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DECISION DOCUMENT AMENDMENT FOR THE REMEDIATION OF

Zeidrich Dump

Columbiana County, Ohio

prepared by

THE OHIO ENVIRONMENTAL PROTECTION AGENCY

November 2005

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency
By: [signature] Date 12-6-05

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DECLARATION

SITE NAME AND LOCATION

Zeidrich Dump Site
Columbiana County, Ohio

STATEMENT OF BASIS AND PURPOSE

This Decision Document Amendment presents the selected remedial action for the Zeidrich Dump Site in Columbiana County, Ohio, chosen in accordance with the policies of the Ohio Environmental Protection Agency, statutes and regulations of the State of Ohio, and the National Contingency Plan, 40 CFR Part 300 . The original Decision Document was issued on May 2, 2003 and allowed for additional sediment and soil sampling by Northrop Grumman Space and Mission Systems Corporation under the Remedial Design/Remedial Action Order, which was entered in the Director's Journal on March 18, 2004.

ASSESSMENT OF THE SITE

Actual and threatened releases of industrial wastes, hazardous wastes, and Polychlorinated Biphenyls (PCBs), at the Site, if not addressed by implementing the remedial action selected in the Decision Document Amendment, constitute a substantial threat to public health or safety and are causing or contributing to air or water pollution or soil contamination.

DESCRIPTION OF THE SELECTED REMEDY

Northrop Grumman Space and Mission Systems Corporation collected additional samples from the wetland portion of the Site. Results from additional sediment and soil sampling, interpretation of analytical results, and comparison to screening levels indicate that concentrations of constituents [(*i.e.,* aluminum, arsenic, chromium, mercury, iron, manganese, Benzo(a)Pyrene, and PCBs (Arochlor-1248 and Arochlor-1254)] previously detected within the wetland area at the Zeidrich Dump Site do not exceed remedial standards, and, therefore, unacceptable risk to human health or ecological receptors due to contact with the off-site sediments does not exist. The amended remedy selected for implementation at the Zeidrich Dump Site includes:

- low-permeability cap installation and long-term maintenance to insure its reliability;
- leachate collection system installation and operation;
- ground water monitoring network installation and long-term monitoring; and
- institutional control implementation.

STATUTORY DETERMINATIONS

STATUTORY DETERMINATIONS

The selected remedial action is protective of human health and the environment, complies with legally applicable state and federal requirements, is responsive to public participation and input and is cost-effective. The remedy utilizes permanent solutions to the maximum extent practicable to reduce toxicity, mobility and volume of hazardous substances at the Site. The effectiveness of the amended remedy will be reviewed regularly. The Decision Document Amendment will become part of the administrative record available during normal business hours at the Ohio Environmental Protection Agency, Northeast District Office located at 2110 E. Aurora Road, Twinsburg, Ohio 44077.

Joseph P. Koncelik, Director

12/5/05
Date

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DECISION DOCUMENT AMENDMENT

for Zeidrich Dump
Columbiana County, Ohio

1.0 SITE BACKGROUND

1.1 Site History

The Zeidrich Dump Site is located on a 6.8-acre parcel of land in the southwestern corner of Columbiana County, Ohio. The Site is located within West Township, north of East Line Street and east of the Village of Minerva (see Figure 1). The property contains approximately one and one-half (1½) acres of fill, with the remainder being a combination of woods and wetlands (see Figure 2). The property is situated in a mixed residential and farming area with a number of homes utilizing ground water down-gradient from the Site.

The Zeidrich Dump property was originally owned by Andy Dietrich and was leased to Matthew Zeidrich for use as a disposal site in 1947. In 1954, Matthew Zeidrich purchased the property from Andy Dietrich. Following Matthew Zeidrich's death in 1978, the property was transferred to his children: Matthew Zeedrich (legal name change); Joseph Zeidrich; and Frances Elaine Zeidrich Baum. The Zeidrich Dump property was recently purchased by the TRW Corporation.

In the early 1950s, Matthew Zeidrich began accepting municipal and household wastes for disposal from the Village of Minerva. This practice continued into the early 1960s.

From 1963 through 1970 the landfill accepted industrial wastes from the TRW, Inc. facility located in Minerva. This industrial waste included ceramic mold material, stainless steel and drummed wastes. The drummed wastes consisted primarily of caustic soda and baghouse dust, although quantities of solvents and elemental mercury were also disposed on the Site.

In September 1983 the Minerva Village Services Director filed a complaint with Ohio EPA regarding the dump. The complaint included information that trees located to the west of the landfill were dying. An inspection was performed by Ohio EPA's Division of Solid and Hazardous Waste Management and followed up by sampling in November 1985. In December 1986, additional samples were collected. Analytical results revealed soil and wastes contaminated with a variety of metals, solvents and polychlorinated biphenyls (PCBs). Surface water samples collected down-gradient from the landfill also contained metals.

Information collected by Ohio EPA led to the referral of the Zeidrich Dump Site to the United States Environmental Protection Agency (U.S. EPA) in 1989. During that year, additional sampling was performed by the U.S. EPA. Again, metals, solvents and PCBs were detected. U.S. EPA then negotiated a removal order with TRW, Inc. This order included the

performance of a hydrogeologic investigation and the removal of surface drums. These activities took place in 1990. A total of 1,582 drums were collected and disposed from the Site. Results of the hydrogeologic investigation revealed that contaminants existed in ground water.

On March 16, 1992, Ohio EPA entered into negotiations with TRW, Inc. for the performance of a Remedial Investigation/Feasibility Study (RI/FS) at the Site. These Orders were journalized on October 2, 1992 and investigative work began following approval of the RI/FS Work Plan on April 29, 1993. The RI work was performed from 1993 through 1995 and the final RI report was approved on September 17, 1995. The FS for the Site was approved by Ohio EPA on May 4, 1999.

On March 18, 2004, following completion of the RI/FS for the Site, Ohio EPA and Northrop Grumman Space and Mission Systems Corporation (NGSMSC), the successor to TRW, Inc., entered into an agreement for the performance of remedial design/ remedial action activities at the Zeidrich Dump Site. As part of this agreement, NGSMSC was permitted to collect additional sediment samples in order to reevaluate the need for remediation in the wetland portion of the Site. The results of this reevaluation were submitted to Ohio EPA and approved on April 20, 2005.

1.2 Summary of the Remedial Investigation

The Remedial Investigation, performed by TRW, Inc. with Ohio EPA oversight, included a number of tasks to identify the nature and extent of site related chemical contaminants. The tasks included sampling of air, surface and subsurface soils, sediments, surface water and ground water. The data obtained from the investigation were used to conduct a baseline risk assessment and to determine the need to evaluate remedial alternatives. This Decision Document contains only a brief summary of the findings of the Remedial Investigation and Feasibility Study. Please refer to the *Remedial Investigation Report* (O'Brien & Gere, January 1996) and *Feasibility Study Report* (O'Brien & Gere, March 1999) for additional information on contaminant concentrations.

The nature and extent of contamination at the Zeidrich Dump Site in each environmental medium and the contaminants of concern attributable to the Site are described below.

1.2.1 <u>Soil Contamination</u>

A total of fifteen (15) soil borings and seven (7) surface soil samples were collected from the Zeidrich Dump Site. Of the fifteen (15) borings, ten (10) were collected from the perimeter of the fill. The remaining five (5) were collected from the mercury "hot spot" area and used to specifically delineate the mercury contamination. The perimeter samples were analyzed for volatiles, semivolatiles, pesticides, PCBs, total metals and radioactivity. The "hot spot" samples were analyzed for mercury. The seven (7) surface soil samples were collected to

establish background and were analyzed for total metals (see Figures 3 and 4).

Soil samples were collected at two-foot (2') intervals from each perimeter soil boring. No volatiles were found in any of the samples collected. Five semivolatiles were detected, the majority from a depth of less than four feet (4'). These included: bis(2-ethyhexyl) phthalate; 1,4 -dichlorobenzene; diethylphthalate; di-n-butylphthalate; and phenol.

Eleven (11) pesticides and PCBs were detected in the perimeter soil borings. These included: aldrin; arochlor-1254 (PCB); 4,4'-DDE; 4,4'-DDT; dieldrin; endosulfan II; endosulfan sulfate; endrin; endrin ketone; heptachlor epoxide; and methoxychlor. Semivolatiles were located throughout the zero (0) to eight-foot (8') interval.

Soil samples collected from the zero (0) to two-foot (2') interval were also screened for radioactivity. Gross alpha (α), Gross beta (β), and gamma (γ) scans were performed on all samples collected. All levels of radioactivity were within the acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$.

Several metals were also detected at varying concentrations within the perimeter soil borings. These included: arsenic; barium; cadmium; chromium; and lead.

Twenty-four (24) soil samples were collected from the five “hot spot” soil borings located within the fill material. The maximum concentration of mercury in those samples was found to be 21.8 parts per million (ppm). It was detected in the zero (0) to two-foot (2') interval. With the exception of one boring (MB-2), concentrations of mercury decreased with depth.

Background surface soil samples were collected for comparison purposes. These were found to contain arsenic, barium, cadmium, chromium and lead.

A summary of analytical results for detected metals and compounds may be found in Table 1 of this document. An analytical summary of mercury “hot spot” soil samples may be found in Table 2. A complete list of all analytical results from the remedial investigation, including non-detected metals and compounds, may be found in Appendix E of the *Remedial Investigation Report* (O’Brien & Gere, January 1996).

1.2.2 Ground Water Contamination

Ground water studies were performed during the remedial investigation to: (1) determine the ground water flow conditions; and (2) determine the type and extent of ground water contamination on and adjacent to the Site.

The Zeidrich Dump Site is located on the edge of a buried valley aquifer. Subsurface geology consists of overburden material (fine sands, silts, clays and gravels) covering bedrock composed of sandstone, shale and limestone. Ground water has been detected in the overburden material at depths of 12 to 28 feet below grade and in the bedrock at

depths of 26 to 114 feet below grade. Ground water flow in the overburden material was found to be toward the west. Flow in the bedrock aquifer was found to be toward the west and south. Down-gradient residential wells are located within the bedrock aquifer. The nearest residential well is located approximately 1500 feet from the Site.

