United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R05-92/194
March 1992

EPA

Superfund Record of Decision:

Columbus Old Municipal Landfill, IN

NOTICE

The appendices listed in the index that are not found in this document have been removed at the request of the issuing agency. They contain material which supplement, but adds no further applicable information to the content of the document. All supplemental material is, however, contained in the administrative record for this site.

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R05-92/194	2.	3. Recipient's Accession No.

4. Title and Subtitle
SUPERFUND RECORD OF DECISION
Columbus Old Municipal Landfill, IN
First Remedial Action - Final

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401 M Street, S.W.
Washington, D.C. 20460

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800/000

14.

15. Supplementary Notes
PB93-964104

16. Abstract (Limit: 200 words)
The 19-acre Old Municipal Landfill site is located near the City of Columbus in Bartholomew County, Indiana. The site, located in the 100-year floodplain of the East Fork of the White River, is bounded by farmland, state roads, and an inactive gravel quarry pond. Current land use in the vicinity of the site includes an abandoned shooting range, concrete mixing operation, and the City of Columbus POTW. From 1938 to the 1960's, the site was operated as a municipal landfill accumulating an estimated 500,00 cubic yards of fill material. After the landfill reached a maximum of 20 feet, operations ceased and the landfill was closed by placing two to three feet of dredged river sediments over the entire area. Deposited materials were mainly municipal and household wastes, although wastes from industrial sources were reportedly disposed of at the landfill. Limited dumping by unauthorized parties may also have occurred. No records of site operations were kept. The waste material was dumped directly on the ground surface and was exposed to the elements. Open burning of waste material occurred regularly. Annual spring flooding caused the waste material to become submerged periodically. Eventually, the landfill began to function as a berm between the floodplain and the adjacent farmland. In 1981, Cummins Engine Company notified EPA

(See Attached Page)

17. Document Analysis a. Descriptors
Record of Decision - Columbus Old Municipal Landfill, IN
First Remedial Action - Final
Contaminated Media: Not Applicable
Key Contaminants: Not Applicable

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 32
	20. Security Class (This Page) None	22. Price

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Columbus Old Municipal Landfill, IN
First Remedial Action - Final

Abstract (continued)

of waste materials, including solvents, acids, lubricants, cutting fluids, and metals, that were generated and reportedly disposed of at the landfill. In 1990, the PRPs, under direct guidance of the state and EPA, conducted an investigation to assess the potential impacts of the waste material deposited in the landfill on soil, ground water, surface water, and river sediments in the vicinity of the site. Based upon findings of the remedial investigation and evaluation of current site risks, EPA concluded that the site currently poses no immediate or long-term risks to human health and the environment. This conclusion is based on current site conditions with the assumption that these conditions will not change.

The selected remedial action for this site is no further action (modified), which includes ground water monitoring and a five-year review of site conditions to evaluate the protectiveness of the remedy. In the event that the Indiana Department of Transportation and the City of Columbus proceed with construction of the proposed roadway across the site, EPA will require the implementation of a contingency remedy. This limited acton remedy includes the following: installing fencing with appropriate warning signs; implementing a landfill cover maintenance program; developing a ground water recovery system implementation plan; installing a minimum of two additional ground water monitoring wells; implementing a ground water monitoring program; and implementing institutional controls, including deed restrictions on land and water use. There are no costs associated with the no action remedy.

PERFORMANCE STANDARDS OR GOALS: Not applicable.

DECLARATION

RECORD OF DECISION
SELECTED REMEDIAL ALTERNATIVE

SITE NAME AND LOCATION

Old City Landfill (OCL)
Columbus, Indiana

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Old City Landfill located in Columbus, Indiana. The decision has been developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and in accordance with the National Oil and Hazardous Substance Contingency Plan (NCP). This decision is based on the Administrative Record for this site. The attached index identifies the items that comprise the Administrative Record, upon which the selection of the remedial action is based.

The State of Indiana concurs with the selected remedy. The letter of concurrence is attached to the Record of Decision (ROD) package.

DESCRIPTION OF THE SELECTED REMEDY

The results of the Remedial Investigation (RI) show that the Old City Landfill, in its present condition, is within acceptable health-based and environmental quality-based guidelines. Based upon the fact that current conditions at the site do not pose an unacceptable risk, the selected remedy for this site is "No Action" (modified). In order to ensure continued protection of human health and the environment, a minimum of two (2) additional groundwater monitoring wells shall be installed at the site and groundwater monitoring shall continue on a periodic basis for a minimum of five years. At the end of this initial five year period, U.S. EPA will conduct a review to evaluate the protectiveness of the selected remedy.

The Indiana Department of Transportation and the City of Columbus have announced their desire to construct a roadway across a portion of the site, extending State Route 46 into Columbus. Although the Feasibility Study and Technical Supplement to the Feasibility Study suggest that construction of this roadway should not pose any unacceptable risks, it is impossible to fully predict future site conditions. The selected remedy is based upon current site conditions. Construction of a road on the landfill could change these conditions. For example, more leachate could be produced from compression of soils and waste material, further contaminating the ground water. This possibility was indicated in both the Feasibility Study and the Technical Supplement. Therefore, if the Indiana Department of Transportation and the City of Columbus decide to construct the proposed roadway over any portion of the landfill, the U.S. EPA will require implemention of Alternative 2A at the site. The components of this alternative are:

* Installation of a fence with appropriate warning signs around the landfill.

* Implementation of a landfill cover maintenance program, including a provision for periodic leachate seep inspections.

* Development of a Groundwater Recovery System Implementation Plan (including analytical modeling and preliminary design).

* Installation of additional groundwater monitoring wells to augment the existing well network. A minimum of two (2) additional wells are needed downgradient of the landfill in order to monitor flow towards the quarry.

* Implementation of a groundwater monitoring program, allowing for sampling at appropriate intervals, with more frequent sampling events during and after roadway construction.

* Institutional controls will be sought to reduce exposure to site contaminants by legally restricting access to the site. Deed restrictions on land and water use on the landfill will be sought from the landfill owner.

These measures are necessary to ensure continued protection to human health and the environment, both during and after construction of the proposed roadway.

STATE CONCURRENCE

The State of Indiana concurs with the selected remedy. The letter of concurrence is attached to this Record of Decision as Attachment 2.

DECLARATION

The Selected Remedy and Contingent Remedy are protective of human health and the environment and attain Federal and State requirements that are legally applicable or relevant and appropriate to this site. The statutory preferences for cost-effectiveness, permanent solutions and alternative treatment technologies are not applicable to the "No Action" (modified) alternative. In order to ensure continued protection of human health and the environment, a five-year review will apply to this action.

