Progress Report-Phase I RI	Seefried	see document	Reports/Studies	129
8	7	89/02/29	Revised Phase II QAPP with forwarding letter	Aristech	USEPA, OEPA	Reports/Studies	130
4	23	89/03/00	Field Notes March 7-10, 1989	Jacobs Engineering	USEPA	Reports/Studies	131

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FRAME	PAGES	DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE	DOCNUMBER
			for EH Schilling Report for RI/FS oversight				
3	10	89/03/06	Project Progress Report-Phase I RI	Seefried	see document	Reports/Studies	132
1	26	89/04/00	Preliminary Scoping of Potential Remedial Actions report with forwarding memo	Law Environmental	USEPA	Reports/Studies	133
5	34	89/04/07	Project Progress Report-Phase II RI/FS	Seefried	see document	Reports/Studies	134
13	1	87/05/19	Trip Report-visit to Schilling site	Gasior, USEPA	Grand, USEPA	Trip Report	135
14	1	87/05/19	Memo re. 5-19-87 trip report to site	Gasior, USEPA	Grand, USEPA	Trip Reports	136

[illegible]

GUIDANCE DOCUMENTS INDEX
E.H. Schilling Landfill
Guidance Documents are available for review at
USEPA Region 5-Chicago IL

TITLE	AUTHOR	DATE
Integrated Risk Information System (IRIS)[A Computer-Based Health Risk Information System Available through E-Mail--Brochure on Access is Included]	OHEA	00/00/00
Toxicology Handbook OSWER # 9850.2	Life Systems, Inc.	85/08/01
Superfund Public Health Evaluation Manual OSWER # 9285.4-1	OERR	86/10/01
Interim Guidance on Superfund Selection of Remedy	OSWER	86/12/24
Data Quality Objectives for Remedial Response Activities: Development Process OSWER # 9355.0-7B	CDM Federal Programs Corp	87/03/01
A Compendium of Technologies used in the Treatment of Hazardous Wastes	ORD/OSWER	87/09/01
Remedial Action Costing Procedures Manual	JRB Ass./CH2M Hill	87/10/01
A Compendium of Superfund Field Operations Methods OSWER # 9355.0-14	OERR/CSPB	87/12/01
Superfund Exposure Assessment Manual OSWER # 9285.5-1	OERR	88/04/01
Interim Guidance on Potentially Responsible Party Participation in Remedial Investigations and Feasibility Studies OSWER # 9835.1a	OSWER	88/05/16
Community Relations in Superfund: A Handbook	OERR	88/06/01

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H.O. Schilling Landfill
Guidance Documents are available for review at
USEPA Region V-Chicago IL

TITLE	AUTHOR	DATE
(Interim Version) OSWER # [illegible]		
Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses	EPA Data Review Group	88/07/01
Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses	Sample Management Office	88/07/01
CERCLA Compliance with Other Laws Manual	OERR	88/08/08
Technology Screening Guide for Treatment of CERCLA Soils and Sludges	OSWER/OERR	88/09/01
Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA OSWER # 9355.3-01	OSWER/OERR	88/10/01

ADMINISTRATIVE RECORD SAMPLING/DATA INDEX
F.E. Schilling [illegible]

DATE	TITLE	AUTHOR	RECIPIENT	DOCUMENT TYPE

Sampling/Data documents not yet available for review. Data will be released upon final approval.

Acronym Guide to the Administrative Record
E.H. Schilling Landfill
Hamilton Township, Ohio

ACRONYM	DEFINITION
AO	Administrative Order
ATSDR	Agency for Toxic Substance and Disease Registry
CDM	Camp, Dresser & McKee
CERCLA	Comprehensive Environmental Response, Compensation and Liablity Act of 1980
CORPS	United States Army Corp of Engineers
DLPC	Division of Land Pollution Control
DWPC	Division of Water Pollution Control
FIT	Field Investigations Team
FY	Fiscal Year
HRS	Hazard Ranking System
M & E	Metcalf & Eddy
MOU	Memorandum of Understanding
NPL	National Priorities List
OEPA	Ohio Environmental Protection Agency
OSC	On Scene Coordinator
OSWER	Office of Solid Waste and Emergency Response
PRP	Potential Responsible Party
QA/QC	Quality Assurance/ Quality Control

Acronym Guide to the Administrative Record
E.H. Schilling Landfill
Hamilton Township, Ohio

ACRONYM	DEFINITION
QAPP	Quality Assurance Project Plan
RCRA	Resource, Conservation and Recovery Act
RI/FS	Remedial Investigation/ Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SARA	Superfund Amendment and Reauthorization Act of 1986
TAG	Technical Assistance Grant
TAT	Technical Assistance Team
TM	Technical Memo
USEPA	United States Environmental Protection Agency

OhioEPA
State of Ohio Environmental Protection Agency
P.O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149

Richard F. Celeste
Governor

September 28, 1989

Mr. Valdas V. Adamkus
Regional Administrator
U.S. EPA, Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Adamkus:

After review of the draft Record of Decision (ROD) for the E.H. Schilling Landfill site in Lawrence County which we received on September 26, 1989 and is attached hereto, Ohio EPA concurs with the selected remedial alternative for the site. The selected remedial alternative, titled the Selected Remedy in the ROD, consists of the following:

- A RCRA compliant cap which will consist of clay with a permeability of 1 x 10-7 cm/sec or less;
- Constructing a clay berm and drainage features on the face of the earthen dam;
- Installing a contiguous 15 foot slurry wall and 40 foot grout curtain around the perimeter of the landfill;
- Installing a perimeter interceptor drain outside the slurry wall/grout curtain;
- Excavation of contaminated sediment and surface soils adjacent to the landfill and down from the earthen dam. This material will be consolidated into the landfill;
- Installing 3 wells upstream of the dam to collect and treat leachate. Treatment of leachate will be accomplished onsite utilizing metal precipitation, air stripping, and carbon adsorption technologies;
- Quarterly sampling of all 16 monitoring wells. Action levels will be established for groundwater, and if exceeded, will require collection and treatment;
- Complete site fencing and a security guard to limit access;
- Filing of a deed restriction in the county court.

The estimated capital cost for the selected remedy is $6,444,000, and an estimated annual operation and maintenance cost of $99,000. Operation and maintenance is for 30 years. The total cost of this alternative is $9,414,000.

This concurrence should not be construed to mean that Ohio EPA approves of the manner in which U.S. EPA recently accelerated the RI/FS process in order to meet this ROD commitment. In doing this, Ohio EPA was deprived of "meaningful and substantial" involvement in the RI/FS process as required by CERCLA Section 121(f), 42 USC 9601(f). I have asked my staff to address support agency review times in a SMOA which we hope to negotiate with you over the next several months.

Sincerely,

Richard L. Shank, Ph.D.
Director

cc: Scott Bergreen, DERR, SEDO
Maury Walsh, Deputy Director
Jenny Tiell, Chief, DERR
Dave Strayer, RRS Mgr., DERR, CO
Kathy Davidson, DERR, CO
Cindy Hafner, Legal, CO
Bob Cottrill, Chief, SEDO
Tom Alcamo/Joe Dufficy, US EPA, Region V