A total of fourteen (14) monitoring wells were sampled on the Zeidrich Dump property as part of the investigation. Four (4) of these wells were installed for the remedial investigation. The remainder of the wells had been installed during prior investigatory activities. In addition, four (4) wells were installed off-site to monitor potential migration of contaminants. The location of all wells utilized during the remedial investigation can be found in Figure 4.

Ground water from monitoring wells set in both the overburden and bedrock zones on the Site have shown contamination. One of the shallow on-site wells (MW-6S) revealed concentrations of volatile and semivolatile organic compounds, pesticides, PCBs, metals and radioactivity. Trichloroethene was the only volatile compound found in ground water on site. Bis-(2-ethylhexyl) phthalate was the only semivolatile compound detected on site. Pesticides found in the monitoring wells were 4,4'-DDE and gamma chlordane. One PCB, Arochlor 1254, was also detected. Arsenic, barium, chromium and lead were also found in overburden wells. Radioactivity measurements were not collected in the overburden wells.

Bedrock wells were found to contain two semivolatile compounds, bis-(2-ethylhexyl) phthalate and 2-methylnaphthalene. Metals detected in these wells included arsenic, barium, cadmium, chromium and lead. Radioactivity measurements were also taken for bedrock wells. This included measurements for gross alpha (α), gross beta (β), and gamma (γ) radiation. Measurements for radioactivity did not exceed background levels.

Residential well samples were also collected as part of the Site investigation, in order to determine if on-site contaminants had reached the drinking water wells in the area. Seven (7) private wells were sampled. Barium was detected in all of the wells, while arsenic was detected in three (3) and lead was detected in one (1) well. The well with the positive detection for lead was resampled. These second results came back much lower than the first. Two volatiles, 1,2,3-trichlorobenzene and naphthalene, were found in three wells adjacent to the property. One semivolatile, 1,4-dichlorobenzene, was found in one well. No pesticides, PCBs or levels of radioactivity were detected in any of the residential wells.

A summary of analytical results for detected metals and compounds in ground water may be found in Table 3 of this document. The analytical summary for metals and compounds detected in residential wells may be found in Table 4. A complete list of all analytical results from the remedial investigation, including non-detected metals and compounds, may be found in the *Remedial Investigation Report* (O'Brien & Gere, January 1996).

1.2.3 Surface Water and Sediment Contamination

Twenty (20) surface water samples were collected during the Remedial Investigation. Twelve (12) of the samples were collected in the area of concern (SW-2 through SW-11,

SW-9A and SW-10A). The remaining seven (7) were collected upgradient of the Site for use as background (SW-1 and SW-12 through SW-18). Figure 4 provides the location of each sample point.

The twelve samples collected from the area of concern were analyzed for volatiles, semivolatiles, pesticides, PCBs and total metals. Radioactivity was also measured. Background sample SW-1 was also analyzed for volatiles, semivolatiles, pesticides, PCBs, total metals and radioactivity. The remainder of the background samples were analyzed for total metals.

Volatiles were not detected in the surface water samples collected from the area of concern. One semivolatile, diethylphthalate, was detected at a single location. Two pesticides, endosulfan I and endrin aldehyde, and one PCB, Arochlor-1254, were also detected.

Sediment samples were also screened for radioactivity. Gross α, gross β and full γ scans were performed on all samples collected.

Results from background sample SW-1 did not reveal elevated concentrations of volatiles, semivolatiles, pesticides or PCBs. All levels of radioactivity were below background. A number of metals were detected in the background sample including barium, chromium, and mercury.

A total of twenty (20) sediment samples were collected during the remedial investigation, one from each surface water sample location. Sediment samples, SED-1 through SED-11, SED-9A and SED-10A, were sampled for volatiles, semivolatiles, PCBs, pesticides and metals. Levels of radioactivity were also measured. Sediment samples, SED-12 through SED-18, were collected for background purposes and were analyzed for total metals. Sample SED-1 was also a background sample.

Samples collected from the area of concern revealed volatiles, semivolatiles, PCBs, pesticides metals and levels of radioactivity. Volatiles found in sediment samples contained methylene chloride, acetone and 2-butanone. Semivolatiles found included: benzo(a)pyrene; pyrene, fluoranthene; phenanthrene; 4-chloraniline; naphthalene, 2,4-dimethylphenol; and 4-methylphenol. Pesticides and PCBs found in sediment included: 4,4'-DDE endrin ketone; gamma chlordane; Arochlor-1248 and Arochlor-1254. Total metals analysis revealed concentrations of arsenic, barium, cadmium, chromium, lead and mercury.

Gross α, gross β, and γ radiation scans were performed on the sediment samples within the area of concern. These radiation levels were comparable to background levels and were, therefore, eliminated from the risk assessment.

Results from background sampling of sediments for metals did not vary significantly between SW-1 and SW-12 through SW-18, with the exception of lead. Arsenic, barium, chromium, lead and mercury were detected in sample SW-1 and all of these metals plus cadmium were detected in SW-12 through SW-18.

Summaries of detected metals and compounds, including background concentrations, in surface water and sediment may be found in Tables 5 and 6, respectively. A complete list of all analytical results, including non-detected metals and compounds, may be found in the *Remedial Investigation Report* (O'Brien & Gere, January 1996).

1.2.4 Air Releases

Ambient air samples were collected in order to monitor fugitive emissions during site sampling activities. All samples were collected from the height of the human breathing zone using a carbon molecular sieve (CMS) device attached to an air pump. Samples were analyzed for volatiles.

Three sample locations were selected: ZD-1; ZD-2; and ZD-3. ZD-1 and ZD-2 were downwind, while ZD-3 was collected upwind of the sampling area. Three volatiles, 1,1,1-trichloroethane, benzene and toluene, were detected. A summary of detected compounds, including background concentrations, for ambient air samples may be found in Table 7.

1.2.5 Impacts to Biological Resources

A wetland is located approximately 400 yards downgradient (west) of the landfill (see Figure 4). Due to its size and its lack of connection to a river or stream, the wetland is subject to Ohio EPA regulations. Surface water sampling within this area did not reveal elevated levels of Site-related contaminants, however, sediment samples collected during the RI indicated that elevated levels of volatiles, semivolatiles, pesticides, PCBs and metals existed. A complete discussion of analytical results for this portion of the Site can be found in the surface water discussion above (see Section 1.2.3).

1.3 Interim or Removal Actions Taken to Date

In December 1989, U.S. EPA entered into a Consent Order with TRW, Inc. to remove surface drums from the Zeidrich Dump Site. This activity was completed in early 1990. A total of 1,582 drums were collected for disposal from the property. Of this total, 566 contained wastes. These drums were overpacked and sampled for compatibility. A number of the drums were segregated and disposed of separately, based on gamma radiation screening.

Elemental mercury was also found in drums on Site. These drums had released an unquantifiable amount of mercury onto the surface of the landfill. During drum removal activities, a small quantity of contaminated surface wastes and soils were removed from the Site. Following excavation, additional samples were obtained from the area. Analytical results revealed concentrations of elemental mercury at varying depths in soils, ranging from 14.5 to 1,770 ppm. Concentrations of mercury did not decrease linearly with depth.

Therefore, the decision was made to backfill the area and delineate concentrations further during the remedial investigation.

1.4 Additional Sampling Performed After the Remedial Investigation and Summary of Fundamental Differences Between Original Decision Document and Decision Document Amendment

Ohio EPA issued the original Decision Document for the Zeidrich Dump Site on May 2, 2003. On March 28, 2004, Ohio EPA and Northrop Grumman Space and Mission Systems Corporation (NGSMSC), which purchased TRW, Inc. in 2003, entered into an agreement for the performance of remedial design and remedial action (RD/RA) activities at the Site. As part of this agreement, NGSMSC was permitted to collect additional sediment samples in order to reevaluate the need for remediation in the wetland portion of the Site. Results of this reevaluation are presented in the *Wetland Sediment Data Summary Report* (ARCADIS, 2003) and the *Results of Supplemental Sampling in Wetland Soils* correspondence from ARCADIS dated August 10, 2004, both of which are in the administrative record file that supports the need for the amendment. Based on these results, Ohio EPA found it necessary to revise and reissue the Decision Document for the Zeidrich Dump Site. The alternative selected by Ohio EPA in this document differs from the alternative presented in the 2003 Decision Document. Ohio EPA had selected a combination of Alternatives SC-3 and MM-2 for the remediation of the Zeidrich Dump Site. The selected remedy, as originally presented in the 2003 Decision Document, consisted of the following:

- sediment and soil excavation;
- low-permeability cap installation and long-term maintenance to insure its reliability;
- leachate collection system installation and operation;
- ground water monitoring network installation and long-term monitoring;
- wetland restoration; and
- institutional control implementation.

The portion of the Decision Document regarding remediation of wetland sediments has been modified for the following reasons:

(1) The 1996 Remedial Investigation (RI) Report, submitted to the Agency by TRW, Inc., did not take into account naturally occurring concentrations of metals in the clays in wetland soils and sediments. Once site-specific concentrations of these metals in both on-Site and

background soils and sediments were reassessed, it was determined that neither arsenic nor aluminum pose an unacceptable risk to either human health or the environment. Therefore, the wetland does not require remediation for these constituents.

(2) TRW, Inc. proposed remedial standards for sediments in 2001 based on the discovery of contaminants within the landfill waste material, rather than their actual existence at levels of concern within the sediments. The concentrations of iron, manganese, Arochlor-1248 and Arochlor-1254 in wetland sediments at the Site are below the remedial standards proposed by TRW, Inc., and finalized in the 2003 Decision Document. Therefore, the wetland does not require remediation for these constituents.

(3) The baseline risk assessment conducted for the Site by TRW, Inc. utilized maximum detections, rather than a 95% upper confidence limit (UCL) of the mean, as is traditionally utilized at DERR Sites. Benzo(a)pyrene (B(a)P) was detected at one single location within the wetland. Utilizing the maximum detection for B(a)P led to an overestimation of the risk. When the 95% UCL of the mean is utilized, the concentration of B(a)P at the Site is below the remedial standard. Therefore, the wetland does not require remediation for B(a)P.