3/31/92
Date

Valdas V. Adamkus
Regional Administrator

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

OLD CITY LANDFILL
LOCATED IN COLUMBUS, INDIANA

MARCH, 1992

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

OLD CITY LANDFILL

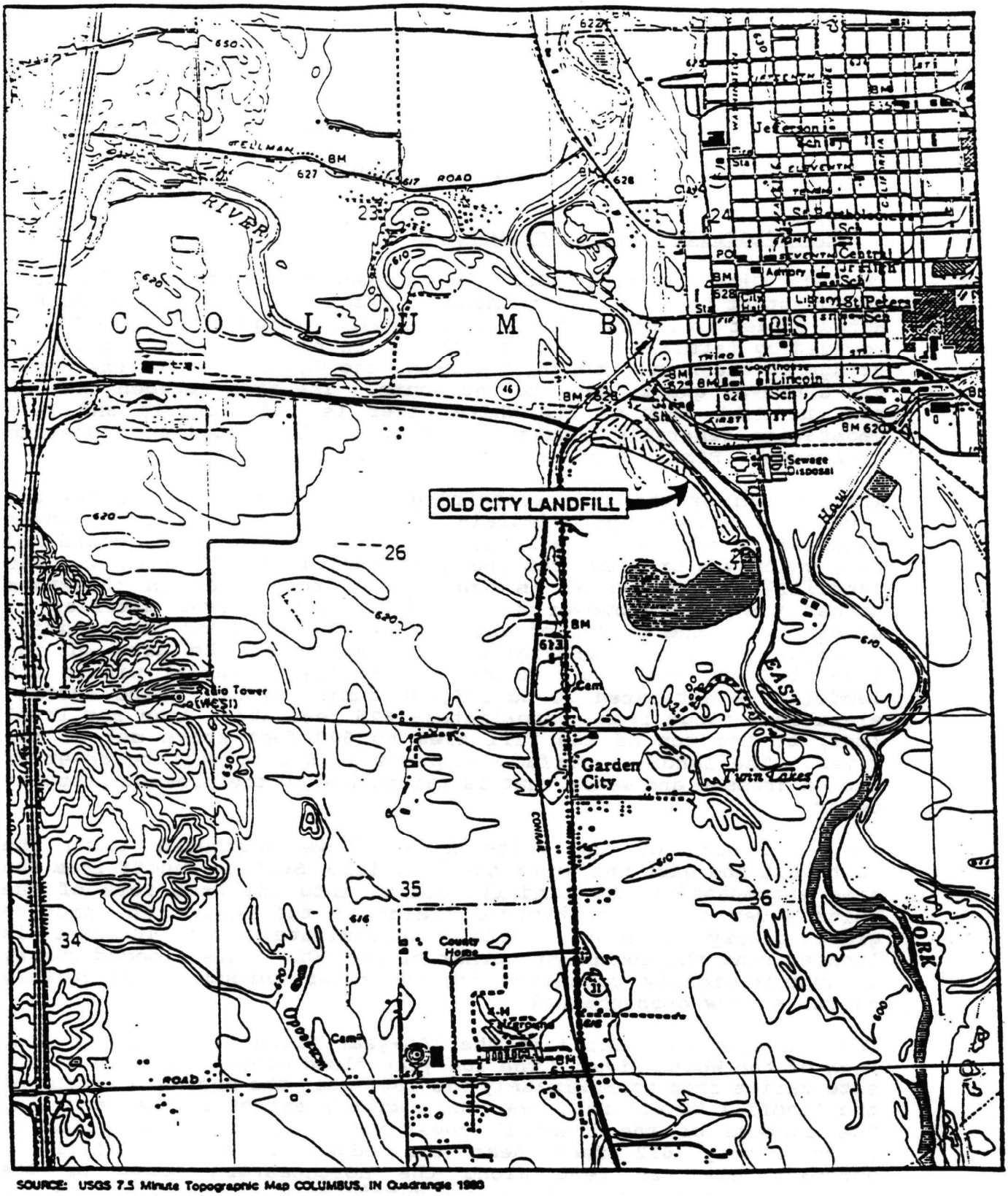
I. SITE LOCATION AND DESCRIPTION

The Old City Landfill (OCL) is located approximately 1/4 mile southwest of the City of Columbus in Section 25, Township 9 north, Range 5 east in Bartholomew County, Indiana (Figure 1). The OCL is bounded by farmland and State Route 11 to the west, the 3rd Street Bridge to the north, the East Fork of the White River to the east, and a gravel quarry pond to the south. The area between the OCL and the East Fork of the White River is a floodplain and it's vegetation generally consists of grass/small shrubs and moderate tree cover. Figure 2 shows the site area in detail.

The portion of the site containing waste material parallels the river and covers approximately 19 acres. The landfill cover material is composed of a mixture of brown to black silty sand and clay which was dredged from the East Fork of the White River. The landfill cover material is generally 2 to 3 feet in thickness across the site, however 4 to 5 feet of the cover material is present near the center of the site. The depth of the landfill material averages approximately 17 feet over the area of the landfill, and the total volume of the fill material within the landfill is estimated to be 500,000 cubic yards. Land surface elevations range from approximately 625 feet above mean sea level (msl) at the top of the fill area to 600 feet above msl at the river. The landfill surface supports a full vegetative cover of native grasses and weeds that is maintained by the present property owner.

The East Fork of the White River flows southward along the northwest and east border of the landfill. Surface runoff from the area encompassing the landfill drains into the East Fork of the White River or the cultivated fields to the west. An inactive gravel quarry, covering an area of approximately 35 to 40 acres, is located near the southeast corner of the OCL. This flooded quarry is hydrologically connected to the river through a relatively short, narrow open channel.

The OCL site is located in the 100-year flood plain of the East Fork of the White River. The 100-year flood elevation level at the site varies from approximately 618 feet near the southern extent of the landfill to 621 feet near the northern extent of the landfill. The surface of the landfill cover varies from an elevation of approximately 612 feet near the edges of the landfill to approximately 625 feet along the northeastern crest of the landfill. Thus, a portion of the surficial soil that overlies the waste material becomes submerged during a 100-year flood occurrence.



SOURCE: USGS 7.5 Minute Topographic Map COLUMBUS, IN Quadrangle 1980

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0 1000 2000 4000

SCALE IN FEET

FIGURE 1
SITE LOCATION MAP
OLD CITY LANDFILL
COLUMBUS, INDIANA

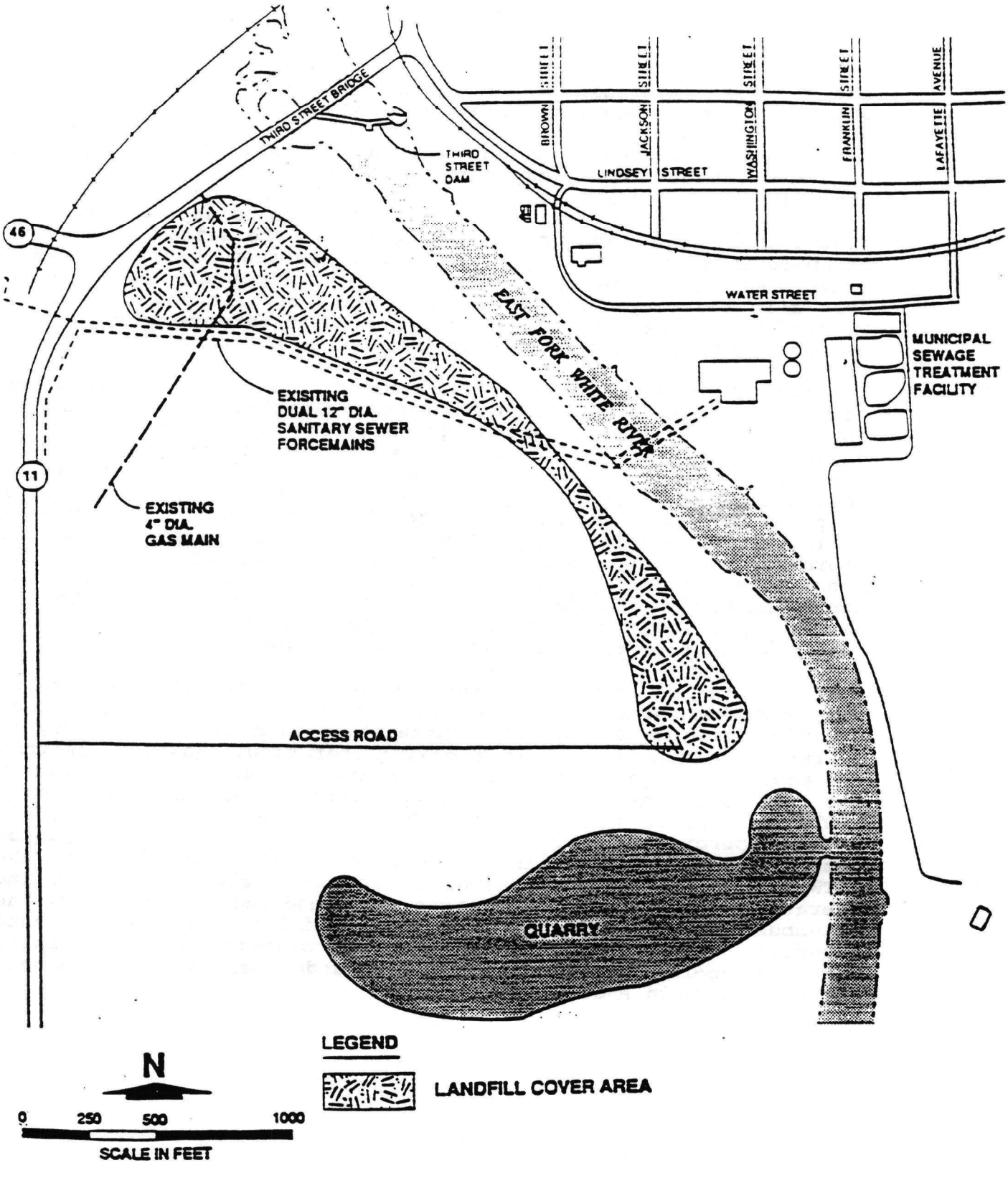

FIGURE 2
SITE CONFIGURATION MAP
OLD CITY LANDFILL
COLUMBUS, INDIANA

The OCL is underlain by a complex heterogeneous deposit of unconsolidated recent and Pleistocene age materials. The uppermost natural deposit of unconsolidated material at the site consists of coarse sand and gravel. Underlying the sand and gravel deposit is an intermittent thin sandy clay and gravel zone (glacial till) approximately 2 to 3 feet thick. The thin till zone is underlain by a very coarse sand and gravel deposit which is approximately 15 feet in thickness, and is continuous across the site. At a depth of approximately 30 to 35 feet below land surface (bls), silts and clays containing organic material become prominent. Underlying this silt and clay zone is a firm deposit of silt and clay mixed with pebbles (glacial till). This till unit extends to the shale bedrock surface, which is continuous across the site.

Groundwater beneath the site exists within a shallow aquifer which consists of the unconsolidated glacial material described above. The predominant direction of groundwater flow at the site is generally parallel to the flow of the East Fork of the White River. The shale unit underlying the unconsolidated deposits acts as an aquitard, effectively separating the upper unconfined aquifer from deeper consolidated permeable water bearing zones. The primary municipal well field for the City of Columbus is located approximately 1.5 miles to the southwest of the site. The population within a three mile radius of the site is estimated approximately 33,000 people. The distance from the site to the nearest private water supply is approximately 750 feet west (upgradient) from the northwest corner of the site.

Current land use in the immediate vicinity of the OCL is variable. The northwest section of the OCL property is used as a target practice shooting range. The southeast portion of the property is currently leased to a concrete mixing operation. However, neither the shooting range nor the concrete mixing operation are located on the landfill. The City of Columbus publicly owned treatment works (POTW) is located directly across the river. Dividing the landfill at its approximate midpoint are two 12 inch diameter, asbestos cement, sanitary sewer lines that extend across the river to the POTW. The two sanitary sewer lines are currently in use and operate as force mains. The lines are owned and maintained by the Columbus City Utilities and are located within or below the waste material. A currently active, four inch diameter steel gas main, owned and operated by Indiana Gas, also underlies the landfill near its northwestern end.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Site History

The OCL operated as a municipal landfill from about 1938 to the mid to late 1960's. Material deposited in the landfill was mainly municipal and household wastes, although waste from industrial sources was also reportedly disposed of in the landfill. No records of site operations were kept. Public dumping was not permitted; however, the site was not secured and limited dumping by unauthorized parties may have occurred. The waste material dumped at the OCL was placed directly on the ground surface. The ground surface was not lined prior to the initiation of dumping activities nor was excavation accomplished to create disposal pits. Open burning of the waste material occurred regularly. The waste material was not consistently contained under daily cover and, thus, was frequently exposed to the elements.

The disposal area was also subjected to annual spring flooding, which likely caused the waste material to become periodically submerged. Eventually, the landfill began to function as a berm between the floodplain and the farmland located west of the landfill. After the waste material reached a maximum height of approximately 20 feet, operation of the landfill ceased. The landfill was closed by placing dredged river sediment, primarily silty sand and clay, over the entire landfill. This material is generally 2 to 3 feet in thickness across the landfill and presently supports a full vegetative cover.

B. Enforcement

In August 1981, the United States Environmental Protection Agency (U.S. EPA) received a "Notification of Hazardous Waste Site" pursuant to Section 103(c) of CERCLA from Cummins Engine Company in Columbus Indiana. Waste materials generated that were reportedly disposed of at the OCL include; solvents, acids, lubricants, cutting fluids, and the metals that were extracted by the solvents.

In March, 1985, the OCL was ranked by the U.S. EPA, using the Hazard Ranking System (HRS). The results of the HRS scoring indicated the existence of a risk of actual or potential release of hazardous substances. Such a release presents a current or potential threat to public health, welfare or the environment. The HRS score of 45.31 exceeded U.S. EPAs 28.5 minimum score for inclusion on the National Priorities List (NPL). On June 10, 1986, the OCL was placed on the NPL.

Special Notice Letters, informing 12 potentially responsible parties (PRPs) (including the site's owner, operator, and waste generators) of their potential CERCLA liability for the OCL site, were sent in July 1986. The U.S. EPA and the Indiana Department of Environmental Management (IDEM) entered into an Administrative Order on November 5, 1987 with three PRPs; Cummins Engine Company, Inc., Arvin Industries, Inc., and the City of Columbus. Pursuant to this Administrative Order, the PRPs agreed to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the OCL under the direct guidance of the U.S. EPA and IDEM. The PRPs hired Geraghty & Miller, Inc., a private contractor, (G&M) to conduct the RI/FS.

In May, 1990, the PRPs performing the RI/FS informed U.S. EPA that the Indiana Department of Transportation (INDOT) and the City of Columbus wished to construct a roadway across the landfill. The PRPs requested that the Feasibility Study be prepared in a manner that addressed this possibility. This request was granted, and a separate document, entitled "Technical Supplement to the Feasibility Study" evaluated the potential environmental impacts from construction of a roadway at the site.

C. Site Investigation

A Remedial Investigation (RI) was conducted at the OCL site from October 1988 through January 1990. The RI pursued the following objectives: (1) to assess the direction and rate of groundwater flow in the vicinity of the landfill; (2) to characterize the horizontal and vertical extent of any affected groundwater; and (3) to assess the impact of the waste material deposited in the landfill on soil, groundwater, surface water and river sediments in the vicinity of the site. Work consisted of the following activities, installation of groundwater monitoring wells and piezometers at and around OCL; surficial and subsurface soil sampling; surface water and sediment sampling from the adjacent East Fork of the White River; landfill waste sampling; and leachate seep inspections. The RI Report, with a Risk Assessment (RA) included, was completed in July 1990. The RI Report, as well as the RI Work Plan and Quality Assurance Project Plan, are part of the Administrative Record. The Remedial Investigation included the following major work components:

Surficial Soil: A total of nineteen surface soil and QA/QC samples were collected from the existing landfill cover during the RI. Background samples were collected at four locations away from the landfill. All of the surficial soil samples were analyzed for the U.S. EPA Target Compound List (TCL) parameters.