(4) Sampling conducted by TRW, Inc. during the RI determined that chromium existed above remedial standards in two locations within the wetland and that mercury existed above remedial standards in one location within the wetland. Sediment sampling during the RI was limited and the intention of TRW, Inc. was to perform confirmatory sampling during wetland remediation activities in order to insure that the contaminants were completely removed. As part of remedial design activities NGSMSC proposed additional sampling within the wetland to confirm that the contaminants actually existed in concentrations that would require removal. Three (3) samples were collected in the area surrounding the locations where the individual contaminants were originally detected. In all cases, confirmatory sampling indicated that mercury and chromium did not exist within wetland sediments in concentrations that would exceed risk based standards. Therefore, remediation of wetland sediments is not necessary and is not required for either mercury or chromium.

As explained above, based on the results from additional sampling, reinterpretation of existing data and comparison of data to screening standards, Ohio EPA has determined that none of the elements previously detected within the wetland area at Zeidrich Dump Site (i.e., aluminum, arsenic, chromium, mercury, iron, manganese, B(a)P, Arochlor-1248 and Arochlor-1254) exist at levels which require remediation. This determination has given Ohio EPA sufficient cause to reevaluate the remedy for the Site, as selected in the Decision Document journalized in May 2003. Based on that reevaluation, Ohio EPA has issued this Decision Document Amendment eliminating the sediment and soil (wetland) excavation and wetland restoration portion of the remedy originally selected for the Site. The remainder of

the requirements outlined in the original Decision Document for the Site, journalized on May 2, 2003, regarding remediation of the landfill have not been altered by the Agency.

2.0 SUMMARY OF SITE RISKS

A baseline risk assessment was conducted to evaluate current and future risks to human health and ecological receptors associated with contaminants present at the Site. The results demonstrated that the existing concentration of contaminants in environmental media pose risks to human and ecological receptors at a level sufficient to trigger the need for remedial actions.

2.1 Risks to Human Health

Following site investigations it was determined that chemicals existed at elevated levels on and adjacent to the Zeidrich Dump property and that there was a way for people to come into contact with these chemicals. As part of the risk assessment, O'Brien & Gere, on behalf of TRW, Inc., identified both the current and future receptors. The receptors included: construction workers; industrial workers; site trespassers; off-site recreational users (e.g., hunters and hikers); and residents.

Based on the media found to be contaminated (e.g., soil, surface water, etc.), five (5) pathways of exposure were identified for both current and future risk purposes. They were: shallow (overburden) ground water; bedrock ground water; on-site soils; off-site surface water; and off-site sediment. The ambient air pathway was not carried through the risk assessment process because VOC concentrations appear to be representative of background and the pathway itself would present an insignificant risk when compared to other factors.

Each pathway was analyzed based on each receptor. The table provided below lists the pathway of exposure and which receptors may be impacted by that pathway.

Current Land Use

Pathway	Receptor
Shallow Ground Water	Construction Workers
Bedrock Ground Water	Residents

On-Site Soils	Construction Workers Industrial Workers Residents Trespassers
Off-Site Surface Water	Trespassers/Recreational Users Residents Construction Workers Industrial Workers
Off-Site Sediments	Trespassers/Recreational Users Residents Construction Workers Industrial Workers

Future Land Use

Pathway	Receptor
Shallow Ground Water	Construction Workers
Bedrock Ground Water	Residents
On-Site Soils	Construction Workers Industrial Workers Residents Trespassers/Recreational Users
Off-Site Surface Water	Trespassers/Recreational Users Residents Construction Workers Industrial Workers
Off-Site Sediments	Trespassers Recreational Users Residents Construction Workers Industrial Workers

Once these determinations were made, a series of mathematical equations, involving site analytical data and conservative assumptions, were used to calculate risk for each receptor and pathway. Based on calculations performed by O'Brien and Gere, consultants for TRW, Inc., it was determined that current carcinogenic risk for all evaluated pathways and receptors fell within the acceptable Ohio EPA risk range. However, O'Brien and Geer determined that non-carcinogenic risk for both current and future scenarios as well as future carcinogenic risk for the adult resident fell outside the acceptable risk range.

Following the performance of additional field sampling and data evaluation by NGSMSC and Ohio EPA (as discussed in Section 1.4, above), concentrations of constituents found in sediments were compared to the established remedial standards for the Site. During this comparison, it was determined that the constituents detected in the off-site sediments do

not exceed remedial standards, and, therefore, unacceptable risk to human health due to contact with off-site sediments does not exist. This finding does not change the earlier determination regarding risk to human health due to contact with on-site soils, groundwater and off-site surface water. Additional information regarding these determinations may be found in Ohio EPA's May 5, 2004 correspondence to NGSMSC, the *Wetland Sediment Data Summary Report* (ARCADIS, 2003), and the *Results of Supplemental Sampling in Wetland Soils* correspondence from ARCADIS, dated August 10, 2004.

2.2 Risks to Ecological Receptors

An ecological risk assessment was conducted to determine the impact of contaminants in sediments and surface water to organisms in the vicinity of the Zeidrich Dump Site. Data collected during the remedial investigation was utilized to calculate a hazard quotient (HQ) for each potential contaminant of concern. The HQ represents risk to the health of an ecological receptor.

Site data were utilized to model HQs for selected receptors. The receptors were selected based on the potential to be present in the area as well as their ability to provide a representative view of risk. The racoon, American woodcock and meadow vole were selected. HQs were calculated for metals, volatiles, semivolatiles and PCBs found in surface waters and sediments. Ohio EPA has identified a HQ of 1 to be an acceptable risk level for ecological receptors.

Initially, Ohio EPA determined that unacceptable risk existed to ecological receptors due to exposure to on-site and off-site soils, surface water and sediments. However, based on the performance of additional field sampling and data evaluation, as discussed in Section 2.1, it has been determined that off-site sediments do not pose a risk to ecological receptors and therefore do not require remediation. Information supporting this conclusion may be found in Ohio EPA's May 5, 2004 correspondence to NGSMSC, the *Wetland Sediment Data Summary Report* (ARCADIS, 2003), and the *Results of Supplemental Sampling in Wetland Soils* correspondence from ARCADIS, dated August 10, 2004.

3.0 FEASIBILITY STUDY

A Feasibility Study was conducted by TRW, Inc. in order to define and analyze appropriate remedial alternatives. That study**,** which was conducted with oversight by Ohio EPA, was approved on May 4, 1999. The Remedial Investigation and Feasibility Study are the basis for the selection of Ohio EPA's preferred remedial alternative. Copies of both of documents are available for review in the site document repository, located in the Minerva Public Library, 677 Lynwood Drive, Minerva, and in Ohio EPA, Northeast District Office at 2110 East Aurora Road, Twinsburg.

4.0 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAO's) were developed for this project in accordance with the National Contingency Plan (NCP), 40 CFR Part 300, which was promulgated under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, and U.S. EPA guidance. The intent of the remedial action objectives is to set goals that a remedy should achieve in order to insure the protection of human health and the environment. The goals are designed to reduce or eliminate the potential adverse effects of site contaminants present in environmental media.

For environmental media, remediation levels were developed for a range of potential residual carcinogenic risk levels (*i.e.*, 1 in 100,000, 1 in 1,000,000 etc.), and using a non-cancer hazard quotient (or index) of 1, and a range of potential exposed receptors, *i.e.*, direct contact with contaminated soils, sediments and surface water by people and animals. These carcinogenic risk levels refer to the increased likelihood that someone exposed to the chemical releases from the site would develop cancer during his lifetime as compared with a person not exposed to the site. For example, a 1 in 10,000 (10^{-5}) risk level means that if 10,000 people were chronically exposed to the carcinogens at the site, there is a probability of one additional case of cancer. Note that these risks refer only to the incremental risks created by exposures from the site. They do not include the risks of cancer from other non-site related factors to which people may be exposed. Non-carcinogenic hazards are generally expressed in terms of a hazard quotient or index, which combines the concentration of chemical exposures with the toxicity of the chemicals (quotient refers to the effects of an individual chemical whereas index refers to the combined effects of all chemicals) . A hazard index of one (1) represents the maximum exposure at which no harmful effects are expected.

The RAOs were developed to ensure that remedial actions reduce the projected risk to humans to acceptable levels. The USEPA through the NCP defines acceptable remediation goals for known or suspected carcinogens to be concentration levels that represent an upper bound excess (i.e., above background) lifetime cancer risk to an individual between 1 in 10,000 (10^{-4}) and 1 in 1,000,000 (10^{-6})**,** using information on the relationship between dose and response**,** with the 1 in 1,000,000 (10^{-6}) risk level as the point of departure (the level of risk at which further remedial action is considered unnecessary). Likewise, noncarcinogenic risks are also to be reduced to an acceptable level, which corresponds to a hazard index of 1.0, at which harmful effects are generally not observed in exposed persons. In a similar manner, important ecological resources (e.g., waters of the state or endangered species) will also be protected. At the Zeidrich Dump Site, soil, sediment and surface water pathways will be remediated in order to limit risk to both human health and the environment.

The RAOs developed for the Zeidrich Dump Site are detailed below.

– Minimize incidental ingestion and dermal contact with contaminated soils and sediments and inhalation from contaminated soils present in concentrations above

a human health carcinogenic risk of 10^{-6} (1 in 1,000,000) and a non-carcinogenic hazard index greater than or equal to one (HI$\geq$1);

- Minimize ingestion and dermal contact with contaminated surface water, leachate and ground water and inhalation for contaminants in leachate and ground water at concentrations above a human health carcinogenic risk of 10^{-6} (1 in 1,000,000) and a non-carcinogenic hazard index greater than or equal to one (HI$\geq$1);

- Minimize migration of constituents from the sediment and soil to surface water and ground water that have the potential to result in concentrations representing unacceptable human health or ecological risk (i.e., human health carcinogenic risk above 10^{-6} (1 in 1,000,000); non-carcinogenic risk (hazard index) greater than or equal to one (HI$\geq$1);and ecological risk (hazard quotient) above one (HI>1);

- Reduce risk to ecological receptors due to contact with contaminated soils, sediments, surface water and leachate at concentrations representing hazard quotients (HQ) above 1.

Clean-up levels have been calculated for Ohio EPA's preferred remedial alternative, utilizing these RAOs. These are presented as part of the "Selected Remedial Alternative" in Section 7.1 of this document.

5.0 SUMMARY OF REMEDIAL ALTERNATIVES

A total of five (5) alternatives were considered in the Feasibility Study (FS). A brief description of the major features of each of the alternatives follows. More detailed information about these alternatives can be found in the FS Report.

5.1 Source Control Remedial Alternatives

This section discusses those remedial alternatives directly related to source control. These remedies focus on soil/fill materials, sediment and ground water located below the landfill itself. They include a no-action alternative, management of wastes and natural attenuation, and the installation of a low-permeability cap.

5.1.1 Alternative SC-1 - No Action Alternative

Ohio EPA requires Potentially Responsible Parties to include a "No Action" alternative as part of the variety (or array) of alternatives evaluated as part of the Feasibility Study Report. This "No Action" alternative is used as a baseline, against which other alternatives are compared. In a "No Action" alternative, absolutely no effort is made to remediate the site. Contaminants within soils, sediments, surface water and ground water are reduced through

natural biological, chemical and physical means such as degradation and dilution, without human assistance.

Because this alternative does not achieve the remedial action objectives for risk, it is not a viable option. However, it is necessary for the purpose of comparison.

Since this alternative does not have any active components of remediation or monitoring, there is no capital cost for implementation.

5.1.2 Alternative SC-2 - Management/Natural Attenuation

This alternative relies on restriction of use and natural attenuation as a remedy for site contamination. The alternative includes: long-term monitoring of the ground water, sediment and soil/fill material; environmental land use (deed) restrictions, through the implementation of an Environmental Covenant; access restrictions; posting warning signs; and implementation of a public education program.

Even though this alternative provides for monitoring and restriction of access to the property, it does not provide for the active remediation of any site contaminants. The potential for contaminants to migrate from the site via groundwater and surface water run-off would still exist.

Costs for this alternative were not provided as part of the Feasibility Study Report, but an estimate was provided to Ohio EPA by TRW, Inc. in 2002. That cost estimate was $2,612,792.

Based on failure to meet risk based requirements of the remedial action objectives and an elevated cost over Alternative SC-2, this alternative was eliminated as a remedial option for the Zeidrich Dump Site.

5.1.3 Alternative SC-3 - Low-Permeability Cap

Alternative SC-3 involves the excavation and consolidation of contaminated soils and sediments to a location within the landfill boundaries, as well as the installation of a low-permeability cap over the landfill and the installation of a leachate collection system. The restoration of the wetland area has been removed from this alternative. Deed and access restrictions and a public education program would also be implemented as part of this alternative.

This alternative fulfills all of the requirements of the remedial action objectives, including those which are risk-based. Human and ecological receptors would be protected through the minimization of contact with contaminated media. Ground water would be monitored to ensure that contamination does not leave the property and the leachate collection system would prohibit additional impact to surface water and ground water.

Costs for this alternative are considerable and include a minimum of 30-years of operation

and maintenance (O&M) costs for the landfill (including the fencing and signs); and leachate collection system, as well as ground water monitoring. The original estimated capital cost in 1999 for Alternative SC-3 was $4,455,714. In 2005 the estimated capital cost for Alternative SC-3 without the removal of the wetland sediments was reduced to $2,550,000 (which includes $750,000 of O&M costs with a net present value of $601,000).

Based on the ability of this alternative to meet the remedial action objectives, it is considered to be a viable option for the Zeidrich Dump Site.

5.2 Management of Migration Remedial Alternatives

The remedial alternatives provided in this section were developed to address contamination that has migrated away from the Zeidrich Dump Site. This includes ground water and surface water/leachate. As with the source control remedial alternatives, this section also includes a “No Action” option. A ground water monitoring option is also discussed.

5.2.1 Alternative MM-1 - No Action Alternative

As with the source control remedial alternatives, a “No Action” alternative has been evaluated for the purpose of establishing a baseline. As was previously discussed, this “No Action” alternative does not propose any type of remedial action at the Site. Contaminants within surface water and ground water are reduced through natural biological, chemical and physical means such as degradation and dilution, without human assistance.

Since this alternative does not have any active components of remediation or monitoring, there is no capital cost for implementation.

Because this alternative does not achieve the remedial action objectives for risk, it is not a viable option, however, it is adequate for the purpose of comparison.

5.2.2 Alternative MM-2 - Monitoring

This alternative involves the long-term monitoring of surface water/leachate and ground water to detect the migration of contaminants off-site. Deed and access restrictions, posting of the property and implementation of a public information program would also be included as part of this alternative. Capital costs for Alternative MM-2 were estimated in 1999 to be $447,921.

Alternative MM-2 does not, in itself, meet all of the remedial action objectives, especially those involving risk, rather, it provides advanced notification of potential risk before it can affect neighboring residents. It is, however, a viable option when combined with an adequate proposal for source control.

6.0 COMPARISON AND EVALUATION OF ALTERNATIVES

6.1 Evaluation Criteria

In selecting the remedy for this Site, Ohio EPA considered the following eight criteria as outlined in the NCP promulgated under CERCLA (40 CFR 300.430):

1. Overall protection of human health and the environment - Remedial alternatives shall be evaluated to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site.

2. Compliance with ARARs - Remedial alternatives shall be evaluated to determine whether a remedy will meet all of the applicable or relevant and appropriate requirements (ARARs) under State and Federal and Local environmental laws;

3. Long-term effectiveness and permanence - Remedial alternatives shall be evaluated to determine the ability of a remedy to maintain reliable protection of human health and the environment over time**,** once pollution has been abated and RAOs have been met. This includes assessment of the residual risks remaining from untreated wastes, and the adequacy and reliability of controls such as containment systems and institutional controls;

4. Reduction of toxicity, mobility, or volume through treatment - Remedial alternatives shall be evaluated to determine the degree to which recycling or treatment are employed to reduce toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site**;**

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

5. Implementability - Remedial alternatives shall be evaluated to determine the ease or difficulty of implementation and shall include the following as appropriate: (1) Technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy **;** (2) Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions); and (3) Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the

availability of services and materials; and the availability of prospective technologies**;**

7. Cost - Remedial alternatives shall evaluate costs and shall include the following: (1) Capital costs, including both direct and indirect costs; (2) Annual operation and maintenance costs (O&M); and (3) Net present value of capital and O&M costs. The cost estimates include only the direct costs of implementing an alternative at the Site and do not include other costs, such as damage to human health or environment associated with an alternative. The cost estimates are based on figures provided by the Feasibility Study.

8. Community acceptance - Remedial alternatives shall be evaluated to determine which of their components interested persons in the community support, have reservations about, or oppose.

6.2 Analysis of Evaluation Criteria

This section looks at how each of the evaluation criteria is applied to each of the remedial alternatives found in Section 5.0 and compares how the alternatives achieve the criteria. Evaluation Criteria 1 and 2 are threshold criteria required for acceptance of an alternative that has accomplished the goal of protecting human health and the environment and complied with the law. Any acceptable remedy must comply with both of these criteria. Evaluation Criteria 3 through 7 are the balancing criteria for picking the best remedial alternatives. Evaluation Criteria 8, community acceptance, was determined, in part, by written responses received during the public comment period and statements offered at the public meeting.

6.2.1 Overall Protection of Human Health and the Environment

The assessment of cancer risks and non-cancer hazards to human receptors requires that pathways for exposure be identified and the risks and hazards of each pathway be numerically estimated. Five (5) chemical exposure routes have been identified: shallow (overburden) ground water; bedrock ground water; on-site soils; off-site surface water; and off-site sediments. As discussed in Section 4.0 of this document, both the U.S. EPA and Ohio EPA identify acceptable carcinogenic risk as a range from $1x10^{-4}$ to $1x10^{-6}$. This means that an individual would have a 1 in 10,000 to 1 in 1,000,000 chance of developing cancer due to site-related contaminants.

As also discussed in Section 4.0 of this document, adverse impacts to ecological receptors are identified as a hazard index (HI) greater than 1. Thus, remediation goals for ecological receptors in the Feasibility Study for Zeidrich Dump were based on a hazard quotient (HQ) of 1.

The following table outlines the residual risks anticipated to remain following completion of each of the remedial alternatives discussed in the Feasibility Study:

Alternative	Human Health Risk	Ecological Risk
Source Control Alternatives		
SC-1 - No Action Alternative	X	X
SC-2 - Management/Natural Attenuation	X	X
SC-3 - Low-Permeability Cap	meets	meets
Management of Migration Alternatives		
MM-1 - No Action Alternative	X	X
MM-2 - Monitoring Alternative	X	X

"X" - does not meet acceptable risk goals following implementation of remedy.

"meets" - meets or exceeds acceptable risk goals following implementation of remedy.

Note that the implementation of Alternative MM-2 does not achieve acceptable risk standards by itself; however, when combined with alternative SC-3, it helps to insure that acceptable risk standards continue to be met following implementation of a source control remedy.

6.2.2 Compliance with ARARs

Of the three source control alternatives discussed within the feasibility study, only one, the installation of a low-permeability cap (SC-3) would comply with applicable relevant and appropriate requirements. This alternative would require state and federal permits for the storage and treatment of leachate generated from the landfill. It would eliminate risk created through human and ecological contact with contaminants within the landfill area. Sediments from the wetland areas and restoration of the wetland area do not exceed remedial standards, and, therefore, unacceptable risk to human health or ecological receptors due to contact with the off-site sediments does not exist.

Source control alternatives SC-1 (no action) and SC-2 (monitoring/natural attenuation) would permit contact with contaminated wastes, sediments and soils on the Site in excess of acceptable risk goals, therefore, these alternatives are not acceptable.

Of the two management of migration alternatives discussed within the feasibility study, only one, the monitoring alternative (MM-2), complies with applicable regulations when coupled with source control alternative SC-3 (low-permeability cap). This alternative will insure that acceptable risk goals are met by the source control remedy, allowing compliance with applicable regulations (e.g., Ohio EPA Surface Water Quality Standards). Alternative MM-1 is a "no action" alternative which does not provide a mechanism to insure compliance with applicable requirements.