Subsurface Soil: A total of nine subsurface samples were collected for U.S. EPA TCL analysis from six soil borings located adjacent to and outside the landfill area.

Groundwater: Two rounds of groundwater samples were collected from the 13 monitoring wells and submitted for chemical analysis. The monitoring well network consisted of seven existing wells that had been installed as part of a previous investigation by a PRP in 1985, as well as six new monitoring wells installed by G&M as part of the Remedial Investigation. Twenty-three groundwater samples were submitted for analysis during the initial round of sampling, and twenty-two samples were taken in the second round with the same distribution as the first sampling round, with the exception of one less trip blank.

Measurement of groundwater elevations were taken from the monitoring wells and piezometers in order to determine groundwater flow direction.

Surface Water: Three surface water samples were collected from the East Fork of the White River to evaluate the river water quality upstream, adjacent to, and downstream of the OCL. Surface water samples were analyzed for U.S. EPA TCL parameters.

Sediments: Three river sediment samples were collected to assess the quality of the river sediments upstream, adjacent to, and downstream of the OCL. These samples were analyzed for U.S. EPA TCL parameters.

Landfill Waste: A total of eleven landfill waste samples were collected from soil borings completed in the landfill waste area. These samples were analyzed for U.S. EPA TCL parameters.

Leachate Seep Inspections: An inspection of the landfill area for leachate seeps was conducted during groundwater collection activities for each round of groundwater sampling. No evidence of active or inactive seeps were visible; therefore, no samples were collected for analysis.

A Feasibility Study Report was submitted in draft form by the PRPs to the U.S. EPA. Following review and comment by by the U.S. EPA and IDEM, the report was finalized in May 1991. The Technical Supplement to the FS was also submitted, summarizing results from a preload testing program which studied the effect of roadway weight upon the landfill material. The Technical Supplement provided geotechnical data, groundwater monitoring data, and evaluated the environmental feasibility of placing a roadway across the landfill. The Technical Supplement was finalized in November 1991.

III. COMMUNITY RELATIONS

The FS Report and the Proposed Plan were made available for public comment from January 23, 1992 through February 21, 1992. A public meeting was held during this comment period on January 30, 1992 to inform local residents of the Superfund process and about the work conducted under the RI. The U.S. EPA has responded to all significant comments received during the public comment period pursuant to Sections 113(k) (2) (B) (i - v) and 117 of CERCLA. U.S. EPA's responses to these comments is included in the Responsiveness Summary, which is attached to this ROD.

An information repository has been established at the Bartholomew County Public Library, 536 Fifth Street, Columbus, Indiana. Pursuant to Section 113 (k) (1) of CERCLA, which requires that the Administrative Record be available to the public at or near the facility at issue, the Administrative Record File is available to the public at this information repository.

IV. SCOPE AND ROLE OF THE RESPONSE ACTION

The scope of this response action is to provide a final remedy that addresses the actual or potential contamination caused by waste disposed at the OCL.

Based upon the findings of the RI, the current site risks (discussed below), and the Administrative Record, EPA has concluded that the OCL currently poses no immediate or long-term risks to human health and the environment. It is important to note, however, that this conclusion is based on current site conditions with the assumption that these conditions will not change. In addition, the selected remedy, "No Action" (modified), includes groundwater monitoring and a five year review of site conditions.

V. SUMMARY OF CURRENT SITE CONDITIONS AND SITE RISKS

The RI/FS Reports have adequately described the current conditions of the OCL site. A summary of the conclusions of the RI Report and the RA is as follows:

Surficial Soil

Evaluation of the analyses for photoionizable volatile organic compounds (VOCs) indicates that chloroform and methyl ethyl ketone were detected on one occasion in separate samples, at concentrations of 23.0 ug/kg and 10.0 ug/kg, respectively. All other VOCs analyzed for were below the minimum detection limits (MDLs) for the analytical method used. All semi-volatile compounds analyzed for were below MDLs. Estimated values for several semi-volatile compounds that were identified at concentrations below the MDLs are presented in Table 2-1. No TCL pesticides or PCBs were detected.

Cadmium and mercury were the only inorganics detected above background soil levels. The inorganic analyses identified two elements, cadmium and mercury, in all but one of the samples, at maximum concentrations of 2.6 mg/kg and 0.47 mg/kg, respectively. Refer to Table 1 for the occurrence of constituents in the surficial soil samples.

Subsurface Soil

Evaluation of the VOC analyses indicates that three compounds (acetone, methylene chloride, and methyl ethyl ketone) were detected at concentrations above their MDLs in several of the subsurface soil samples. The maximum detected concentrations of acetone and methylene choride were 134 ug/kg and 17.6 ug/kg, respectively; however, acetone and methylene chloride were also detected in the field and trip blanks indicating these compounds are likely laboratory contaminants. In addition, please note that because they are considered to be likely laboratory contaminants, acetone and methylene chloride are not listed as part of Table 2. Methyl ethyl ketone was detected in one subsurface soil sample at an estimated maximum concentration of 23.8 mg/kg. Evaluation of the semi-volatile analyses indicate that no concentrations of compounds were detected above the MDLs. The only detectable pesticide/PCB compound was delta-BHC occurring in one subsurface soil sample at an estimated concentration of 30 ug/kg. The inorganic analyses indicates maximum concentrations of cadmium (1.6 mg/kg), zinc (340 mg/kg), copper (348 mg/kg), and lead (210 mg/kg) which exceed the background subsurface sample concentrations. Refer to Table 2 for the occurrence of constituents in the subsurface soil samples.

Groundwater

The groundwater samples collected from the thirteen on-site monitoring wells did not exhibit any VOCs above the MDLs. The semi-volatile analyses indicated that four compounds were detected above MDLs during the two groundwater sampling rounds. Concentrations above the MDLs of 2,4-dimethylphenol (23 ug/l), napthalene (110 ug/l), and 2-methylnapthalene (6.63 ug/l) were detected in a single groundwater sample during the first round. During the second round of groundwater samples bis-(2-ethylhexyl)phthalate was detected above the MDL in one sample at a concentration of 2.3 mg/l. No TCL pesticides or PCBs were detected. Seventeen inorganic elements were detected in at least two groundwater samples including cadmium and lead at maximum concentrations of 3.2 ug/l and 9.9 ug/l respectively. Groundwater indicator parameters were also analyzed to assist in characterizing

Table 1 Occurrence of Constituents in Surficial Soil at the Old City Landfill, Columbus, Indiana