6.2.3 Long-Term Effectiveness and Permanence

Source control alternatives SC-1 ("no action") and SC-2 (monitoring/natural attenuation) provide no long-term effectiveness or permanence. These alternatives permit current contamination to remain and potentially migrate from the Site. Although alternative SC-2 has the potential to provide long-term effectiveness and permanence based on a reduction or elimination of contaminants through natural attenuation (biological and chemical degradation of contaminants), information has not been provided to support this possibility. Alternative SC-3 (low-permeability cap) provides both long-term effectiveness and permanence, as long as operation and maintenance (O&M) requirements are met and deed restrictions are maintained. Capping of the landfill would prevent human and ecological contact with contaminants. Removal of sediments from the wetland areas is no longer necessary and is removed from alternative SC-3. This protection of human and ecological receptors would continue as long as the cap and monitoring system are properly maintained, which would be insured through an operation and maintenance (O&M) agreement between the PRPs and the State of Ohio.

Management of migration alternative MM-1 ("no action") would not provide either long-term effectiveness or permanence. This alternative would not provide either the PRP or Ohio EPA with information to assess whether contaminants are migrating from the Site. Alternative MM-2 (monitoring) does provide a way to measure long-term effectiveness and permanence of the remedy selected for the Site. This is done through long-term monitoring of ground water, surface water/leachate and sediments, as well as through deed restrictions. Monitoring would provide analytical information to support the continued effectiveness of the selected remedy. Deed restrictions would provide a mechanism to insure that human and ecological receptors are protected by limiting excavation of soils and use of ground water on the Site.

6.2.4 Reduction of Toxicity, Mobility or Volume by Treatment

Toxicity, mobility and volume of wastes are not reduced through the implementation of source control alternatives SC-1 ("no action") or SC-2 (monitoring/natural attenuation). These alternatives permit wastes, contaminated soils and sediments to remain on-site in their current state. Only source control alternative SC-3 (low-permeability cap) provides a reduction of mobility of wastes and contaminated media on the Site. This alternative consolidates contaminated media under a low-permeability cap, thereby limiting the ability of the contaminants to migrate from the Site through both ground water and leachate. Leachate from the landfill will also be collected and either treated via an on-Site system or by the local wastewater treatment plant thereby reducing the toxicity of that waste stream. The installation of a low-permeability cap would reduce the volume of leachate generated but, would not reduce the overall toxicity. The cap would limit human and ecological receptor contact with contaminated media and will sever the existing direct contact pathway, thus leading not to a reduction of toxicity, but to a reduction of risk. By limiting infiltration of water through the wastes, the mobility of the contaminants is effectively reduced.

Reduction of toxicity, mobility or volume of wastes does not occur with either management of migration alternatives. Alternative MM-1 ("no action") does not involve any type of action to reduce contamination. Alternative MM-2 (monitoring) simply provides a mechanism to show whether contaminants are leaving the Site, as well as limiting contact with contaminated media through the use of deed restrictions.

6.2.5 Short-Term Effectiveness

Neither source control alternatives, SC-1 ("no action") or SC-2 (monitoring/natural attenuation), are effective over the short-term, since neither involve any type of active remediation. Natural attenuation may reduce contaminants on Site over the long-term, although this possibility has not been supported within the Feasibility Study; however, short-term reduction of contaminants would not occur with this type of remedy.

Alternative SC-3 (low-permeability cap) is effective over the short-term, especially once cap construction is complete. The cap will prohibit the infiltration of rainwater through waste materials, thereby reducing contaminants which reach both ground water and surface water. In addition, the cap will immediately lessen risks posed through direct contact with the wastes. During excavation of contaminated soils and grading of the landfill, a slight increase in the chance of release of contaminants to the environment may exist. Excavation of sediments from the wetland areas is no longer necessary and is removed from alternative SC-3. Intact drums uncovered during grading activities on the landfill would be properly characterized and disposed off-Site. Air monitoring would be performed at the perimeter of the Site for volatile contaminants of concern, as well as radioactive contaminants detected during the remedial investigation. This monitoring would insure that unsafe levels of contaminants are not migrating off the Site via the air pathway.

Management of migration alternative MM-1 ("no action") is not effective over the short-term due to its lack of active remediation. Alternative MM-2 (migration) is effective over the short-term because it requires the placement of deed restrictions on the property, in order to minimize human and ecological receptor contact with contaminants. It also requires the installation of a fence and warning signs which would help to deter trespassers. This alternative is also effective because it requires scheduled monitoring, which would provide periodic feedback on the efficiency of the implemented source control remedy.

6.2.6 Implementability

Source control alternative SC-1 ("no action") is easily implementable. It does not require any permits and because no construction activities would take place, technical problems and difficulty with availability of goods and services do not exist.

Source control alternative SC-2 (monitoring/natural attenuation) is also easily implementable. Permits would not be required. Monitoring which would be scheduled could be easily arranged through an environmental laboratory. Posting of warning signs, development of a public education program and placing deed restrictions on the property are all easily performed. Goods and services needed to implement this remedy are easily

accessible and technical problems would likely be minimal.

Source control alternative SC-3 (low-permeability cap) is the most complicated of the proposed remedial alternatives; however, it is a standard method of landfill closure and thus should not be difficult to implement. Permits would be required for the leachate collection system and treatment system, should one be constructed. The cap would be required to be constructed in compliance with state regulations. Wetland sediment excavation and restoration would have be performed under the appropriate state and federal permits, however, wetland sediment excavation and restoration are no longer necessary and will be removed from alternative SC-3. As discussed in source control alternative SC-2, posting of warning signs, development of a public education program and placing deed restrictions on the property are all easily performed. Goods and services needed to implement this remedy are accessible and technical problems would likely be minimal.

Management of migration alternative MM-1 ("no action") is easily implementable. It does not require any permits because it would not actively remediate surface water or ground water from the Site.

Management of migration alternative MM-2 (monitoring) is also easily implementable. It involves the analysis of surface water and ground water, which is easily performed by a laboratory. The placing of deed restrictions on the property, as required under this alternative, is easily performed through the county government. The installation of warning signs and the implementation of a public education program, as discussed under source control alternative SC-3, are also requirements which are very easily attained. Goods and services needed to implement this remedy would be easily obtained and technical problems would likely be minimal. In a similar manner, the long-term inspections and maintenance actions needed to preserve the integrity of the cap also present minimal problems of implementation.

6.2.7 Cost

Cost estimates to implement the source control and management of migration proposed remedies are provided below. These costs were estimated in 1999 and may be slightly higher once the selected remedy is implemented. They include the estimated cost for 30-years of operation and maintenance (O&M) activity, if required.

Proposed Alternative	Estimated Cost
Source Control Alternative	
SC-1 - No-Action	$ 0
SC-2 - Management/Natural Attenuation	$ 2,612,792
SC-3 - Low-Permeability Cap	$ 2,550,000
Management of Migration	
MM-1 - No-Action	$ 0

MM-2 - Monitoring	$ 447, 921

6.2.8 Community Acceptance

Ohio EPA received comments from interested parties during the public comment periods and at the public meetings held on August 14, 2002 and August 3, 2005. Those comments and Ohio EPA's responses are included in the Responsiveness Summary, which appears at the end of this document.

7.0 SELECTED REMEDIAL ALTERNATIVE

Ohio EPA has changed the original selected alternative journalized on May 2, 2003 to a modified combination of Alternatives SC-1, SC-3 and MM-2 for the remediation of the Zeidrich Dump Site. Since wetland sediments will not require remediation based on results of additional sampling and data interpretation, the relocation of contaminated sediments to the surface of the landfill has been removed from Alternative SC-3. Ohio EPA's revised alternative consists of the following:

- low-permeability cap installation and long-term maintenance to insure its reliability;
- leachate collection system installation and operation;
- ground water monitoring network installation and long-term monitoring; and
- institutional control implementation.

The estimated cost of the long-term (*i.e.,* 30-years) operation and maintenance of the selected remedy is approximately $601,000.

7.1 Low Permeability Cap Installation

The landfill itself was found to contain a variety of contaminants which present an unacceptable risk to human health and the environment. In order to prevent receptors from coming into contact with these contaminants, it is proposed that the entire landfill be covered with a low permeability cap. This cap will prevent infiltration of water into the waste, thereby reducing the ability for the contaminants to reach both surface water and ground water. In order for the cap to meet with the approval of Ohio EPA, it must comply with specifications presented in the Ohio Administrative Code (OAC) and must be maintained to preserve its performance.

Performance Standard: In order to achieve this performance standard, a low-permeability

cap will be constructed in compliance with state and federal rules and regulations. In compliance with Ohio Administrative Code Rule 3745-27-08, the cap will be constructed, from the surface of the waste up, as outlined below:

Barrier layer consisting of one of the following:

- 24 inches of a compacted soil with a maximum permeability of $1x10^{-7}$ centimeters per second (cm/sec);
- 18 inches of compacted soil with a maximum permeability of $1x10^{-6}$ cm/sec and a minimum 40 ml flexible membrane cover (FMC); or
- Geosynthetic clay liner (GCL) and a minimum 40 mil FMC.

Drainage layer consisting of one of the following:

- 12 inches of a granular material with a minimum permeability of $1x10^{-3}$ cm/sec; or
- Drainage geonet with performance equivalent to the granular drainage layer.

Frost protection layer consisting of 30 inches of silty-sand material. The drainage layer may be used as part of the frost protection layer if the material meets the requirements of the drainage layer.

Vegetation layer sufficient to prevent erosion.

Long-term maintenance of the cap will be performed according to a plan to be approved by Ohio EPA. Ohio EPA will receive reports on inspections and maintenance and may, as necessary, conduct its own inspections of the Site.

7.2 Leachate Collection System Installation

In order to prevent the release to the environment of leachate initially generated from the landfill following capping activities, a leachate collection system is being proposed. This system will consist of a trench lined with either clay or a synthetic liner to prevent infiltration of leachate at the base of the landfill. The trench will contain perforated pipe and gravel, which will be designed to collect the leachate and transport it from the trench to an approved collection area. Additional specifications regarding the design of the trench will be approved by Ohio EPA as part of remedial design activities.