Constituent	Range [a]	Average Detected Concentration [b]	Frequency of Detection [c]	Background Range
Metals				
Aluminum	3,800-7,610	6388	12/12	7,410-16,500
Antimony	3.4-9.6	6.12	6/12	6.3-8.4
Arsenic	3.2-6.9	4.39	12/12	5.0-7.0
Barium	20-120	70.3	12/12	73-180
Beryllium	0.18-0.55	0.34	12/12	0.33-0.82
Cadmium	0.13-2.6	0.65	12/12	0.37-0.97
Calcium	31,500-126,000	53058	12/12	4,100-62,900
Chromium	7.9-35	13.03	12/12	12-32
Cobalt	3.3-6.7	4.89	12/12	5.3-11
Copper	7.1-67	18	12/12	12-29
Iron	9,590-21,400	14216	12/12	15,200-28,700
Lead	7.4-92	33	12/12	2-54
Magnesium	10,700-34,600	18350	12/12	4,050-23,900
Manganese	263-833	468	12/12	546-1,310
Mercury	0.05-0.47	0.10	12/12	0.061-0.096
Nickel	2.1-43	21.1	12/12	13-60
Potassium	540-1,300	933	12/12	1,100-2,400
Silver	0.57-0.76	0.65	4/12	BDL-0.93
Sodium	52-140	83.3	12/12	41-110
Vanadium	11-22	16.4	12/12	21-37
Zinc	28-180	74.1	12/12	58-110
Volatile Organics				
Chloroform	0.023	0.023	1/12	BDL
Dichlorobromo-methane [d]	0.0048	0.0048	1/12	BDL
2-Hexanone [d]	0.0058	0.0058	1/12	BDL
Methyl ethyl ketone [d]	0.01	0.01	1/12	BDL
M-xylene [d]	0.002	0.002	1/12	BDL
Semi-Volatile Organics [d]				
Diethyl phthalate	0.04-0.06	0.05	4/12	0.043-0.063
Di-n-butylphthalate	0.04-0.05	0.05	2/12	0.055
Fluoranthene	0.03-0.49	0.21	6/12	0.056-0.077
Pyrene	0.03-0.39	0.18	6/12	0.069
Chrysene	0.07-0.11	0.09	2/12	BDL
Bis(2-ethylhexyl)phthalate	0.06-0.41	0.17	4/12	0.2-0.3
Di-N-octylphthalate	0.07	0.07	1/12	BDL
Benzo(b)fluoranthene	0.02-0.18	0.11	4/12	BDL
Benzo(a)pyrene	0.09	0.09	1/12	BDL
Indeno(1,2,3-c,d)pyrene	0.08	0.08	1/12	BDL
Benzo(g,h,i)perylene	0.09	0.09	1/12	BDL
Miscellaneous				
Cyanide (total)	0.00061-0.00078	0.00068	3/12	0.00091

Concentrations reported in milligrams per kilogram (mg/kg).

BDL = Below Detection Limit.

[a] = Minimum - Maximum Concentrations.

[b] = Average is based upon those data points reported as above Detection Limit.

[c] = x/y; where x = number of samples with analytical results above the detection limit and y = number of samples analyzed.

[d] = Estimated concentration; all semi-volatile compound concentrations are estimated values.

Table 2 Occurrence of Constituents in Subsurface Soil at the Old City Landfill, Columbus, Indiana

Constituent	Range [a]	Average Detected Concentration [b]	Frequency of Detection [c]	Background Range [d]
Metals				
Aluminum	1,300-3,250	2247	7/7	8,810-12,900
Antimony	2.2-5.3	3.8	7/7	BDL
Arsenic	2.0-5.2	3.1	7/7	5.4-9.9
Barium	8.3-180	47.0	7/7	85-120
Beryllium	0.055-0.28	0.12	7/7	0.29-0.47
Cadmium	0.091-1.6	0.85	2/7	BDL
Calcium	41,200-176,000	97314	7/7	44,200-44,900
Chromium	3.1-49	12	7/7	11-14
Cobalt	1.8-3.6	2.6	6/7	6.4-7.8
Copper	3.4-348	55	7/7	12-17
Iron	5,780-14,900	8388	7/7	16,600-24,400
Lead	1.8-210	33	7/7	12-17
Magnesium	1,920-43,500	24517	7/7	16,000-19,700
Manganese	196-445	290	7/7	570-934
Mercury	0.018-0.24	0.067	5/7	BDL
Nickel	3.6-36	9.7	7/7	13-20
Potassium	120-590	281	7/7	670-800
Silver	0.27-1.9	0.92	4/7	BDL
Sodium	44-93	63.3	7/7	BDL
Vanadium	4.5-16	8.3	7/7	19-26
Zinc	9.8-340	63	7/7	53-74
Cyanide (total)	0.00059-0.00085	0.00069	6/7	BDL
Volatile Organics				
Methyl Ethyl Ketone [e]	0.023	0.023	1/7	BDL
Base/Neutral and Acid Compounds				
Acenaphthene	0.032	0.032	1/7	BDL
Benzo(a)anthracene	0.053	0.053	1/7	BDL
Benzo(a)pyrene	0.36	0.36	1/7	BDL
Benzo(b)fluoranthene	0.45	0.45	1/7	BDL
Benzo(g,h,i)perylene	0.69	0.69	1/7	BDL
Benzo(k)fluoranthene	0.41	0.41	1/7	BDL
Chrysene	0.43	0.43	1/7	BDL
1,4-Dichlorobenzene	0.039	0.039	1/7	BDL
Fluoranthene	0.54	0.54	1/7	BDL
Fluorene	0.021	0.021	1/7	BDL
Indeno(1,2,3-c,d)-pyrene	0.3	0.30	1/7	BDL
Naphthalene	0.022	0.022	1/7	BDL
N-Nitrosodi-N-propyla	0.025	0.025	1/7	BDL
Phenanthrene	0.28	0.28	1/7	BDL
Pyrene	0.44	0.44	1/7	BDL
1,2,4-Trichloro-benzene	0.021	0.021	1/7	BDL
Dibenzofuran	0.012	0.012	1/7	BDL
Diethyl phthalate	0.030	0.030	1/7	0.030
2-Chlorophenol	0.048	0.048	1/7	0.04
Pesticides and PCBs				
Delta-BHC [e]	0.03	0.03	1/7	BDL

Concentrations reported in milligrams per kilogram (mg/kg).
BDL = Below Detection Limit.
[a] = Minimum - Maximum concentrations.
[b] = Average is based upon those data points reported as above Detection Limit.
[c] = x/y; where x = number of samples with analytical results above Detection Limit and y = number of samples analyzed.
[d] = Average range of two samples (GMSB14-03 and GMSB14-08) collected from depths of 4-6 and 14-16 feet.
[e] = Estimated concentration.

Table 3 Occurrence of Constituents in Ground Water at the Old City Landfill, Columbus, Indiana

Constituent	Range [a]	Average Detected Concentration [b]	Background Range	MCLs [c]	
Metals					
Aluminum	0.02[d]–0.16	0.030	0.073–1.32	0.05–0.2	[PS]
Arsenic	0.0004[d]–0.016	0.0026	0.0009	-	
Barium	0.078–0.58	0.21	0.10	5.00	
Beryllium	0.00020[d]–0.0004	0.00023	BDL	0.001	[P]
Cadmium	0.00075[d]–0.0032	0.0011	BDL	0.005	
Calcium	86.4–165	120	109–112	-	
Chromium	0.0029[d]–0.0058	0.0031	BDL	1.0	
Copper	0.0018[d]–0.012	0.003	BDL	1.3	
Lead	0.0006[d]–0.0099	0.002	0.0037–0.0083	0.005	
Magnesium	21–49	3.3	27.4–27.9	-	
Manganese	0.00075[d]–0.89	0.31	0.258–0.944	0.05	[S]
Nickel	0.0019[d]–0.0063	0.0028	BDL	1.0	
Potassium	0.65–34.6	9	1.7–1.9	-	
Selenium	0.00035[d]–0.0018	0.0049	BDL	0.05	
Silver	-	-	BDL	0.09	[PS]
Sodium	2.1–3.5	19	8.2–12	-	
Thallium	-	-	BDL	0.002	[P]
Vanadium	0.0027[d]–0.001	0.0039	BDL	-	
Zinc	0.0015[d]–0.31	0.076	0.0054–0.068	5.0	[S]
Organic Compounds					
Bis(2-ethylhexyl) phthalate [e]	0.0020–2.3	0.0061	BDL	-	
Acenaphthylene	-	-	BDL	-	
2,4-dimethylphenol	-	-	BDL	-	
1,2-dichloroethane	-	-	BDL	0.005	
Methyl ethyl ketone	-	-	BDL	-	
2-methylnaphthale	-	-	BDL	-	
Napthalene	-	-	BDL	-	
Toluene	-	-	BDL	2.0	
Miscellaneous					
Chloride	21–56	33	24.6–31.8	250	[S]
Nitrate	0.05[d]–10.8	2.4	7.6	10.0	
Sulfate	26–60	41	43–67	250	[S]

Concentrations reported in milligrams per liter (mg/L).
BDL = Below Instrument Detection Limit.
"-" Indicates constituent detected only once or MCL not currently established.
[a] = Minimum–Maximum concentrations.
[b] = Average utilizes 50% of method Detection Limit for data points reported below quantitation limit.
[c] = Maximum contaminant levels for drinking water (USEPA April 1990)
[d] = Value is one-half of instrument Detection Limit.
[e] = Average was calculated geometrically due to an extreme outlier concentration.
[S] = Secondary Maximum Contaminant Level
[P] = Proposed Maximum Contaminant Level
[PS] = Proposed Secondary Maximum Contaminant Level

groundwater conditions at the site. Because no distinct plume of TCL constituents has been identified as emanating from the landfill area, groundwater indicator parameters were monitored to assist with the assessment of groundwater transport from the site. The groundwater indicator parameters measured included; chloride, nitrate, and sulfate. Refer to Table 3 for the occurrence of these constituents in the groundwater samples.

Surface Water

Evaluation of the VOC analyses indicates that methylene chloride and acetone were detected, although these compounds were also detected in the field and trip blank samples. Bis(2-ethylhexyl) phthalate was detected at a maximum concentration of 1.8 ug/l; however, it was also detected upstream of the landfill at a concentration of 1.2 ug/l. There were no semi-volatile compounds detected above the MDLs in the three surface water samples and in the duplicate and field blank samples. No TCL pesticides or PCBs were detected.

The inorganic analyses results identified 10 elements with concentrations above the MDL. Of these, only lead, which was detected in only one sample at 1.1 ug/l, has a federal standard for ambient water quality, which is 3.2 ug/l. Refer to Table 4 for the occurrence of constituents in the surface water samples. Acetone and methylene chloride are not listed on Table 4 because they are likely laboratory contaminants.

River Sediment

There were no concentrations of VOCs or semi-volatiles detected above the MDLs in the river sediment samples. However, estimated concentrations (below MDLs) of bis(2-ethylhexyl) phthalate (maximum concentration of 0.68 mg/kg) and 2,4,6-trichlorophenol (0.12 mg/kg) were detected. In addition, no TCL pesticides or PCBs were detected and the inorganic analytical results indicated that the detected element concentrations were not excessive relative to the background levels. Refer to Table 5 for the occurrence of constituents in the river sediment samples.

Landfill Waste Material

The VOC constituents detected in the waste material samples include benzene, ethylbenzene, metyhlene chloride, toluene, acetone, carbon disulfide, methyl ethyl ketone, methyl isobutyl ketone, and xylene. Semi-volatile constituents (flouranthene 4.9 mg/kg, phenanthrene 6.7 mg/kg, pyrene 3.6 mg/kg, napthalene 8.2 mg/kg, and 2-methylnapthalene 2.3 mg/kg) were detected above the MDL in three of

Table 4 Occurrence of Constituents in Surface Water from the East Fork of the White River, Columbus, Indiana

Constituent	*Range [a]*	*Average Detected Concentration [b]*	*Frequency of Detection [c]*	*Site-Specific Background [d]*
Metals				
Aluminum	0.057–0.058	0.058	2/2	0.047
Barium	0.074–0.081	0.078	2/2	0.074
Calcium	84.2–86.2	85.2	2/2	85.5
Copper	0.0052–0.0056	0.0054	2/2	0.0039
Iron	0.16–0.17	0.17	2/2	0.13
Magnesium	28.9–29.5	29.2	2/2	29.5
Manganese	0.020–0.035	0.028	2/2	0.02
Potassium	1.9–2.0	2.0	2/2	1.8
Sodium	26.0–29.0	27.5	2/2	27.0
Zinc	0.0072–0.0075	0.0074	2/2	0.012
Organics				
Bis(2-ethylhexyl) phthalate	0.00087–0.0018	0.0016	2/2	0.0012

Concentrations reported in milligrams per liter (mg/L).

[a] = Minimum–Maximum concentrations.

[b] = Average is based upon those data points reported as above detection limit.

[c] = x/y; where x = number of samples with analytical results above the detection limit and y = number of samples analyzed.

[d] = From upstream sample (I.D. GMSS01).

Table 5. Occurrence of Constituents in Sediment from the East Fork of the White River, Columbus, Indiana.

Constituent	Range [a]	Average Detected Concentration [b]	Frequency of Detection [c]	Site-Specific Background [d]
Metals				
Aluminum	1,500-1,600	1550	2/2	1600
Antimony	3.5-4.7	4.1	2/2	BDL
Arsenic	1.8	1.8	2/2	1.8
Barium	13-16	14.5	2/2	13
Beryllium	0.19	0.19	1/2	0.19
Cadmium	0.16	0.16	1/2	0.11
Calcium	108,000-128,000	18000	2/2	64700
Chromium	4.2-5.2	4.7	2/2	5.8
Cobalt	1.4	1.4	2/2	BDL
Copper	3.7-4.4	4.1	2/2	2.6
Iron	5,150-6,110	5630	2/2	4400
Lead	2.3-10	6.2	2/2	2.6
Magnesium	36,800-37,500	37150	2/2	18300
Manganese	216-324	270	2/2	152
Mercury	BDL	BDL	0/2	0.042
Nickel	4.2-4.4	4.3	2/2	4.9
Potassium	210-250	230	2/2	290
Silver	0.81	0.81	1/2	BDL
Sodium	76-130	103	2/2	110
Vanadium	7.2-8.8	8	2/2	5.6
Zinc	14-16	15	2/2	18
Base/Neutral and Acid Compounds				
Bis(2-ethylhexyl) phthalate [e]	0.11-0.68	0.39	2/2	BDL
2,4,6-Trichloro-phenol [e]	0.12	0.12	1/2	BDL
Miscellaneous				
Cyanide (total)	0.0008	0.0008	1/2	BDL

Concentrations reported in milligrams per kilogram (mg/kg).

BDL = Below Detection Limit.

[a] = Minimum-Maximum concentrations.

[b] = Average is based upon those data points reported as above Detection Limit.

[c] = x/y; where x = number of samples with analytical results above the detection limit and y = number of samples analyzed.

[d] = From upstream sample (I.D. GMSD01).

[e] = Estimated concentration(s).

Table 6. Occurrence of Constituents in Landfill Samples at the Old City Landfill, Columbus, Indiana.

Constituent	*Range [a]*	*Average Detected Concentration [b]*	*Frequency of Detection [c]*
Metals			
Aluminum	1,300-8,390	4788	8/8
Antimony	3.20-23.0	11	4/8
Arsenic	1.90-9.40	5.01	8/8
Barium	19.0-1,580	288.0	8/8
Beryllium	0.06-0.52	0.23	8/8
Cadmium	0.14-24.0	6.94	6/8
Calcium	48,800-164,000	102675	8/8
Chromium	4.70-3,250	431	8/8
Cobalt	1.20-49.0	9.53	7/8
Copper	5.30-220	86.7	8/8
Iron	5,240-61,000	31630	8/8
Lead	1.80-7,610	1216	8/8
Magnesium	9,620-38,000	22388	8/8
Manganese	320-1,510	605	8/8
Mercury	0.03-0.36	0.17	7/8
Nickel	4.4-95	39.2	8/8
Potassium	210-1,500	885	8/8
Silver	0.67-29.0	12.52	4/8
Sodium	81.0-380	202	8/8
Vanadium	5.7-19.0	13.14	8/8
Zinc	14.0-3370	912	8/8
Cyanide (total)	0.00064-0.0018	0.0009	8/8
Volatile Organics			
Ethylbenzene	0.003-0.02	0.01	2/8
Toluene	0.001-0.0014	0.0012	1/8
Methyl ethyl ketone	0.01-0.03	0.02	2/8
Methyl-iso-butyl ketone	0.07	0.07	1/8
M-xylene	0.0061-0.05	0.03	2/8
O+P-xylenes	0.0069-0.06	0.04	2/8

see notes next page

Table 6. Occurrence of Constituents in Landfill Samples at the Old City Landfill Columbus, Indiana (continued).