Performance Standard: In order to comply with this performance standard, specifications concerning construction of the leachate collection trench must meet with all Ohio EPA requirements. Leachate will be collected and treated/properly disposed until the concentration of site related contaminants has reached State of Ohio water quality standards for the Ohio River drainage basin, as specified in Ohio Administrative Code Rule 3745-1-34. Once these standards are met, the leachate collection system may be dismantled. Ohio EPA will receive periodic reports on the performance of this system and will only approve discontinuation of its operation upon a demonstration that the leachate

consistently meets State of Ohio Water Quality Standards.

7.3 Ground Water Monitoring Network Installation and Long-Term Monitoring

In order to detect whether contaminants have migrated to the boundary of the Site, a ground water monitoring network will be established and a long-term monitoring schedule will be developed. This network, which will serve to alert Ohio EPA of migration of contaminants toward nearby residential wells, will consist of monitoring wells currently located on the perimeter of the Site, as well as one (1) to two (2) new monitoring wells which will be installed downgradient of the Site. The location and appropriate number of new monitoring wells to be installed in the overburden and bedrock zones will be determined by Ohio EPA during the RD/RA process.

Monitoring will occur for a period of 30 years. The sampling program will consist of the collection of monitoring well samples four (4) times within the initial 180-days of operation, followed by continued monitoring well sampling twice per year for a period of 30 years. Samples will be analyzed for the complete list of contaminants of potential concern and their breakdown products, as identified in the Remedial Investigation Report for the Site (see Table 8).

Performance Standard: Performance standards for the ground water monitoring network include construction of the new monitoring wells and sampling of all monitoring wells in accordance with the requirements outlined in the *Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring* (Ohio EPA, 1995). Implementation of an approved long-term ground water monitoring program will be based on Ohio Administrative Code Rule 3745-27-10, Ground Water Monitoring Program for a Sanitary Landfill Facility.

Ohio EPA will receive reports on the results of the monitoring and will, if necessary, require modifications of the sampling program to assure accurate results. If through sample analysis, it appears that contaminants are continuing to migrate off-site via ground water, the remedy approved by Ohio EPA will be modified or amended and the new measures implemented.

7.4 Institutional Control Implementation

Institutional controls will be implemented as part of the remedy for this site. These institutional controls will include: the recording of restrictions limiting excavation, land use and ground water usage on the property; installation and long-term maintenance of perimeter fencing and signs; and a public education program.

The perimeter of the capped area will be fenced and warning signs will be posted to deter trespassers. Specifications regarding the size, wording, position and maintenance of the signs will be approved by Ohio EPA as part of O&M work plan.

A public education program will also be implemented to relay factual information regarding the landfill and site-related hazards. This may involve periodic town meetings and/or the issuance of fact sheets by NGSMSC. Specifications regarding the public education program will be approved by Ohio EPA as part of remedial design activities.

Performance Standards: Restrictions regarding the excavation of soils and use of ground water must be recorded on the deed and maintained through any property transfers. The deed restriction through the implementation of an Environmental Covenant (Ohio Revised Code §5301.80 et seq.) will be placed in the appropriate official records for Columbiana County following the completion of the installation of the low permeability cap. A survey of the post-cap topographic surface will be a required component of the deed restriction. All perimeter fencing and warning signs must be maintained in good condition in accordance with the approved O&M work plan. Warning signs which are found to be missing, must be replaced. Fact sheets will be issued and town meetings held to provide information regarding site remediation and operation and maintenance activities, on a schedule approved jointly by Ohio EPA and NGSMSC.

8.0 GLOSSARY

Aquifer -	An underground geological formation capable of holding and yielding water.
ARARs	Applicable or relevant and appropriate requirements. Those rules, including state and federal laws, which strictly apply to remedial activities at the site, or those rules whose requirements would help achieve the remedial goals for the site.
Baseline Risk Assessment -	An evaluation of the risks to humans and the environment posed by a site.
Carcinogen -	A chemical that causes cancer.
CERCLA -	Comprehensive Environmental Response, Compensation and Liability Act of 1980 as amended. A federal law that regulates cleanup of hazardous substances sites under the U.S. EPA Superfund Program.
Decision Document -	A statement issued by the Ohio Environmental Protection Agency giving the Director's selected remedy for a site and the reasons for its selection.
Ecological Receptor -	Animals or plant life exposed to chemicals released from a site.
Exposure Pathway -	Route by which a chemical is transported from the contaminated media to a human or ecological receptor.
Feasibility Study -	A study conducted to ensure that appropriate remedial alternatives are developed and evaluated such that relevant information concerning the remedial action options can be presented to a decision-maker and an appropriate remedy selected.
Hazardous Substance -	A chemical that may cause harm to humans or the environment.
Hazardous Waste -	A waste product, listed or defined by the Federal Resource, Conservation and Recovery Act (RCRA), or by State law under ORC Chapter 3734, which may cause harm to humans or the environment.
Human Receptor -	A person exposed to chemicals released from a site.
Leachate -	Water contaminated by contact with wastes.

NCP -	National Oil and Hazardous Substances Pollution Contingency Plan, codified at 40 CFR Part 300 (1990), as amended. A framework for remediation of hazardous substances sites specified in CERCLA.
O&M -	Operations and Maintenance. Those long-term measures taken at a site, after the initial remedial actions, to assure that a remedy remains protective of human health and the environment.
PCB -	Polychlorinated Biphenyl. A group of oily chemicals historical used in electrical equipment and hydraulic systems (ex. arochlor-1254).
Pesticide -	Substances which are intended to destroy or repel insects or to destroy or limit the growth of plants (ex. 4,4'-DDE, 4,4'-DDT, dieldrin, and endrin).
Preferred Plan -	The plan that evaluates the preferred remedial alternative chosen by the Ohio EPA to remediate the site in a manner that best satisfies the evaluation criteria.
RCRA -	Resource Conservation and Recovery Act of 1976, codified at 42 CFR Part 6901 et seq. (1988), as amended. A federal law that regulates the handling of hazardous wastes.
Remedial Action Objectives (RAO's) -	Specific goals of the remedy for reducing risks posed by the site.
Remedial Investigation (RI) -	A study conducted to collect information necessary to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives.
Responsiveness Summary-	A summary of all comments received concerning the Preferred Plan and Ohio EPA's response to all issues raised in those comments.
SVOCs -	Semivolatile Organic Compounds. A group or organic chemicals which volatilize or evaporate slowly (ex. bis (2-ethylhexyl) phthalate, diethylphtalate and di-n-butylphthalate).

VOCs -	Volatile Organic Compounds. A group of organic chemicals which volatilize or evaporate quickly (ex. trichloroethene, and 1,4-dichlorobenzene)
Water Quality Criteria -	Chemical and thermal standards that define whether a body of surface water is unacceptably contaminated. These standards are to intended to ensure that a body of water is safe for fishing, swimming and use as a drinking water source, as well as being safe for ecological receptors.

RESPONSIVENESS SUMMARY

for
Zeidrich Dump Site
Columbiana County, Ohio

(OHIO EPA RESPONSES TO ISSUES SET FORTH BY THE PUBLIC DURING THE JULY/AUGUST 2002 PUBLIC COMMENT PERIOD FOR THE ORIGINAL PREFERRED PLAN AND THE AUGUST 2005 PUBLIC COMMENT PERIOD)

Summary of Comments Received During the July/August 2002 Public Comment Period and Agency Response

The public comment period from Ohio EPA's Preferred Plan for the remedy at the Zeidrich Dump Site was held from July 12, through August 30, 2002. Comments received during this period, both in writing and during the August 14, 2002 public hearing, are summarized below. A copy of the legal transcript of the public hearing may be found in the Site files at the Ohio EPA, Northeast District Office.

(1) Will springs continue to feed water into the wetland?

Ohio EPA Response: Based on information collected during the Remedial Investigation, it has been noted that water is supplied to the wetland area from three main sources: (a) a small stream which enters the wetland from the east and does not flow adjacent to or through the landfill; (b) overland flow from the hillside that is located adjacent to East Line Street (this water does not flow through the landfill); and c) a spring or seep which originates from the base of the landfill and has been noted to be contaminated.

Of these three sources, only c), the spring/seep originating from the base of the landfill, has revealed levels of contamination. During remedial activities, a trench will be installed which will collect the water from the spring/seep for treatment or disposal. This collection of water/leachate from the landfill will continue until it can be demonstrated that either the water/leachate is no longer being produced by the landfill or it meets State of Ohio Water Quality Standards.

(2) Will all the trees be removed from the wetland area?

Ohio EPA Response: No. The only vegetation which will be removed from the wetland is that which is located in areas with sediment and soil contamination. Most of the trees found adjacent to the Zeidrich Dump Site are not located in areas which will require either sediment or soil removal.

(Revised Response: No trees or vegetation will be removed under the amended Decision Document, since it has been determined that remediation of the wetland is unnecessary.)

(3) What will the school board do if water begins to test "positive" for contaminants from Zeidrich Dump?

Ohio EPA Response: As explained above, the water/leachate generated by the landfill will be collected and either treated or properly disposed. The collection system will continue to operate until the water/leachate flow ceases or it meets State of Ohio Water Quality Standards. Contaminated water will not be discharged into the remediated wetland area, which includes property owned by the Minerva School Board.

(4) The construction of Hazen Middle School should be halted until Zeidrich Dump is completely cleaned up and OK'd by the EPA.

Ohio EPA Response: The Hazen Middle School building site is not located within the area of contamination from Zeidrich Dump. The building site is located on a hill, well above the adjoining wetland area. There is no reason to believe that contaminants from Zeidrich Dump have impacted the building site and, therefore, Hazen Middle School's proximity to the dump should not be a factor in determining its construction schedule.

(5) "Crevasses" may exist under the topsoil at Zeidrich Dump which could cause the spread of contamination from the dump into ground water.

Ohio EPA Response: a complete study was performed both on the surface and in the subsurface at the Zeidrich Dump Site. This study did not reveal the presence of any "crevasses" below the landfill. Hydrogeological studies did not reveal the spread of contaminants in ground water to the surrounding area. The presence of any "crevasses" below the landfill is highly unlikely.