Constituent	Range [a]	Average Detected Concentration [b]	Frequency of Detection [c]
Base/Neutral and Acid Compounds			
Acenaphthene	0.11-2.52	1.22	4/8
Anthracene	1.79	1.79	1/8
Benzo(a)anthracene	0.13-1.75	0.69	3/8
Benzo(a)pyrene	0.58	0.58	1/8
Benzo(b)fluoranthene	0.14-0.46	0.3	2/8
Benzo(g,h,i)peryiene	0.08-0.92	0.5	2/8
Benzo(k)fluoranthene	0.45	0.45	1/8
Chrysene	0.10-1.24	0.65	3/8
Dibenzo(a,h)anthracene	0.19	0.19	1/8
Di-N-butyl phthalate	7.63	7.63	1/8
Fluoranthene	0.19-4.89	2.39	5/8
Fluorene	0.13-2.10	0.86	5/8
Indeno(1,2,3-c,d)-pyrene	0.35	0.35	1/8
Naphthalene	0.08-8.15	3.12	5/8
Phenanthrene	0.62-6.7	3.03	5/8
Pyrene	0.22-3.56	1.71	5/8
2-Methylnaphthalene	0.07-2.33	1.19	5/8
Dibenzofuran	0.07-1.62	0.65	5/8
Pesticides and PCBs			
Beta-BHC	0.29	0.29	1/8
Delta-BHC	0.02	0.02	1/8
4,4'-DDD [e]	0.05-0.06	0.06	2/8
Heptachlor	0.013	0.013	1/8
Alpha-Chlordane	0.09	0.09	1/8
Gamma-Chlordane	0.09	0.09	1/8
Aroclor 1254 [e]	0.84	0.84	1/8

Concentrations reported in milligrams per kilogram (mg/kg).

[a] = Minimum - Maximum Concentrations.

[b] = Average is based upon those data points reported as above Detection Limit.

[c] = x/y; where x = number of samples with analytical results above the detection limit and y = number of samples analyzed.

[d] = Average of two samples (GMSB14-03 and GMSB14-08) collected from depths of 4-6 and 14-16 feet.

[e] = Estimated concentrations.

the eight waste samples. Pesticides and PCBs detected include: 4,4'-DDD (estimated concentration 57 ug/kg), alpha- chlordane (maximum concentration of 93 ug/kg); and Aroclor 1254 (estimated concentration of 0.84 mg/kg). The inorganic analyses indicated the presence of a majority of the TCL elements at moderate concentrations including: cadmium (24 ug/kg); nickel (95 mg/kg); mercury (0.36 mg/kg); and lead (estimated at 21,700 mg/kg). Refer to Table 6 for the occurrence of constituents in the landfill samples.

General

* The landfill is currently fully covered with dredged sediment from the river consisting primarily of silty sand and clay.

* The landfill cover material is generally 2 to 3 feet in thickness across the landfill, however, 4 to 5 feet of cover material has been documented in at least two locations.

* The landfill currently supports a full vegetative cover, ranging from grasses to trees. No evidence of stressed vegetation was observed.

* The landfill has been subjected to annual flooding, primarily during the springtime, which most likely has caused the waste material to become submerged in the flood waters.

* No evidence of leachate seeps/cracks have been observed.

Summary of Site Risks

The RI Report contains a Risk Assessment (RA) which characterizes the nature and magnitude of potential risks to human health and the environment caused by the contaminants identified at the OCL. The RA, utilizing data obtained from the RI, addressed the following issues:

* The potential for exposure to constituents found at the site;

* The inherent toxicologic hazards associated with the constituents at the site; and

* The risks posed by potential exposure to constituents at the site.

A. Selection of Indicator Chemicals

The following constituents, judged representative of site contamination and posing the greatest potential health risk, are considered constituents of concern:

* Cadmium
* Lead
* Polycyclic aromatic hydrocarbons (PAHs)
* Phthalate esters
* Methyl ethyl ketone
* cyanide

B. Exposure Characterization

The purpose of the exposure characterization is to estimate the type and magnitude of exposure to constituents of concern that are present at, or migrating from, a site. There are no identified exposed populations or wells impacted by contaminants released from the OCL. The results of the RI concluded that the environmental media of potential concern at the site (i.e., air, surficial soil, groundwater and surface water) have not been adversely affected by contaminants from the the OCL. As a result, the only current potential exposure pathway is the ingestion of, and direct contact with, the landfill soil cover and waste material. Potential future exposure pathways include: (1) direct contact and incidental ingestion of surficial soils on-site by hikers or construction workers; (2) swimming or ingestion of fish caught locally in the East Fork of the White River or the quarry; and (3) ingestion of water from a hypothetical potable well installed downgradient of the site.

C. Toxicity Assessment Summary

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

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

The U.S. EPA has also derived cancer classifications for constituents of concern. These classifications are as follows:

A = Human Carcinogen.
B1 = Probable human carcinogen; limited human data available.
B2 = Probable human carcinogen; animal data only.
C = Possible human carcinogen.
D = Not classifiable as to human carcinogenicity.
E = Evidence of noncarcinogenicity for humans.

Table 7 provides RfDs, CPFs, and carcinogenicity classifications for the constituents of concern at the site.

D. Risk Characterization

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., $1x10^{-6}$ or 1E-6). An excess lifetime cancer risk of $1x10^{-6}$ indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site. An excess lifetime cancer risk of greater than 10^{-4} is generally considered unacceptable. Excess lifetime cancer risks in the range of 10^{-4} to 10^{-6} are potentially acceptable.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The

Table 7 Reference Doses (RfDs), Cancer Potency Factors (CPF), and USEPA Cancer Classification for Constituents Detected at the Old City Landfill, Columbus, Indiana.

Constituent	RfD [a] Oral mg/kg/day	RfD [a] Inhalation mg/kg/day	CPF [a] Oral (mg/kg/day)-1	CPF [a] Inhalation (mg/kg/day)-1	USEPA Cancer Classification
Metals					
Cadmium	5.00E-04	5.00E-04	NA	6.10E+00	B1
Lead	1.4E-3 [b]	4.3E-4 [b]	NA	NA	B2
PAHs					
Benzo(a)pyrene	4.0E-3[c]	4.0E-03	1.15E+1[d]	6.10E+0[d]	B2
Naphthalene	4.03E-3[e]	4.0E-03	NA	NA	D
Phthalates					
Bis(2-ethylhexyl) phthalate	2.0E-02	2.0E-02	1.4E-02	1.4E-02	B2
Volatile Organic					
Methyl ethyl ketone	5.0E-02	5.0E-02	NA	NA	D
Miscellaneous					
Cyanide(as HCN)	2.0E-02	2.0E-02	NA	NA	D

Notes:

a = Source of RfD and CPF was IRIS (1990) unless otherwise noted. When data for inhalation were not available, the oral data were used (number in parenthesis).

b = From USEPA, 1986d.

c = No RFD available for benzo(a)pyrene. The RFD for napthalene is used as a surrogate value.

d = From USEPA, 1986e.

e = From USEPA, 1989c.

NA = Not available.

HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

The risks associated with each of the potential pathways using the contaminants of concern for the OCL are as follows:

Drinking Water

The HI and excess lifetime cancer risk for hypothetical future exposure to groundwater as a source of drinking water were calculated. The HI for the individual constituents and the cumulative total HI for all the constituents (0.97) is below the regulatory concern level of 1.0. The excess lifetime cancer risk level for hypothetical future use of groundwater as a source of drinking water is 9.8×10^{-7} or 9.8E-07.

Soils

1. Hiker/Trespasser

The HI and excess lifetime cancer risks for current hiker/trespasser soil exposure were calculated. The cumulative total HI for all the constituents (0.014) is well within acceptable guidelines. The excess lifetime cancer risk for current exposure to soils by a hiker/trespasser is 9.5×10^{-7}.

2. Construction Worker

Future exposure of a construction worker to the surficial soils while working on the proposed roadway construction project were calculated. Hypothetical future risks for a construction worker exposed to soils are within acceptable guidelines. Estimates of the cumulative total HI and excess lifetime cancer risk are 0.053 and 8.7×10^{-8}, respectively.

3. Resident

The HI and excess lifetime cancer risk for hypothetical future soil exposure by an adult and child living on the site were calculated. For adult residential exposure, the HI for the individual constituents and the cumulative total HI for all the constituents (0.49) is below the regulatory concern level of 1.0. The excess lifetime cancer risk for hypothetical future soil contact by an adult resident is 3.3×10^{-6}. For a child exposed to surficial soils from ages 6 months to 3-1/2 years (when soil ingestion is highest), the cumulative total HI for all constituents

is 0.57. The excess lifetime cancer risk level for hypothetical future child exposure to soils is 3.4×10^{-6}.

Swimming

The HI and excess lifetime cancer risk for people swimming in the East Fork of the White River adjacent to the site were calculated. The HI and excess lifetime cancer risk are 0.0012 and 1.2×10^{-9}, respectively.

Fish Ingestion

The HI and excess lifetime cancer risks for hypothetical future fish ingestion were calculated. The cumulative total HI for all the constituents is 0.057. The excess lifetime cancer risk level is 3.6×10^{-7}.

Environmental Risks

The environmental risks posed by the constituents of concern were judged to be minimal. All constituents detected in surface water were below background concentrations, FWQC, or laboratory-tested LC_{50} results. Constituents found in sediments did not vary significantly from typical background levels and therefore are not considered to currently pose a hazard to aquatic life. Concentrations of constituents in surficial soils are within local background concentrations and are not deemed to contribute excess risk to the terrestrial ecosystem.

In each scenario, conservative assumptions were made, based on current observed conditions at the site. The analytical methods used in making the risk calculations are described within the Risk Assessment portion of the Remedial Investigation Report.

E. Uncertainties

The Risk Assessment calculations were based on current observed conditions at the site. Preliminary data, presented in the Technical Supplement to the FS, indicate that placement of the proposed roadway will not adversely impact the site. This determination, however, is not conclusive as the future impact of roadway construction is impossible to predict. The groundwater beneath the site is especially vulnerable to increased leachate generation from the compaction of the waste material. Therefore,

protective measures are required to monitor site conditions during and after construction of the roadway. In addition, the integrity of the current landfill cover must be maintained against disruption by heavy equipment and road construction activity. Finally, because construction of the roadway will increase site access, fencing is necessary to deter unauthorized entry and reduce impact on the landfill cover.

POTENTIAL ROADWAY PLACEMENT

In the event the Indiana Department of Transportation and the City of Columbus proceed with construction of the proposed roadway across the OCL, the U.S. EPA shall require implementation of Alternative 2A - "Institutional Controls with Roadway Placement" from the FS. The measures outlined as components of Alternative 2A are necessary to ensure the continued protection to human health and the environment if the road is built on the site. The components of Alternative 2A are as follows:

* Installation of a fence with appropriate warning signs around the site. The fence shall be a minimum of six feet in height, with three strands of barbed wire across the top. The type of fence shall be chain link, with a minimum of two swing gates. Locks shall be provided to secure the site.

* Implementation of a landfill cover maintenance program as outlined in the FS, including provisions for periodic leachate inspections.

* Development of a Groundwater Recovery System Implementation Plan (including analytical modeling and preliminary design).

* Installation of additional groundwater monitoring wells to augment the existing well network. A minimum of two (2) additional wells are needed downgradient of the landfill in order to monitor flow towards the quarry.

* Implementation of a groundwater monitoring program, allowing for sampling at appropriate intervals, with more frequent sampling events during and after roadway construction.

* Institutional controls will be sought to reduce exposure to site contaminants by legally restricting access to the site. Deed restrictions on land and water use on the landfill would be sought from the landfill owner. The U.S. EPA would request the local municipality to enact a zoning ordinance that would forbid future use of the site and restrict drilling of groundwater wells.

  In the event that institutional controls are not voluntarily obtained, the remedial action may be re-evaluated to determine if additional actions should be implemented to ensure that the remedy is permanent and effective on a long term basis.

VI. DOCUMENTATION OF SIGNIFICANT CHANGES

The Selected Remedy has not changed from the recommended remedy that was presented within the Proposed plan and which was available for public review and comment from January 23, 1992 through February 21, 1992.

VII. SUMMARY

The OCL, in its present condition, falls within acceptable health-based and environmental quality-based guidelines. Thus, the selected remedy for this site is "no action" (modified). However, the Feasibility Study and Technical Supplement indicate that road construction activities could adversely impact site conditions. Specifically, the potential exists for enhanced leachate generation from the landfill, due to compression of waste material and soils underlying the proposed roadway. Increased leachate generation could further degrade the groundwater at the site and potentially impact the East Fork of the White River. Therefore, in order to ensure protection of human health and the environment in the future, the U.S. EPA shall require implementation of Alternative 2A, described above, before construction of a roadway is permitted across the site.

O: WATER
CC: BECK
RA/RF LTR ONLY

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March 20, 1992

Mr. Valdas V. Adamkus
Regional Administrator
U.S. Environmental Protection Agency
Region V
77 West Jackson Boulevard
Chicago, IL 60604

Dear Mr. Adamkus:

Re: Letter of Concurrence for the Draft Record of Decision for Old City Landfill

The Indiana Department of Environmental Management (IDEM) has reviewed the U.S. Environmental Protection Agency's Proposed Plan. IDEM is in full concurrence with the selected remedial alternative of No Action (with modifications) as long as current site conditions on the Old City Landfill do not change.

The major components of the remedy include:

- Continued ground water monitoring for a minimum of five years.
- Installation of a minimum of two additional wells to augment the current monitoring network.

The Remedial Investigation/Feasibility Reports indicate that there are no contaminants on-site above EPA's health based levels. The Record of Decision is based on sampling results and the risk assessment. The Remedial Investigation/Feasibility Study indicates that the selected alternative adequately addresses the public health, welfare and environment.

The installation of wells and the ground water monitoring procedures must comply with State and Federal rules and regulations.

IDEM also concurs with EPA's contingent alternative of Institutional Controls. It will be implemented if the City of Columbus and INDOT decide to build the proposed State Road 46 over the landfill.

All components of the contingent remedy will be required to meet the respective Applicable or Relevant & Appropriate Requirements.

The major components of the contingent remedy are:

- Install a fence with warning signs.
- Landfill cover maintenance program.
- Development of a ground water recovery system implementation plan.
- Installation of a minimum of two additional ground water monitoring wells.
- Ground water monitoring program.
- Deed restrictions.

Please be assured that IDEM is committed to accomplishing cleanup of all Indiana sites on the National Priorities List and intend to fulfill all obligations required by law to achieve that goal.

Sincerely,

Thomas W. Ranch Jr.

Kathy Prosser
Commissioner

cc: Gary Schafer, U.S. EPA