In order to be proactive and insure the future protection of ground water wells in the area, Ohio EPA will require the installation of a monitoring well network around the landfill. The wells will be sampled periodically as part of operation and maintenance activities.

Remaining Concerns

Only one concern was raised during the public comment period which was not addressed during the Remedial Investigation/Feasibility Study (RI/FS) process. TRW, Inc., the potentially responsible party who performed the RI/FS, has questioned the methods used by their consultant for conducting the risk assessment – specifically the way background levels for arsenic and aluminum were determined.

Background concentrations of arsenic and aluminum vary across the State of Ohio. At Zeidrich Dump, concentrations for these metals appear to be unusually low. TRW, Inc. has questioned whether sample locations for background were appropriately selected. The concern may be valid.

It is Ohio EPA's desire to see a remedial action completed at Zeidrich Dump which is protective, but not so overly conservative that it leads to unnecessary destruction of wetlands. Because of this, Ohio EPA is willing to permit the collection of additional background samples for aluminum and arsenic during remedial design activities. If it is determined that clean-up levels for these two metals are different than presented within the decision document, they will be adjusted by Ohio EPA prior to the implementation of the remedial action. The alteration of clean-up levels for aluminum and arsenic will not increase risk posed to either human health or the environment. Acceptable risk at the Site will remain as identified in the Remedial Action Objectives (RAOs).

(Revised Response: Additional sampling was performed under the RD/RA Orders for the Zeidrich Dump Site. Results lead to Ohio EPA proposing an amendment to the Decision Document, which eliminated remediation in the wetland.)

Summary of Comments Received During the August 2005 Public Comment Period and Agency Response

The public comment period from Ohio EPA's Proposed Decision Document Amendment for the remedy at the Zeidrich Dump Site was held from June 24, through August 12, 2005. Comments received during this period, both in writing and during the August 3, 2005 public hearing, are summarized below. A copy of the legal transcript of the public hearing may be found in the Site files at the Ohio EPA, Northeast District Office.

(1) "I'll make it short and sweet. My understanding of this wetland situation is that it is a wetland all the way down to the school board property. Once it got to the school board property it not longer became a wetland and that's where the end product of the water that came down the valley quit running. *(The wetland)*It came to the school board property and until this *(Proposed Decision Document Amendment)* was determined, () the solution was *(to remove)* the wetland.

I'm quite disappointed to see the school board advance, move ahead with what they've done and bury the tail end of the wetland water and apparently it wasn't even sampled to see whether there could have been any contaminants at that site.

I would say my opinion of the plan to cap the site if it's developed correctly would be, probably, the best plan. And as far as the wetland goes, the school board already buried the most important part of it. And above the darn property there is now a little lake in there. Before, there was not water laying there at all. I recall it just drained on through there and came to the school board property and went down and soaked into the sand. And now it can't do that; it's blocked. And so there's a little pond up there. The farmers, why they'd see if the fish was still living there and if there were any dead fish, they'd fine them for every fish that was in there. Maybe we ought to go up there and check to see if there are any frogs dead in there.

The plans for capping the site is probably the best plan and if they do seal off and trap the water that drains from the site and monitor that water then it is probably the best plan. In the long term, the wetland will survive."

Ohio EPA Response: These comments have been considered and placed in the public record for this Site.

(2) "I don't feel the site or the ground waters are safe and free from contaminants. The area should be cleaned and loaded up and hauled away. The only supposed testing that they did appears that they merely loaded? Four (4) dumpsters, covered them with tarps and the 4 dumpsters still remain at the site in question. We have a very concerned interest in this as we have family living within approx. 200 yards of this site. Their well water tests strongly of mercury and there had to be 2 water conditioning systems along with a very expensive reverse osmosis system so their water would be drinkable. I'm sure there are other wells in the area that would test likewise. I had suspicions when they were contemplating purchasing the property and did some research on mercury noting that one of the indications of mercury presence was and is the greenish corrosion of copper plumbing which was prevalent in the home. The water was tested by a competent testing company and showed positive mercury. I sincerely think that Grumman Space and Mission Systems Corp. have paid someone off or someone did not follow thru on their testing since they were allowed to collect their own samples. I sincerely feel that there should be further and extensive testing of the ground water and of wells in the area surrounding. We had an unusual amount of rainfall in the year 2004 and several heavy snowfalls and rain in early 2005 which could contribute to the dilution of chemicals in the groundwater..."

Ohio EPA Response: Extensive sampling of soils on the Site and ground water both on and off the Site occurred during and following the remedial investigation. A summary of the sampling performed, as well as the analytical results from the sampling, may be found in the document repository at the Minerva Library, as well as at the Ohio EPA Northeast District Office.

The roll-offs that currently remain on-site are from the most recent sampling event which occurred in June 2004. The purpose of that sampling event was to further characterize the landfill, in order to determine whether excavation and off-site disposal of the entire landfill was an option. They do not represent the materials that were sampled as part of the remedial investigation and will be removed during implementation of the remedy.

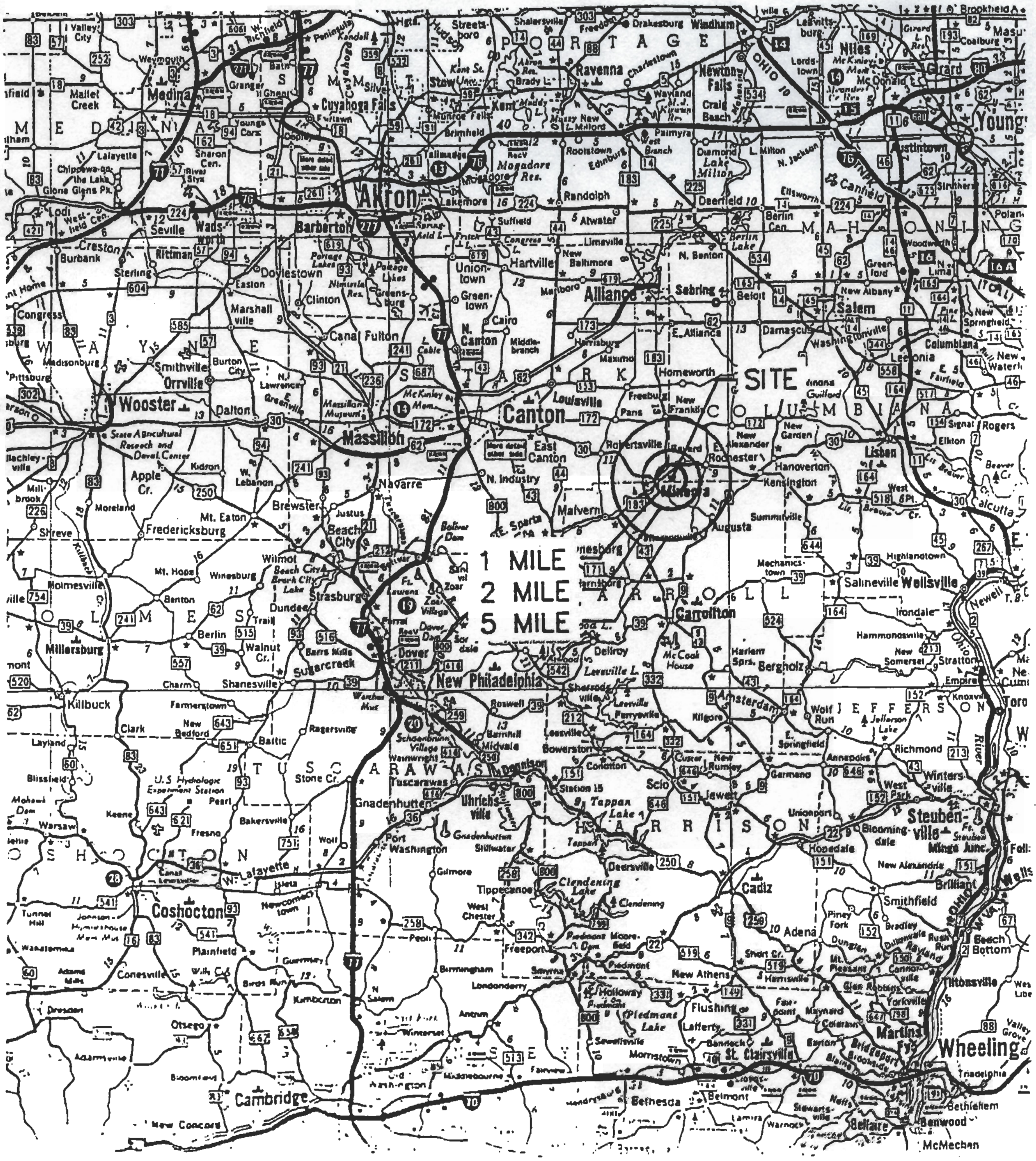
At least three (3) rounds of ground water/ drinking water sampling have been performed in the residences located in the vicinity of Zeidrich Dump. These sampling events did not detect elevated levels of site-associated contaminants, including mercury. All sampling was performed following approved methodologies, with the oversight of Ohio EPA, as is commonly done at other remedial response sites. In addition, the wells surrounding the Site were recently

sampling in January 2005. Results of this sampling did not reveal elevated levels of mercury in the ground water in the area surrounding the landfill. This indicates that the landfill is not acting as a source of mercury to residential water wells in the area.

FIGURES

MWH H:\DIVISION\71\MINERVA\FIG1.DWG SF:1 1/8/96

FIGURE 1



ZEIDRICH SITE
MINERVA, OHIO

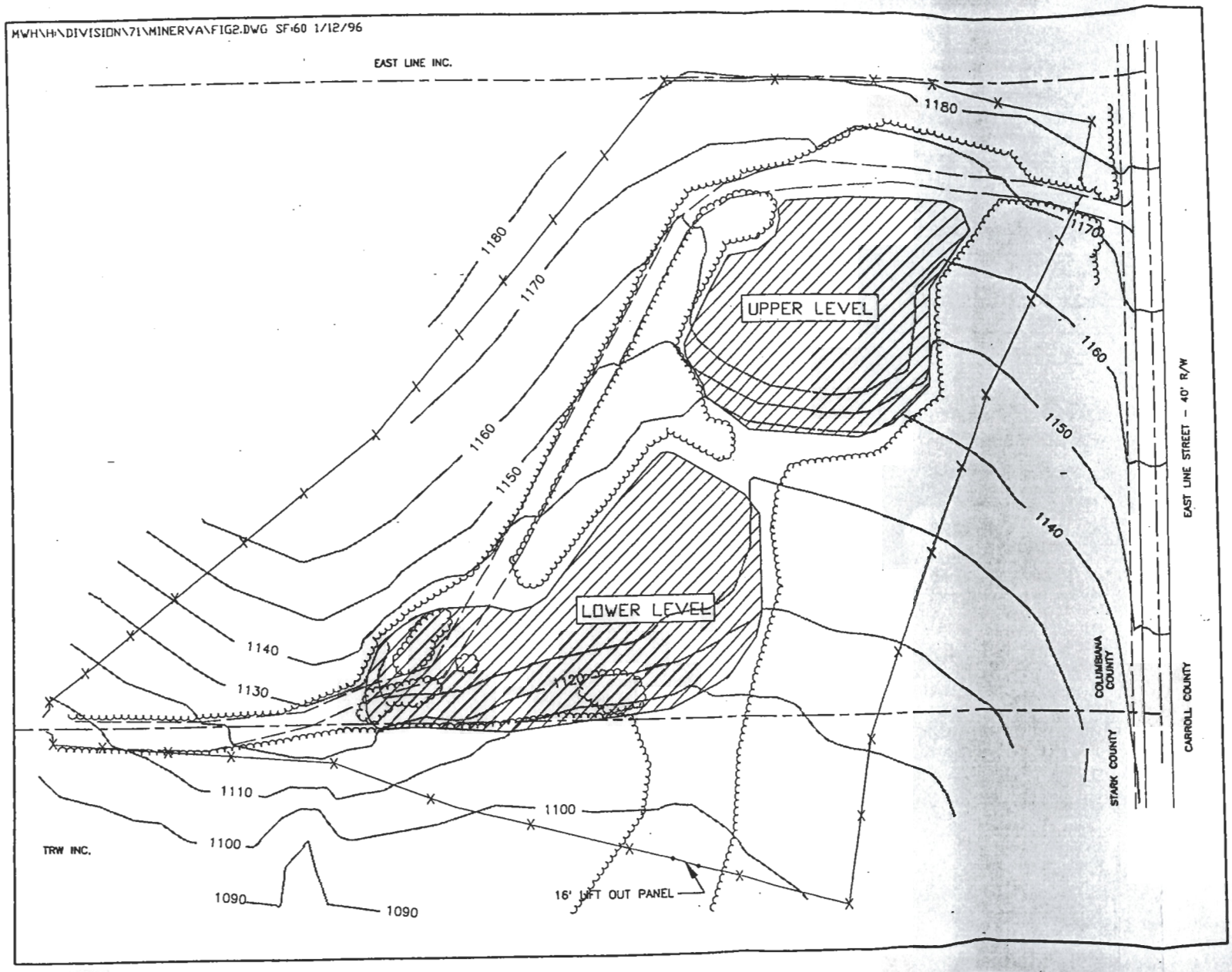
SITE LOCATION MAP

0 11.6 23.2

APPROX. SCALE IN MILES

O'BRIEN & GERE ENGINEERS INC.

FIGURE 2



LEGEND

- CHAIN LINK FENCE
- 1140 EXISTING TOPOGRAPHIC CONTOURS
- APPROX. LIMITS OF FILL

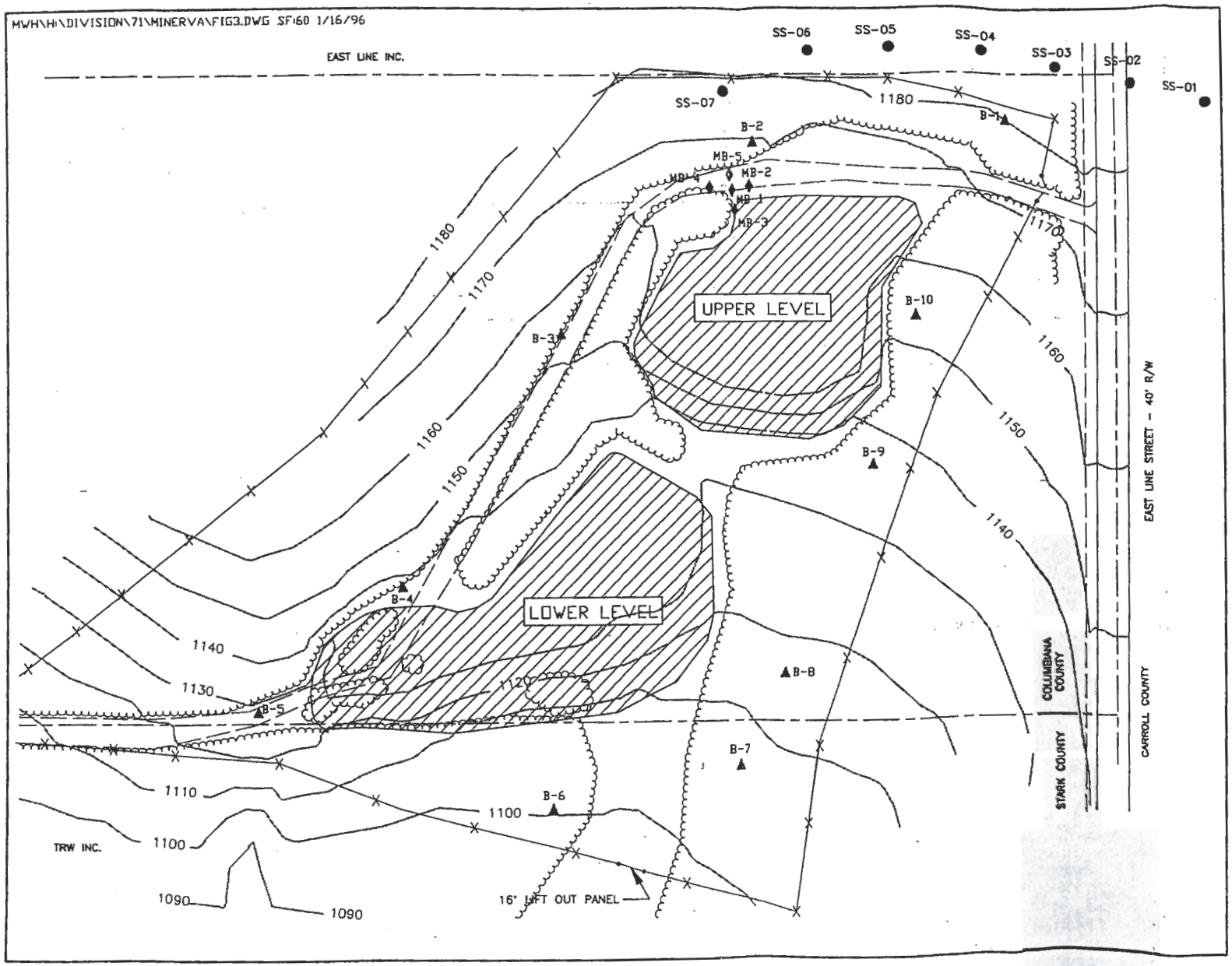
ZEIDRICH SITE
MINERVA, OHIO

SITE PLAN

0 60 120
SCALE IN FEET

O'BRIEN & GERE ENGINEERS INC.
Syracuse, New York

FIGURE 3



LEGEND

- CHAIN LINK FENCE
- 1140 EXISTING TOPOGRAPHIC CONTOURS
- SS-01 SURFACE SOIL SAMPLING LOCATION
- B-9 SOIL BORING LOCATION
- MB-3 MERCURY BORING LOCATION
- APPROX. LIMITS OF FILL

ZEIDRICH SITE
MINERVA, OHIO

SOIL SAMPLING LOCATIONS

0 60 120
SCALE IN FEET

O'BRIEN & GERE ENGINEERS INC.
Syracuse, New York

TABLES

TABLE 1
ZEIDRICH SITE
MINERVA, OHIO
SOIL ANALYTICAL DATA SUMMARY

	B1	B1	B2	B2	B3	B3	B4	B4	B5	B5	B6	B6	B7	B7	B8	B8	B9	B9	B10	B10	SS01	SS02	SS03	SS04	SS05	SS06	SS07
	0-2'	2-4'	4-6'	6-8'	0-2'	6-8'	0-2'	2-4'	0-2'	2-4'	0-2'	2-4'	0-2'	4-6'	0-2'	2-4'	0-2'	2-4'	0-2'	2-4'	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
PARAMETER	6/2/93	6/2/93	6/2/93	6/2/93	6/3/93	6/3/93	6/3/93	6/3/93	6/3/93	6/3/93	6/3/93	6/3/93	6/3/93	6/3/93	6/6/93	6/6/93	6/14/93	6/14/93	6/14/93	6/14/93	10/30/95	10/30/95	10/30/95	10/30/95	10/30/95	10/30/95	10/30/95
METALS (mg/kg)																											
Aluminum	7370 J	6350 J	5730 J	6460 J	5130 J	2690 J	2900 J	5030 J	7640 J	4150 J	5050 J	1880 J	10600 J	1760 J	3210	4140	5910	1450	5410	9280	7580	5070	4880	5100	7540	4960	5800
Antimony	4.2 J	3.7 J	4.2 J	R	4.3 J	3.7 J	R	5.5 J	R	5.0 J	R	R	5.0 J	2.5	ND	R	R	R	R	R	ND	ND	ND	ND	ND	ND	ND
Arsenic	2.7	0.66 J	1.4 J	1.5 J	1.4 J	1.1 J	0.57 J	0.79 J	ND	1.3 J	4.2 (6) J	4.6	5.4 (6) J	2.5	3.6	3.0	7.2 (6)	3.5	5.0 (6)	10.6 (6)	9.5	7.1	7.3	5.6	7.4	6.4	6.9
Barium	22.0 J	30.5 J	13.0 J	12.2 J	14.5 J	7.8 J	10.4 J	16.7 J	27.5 J	16.2 J	63.3	18.3 J	72.2	12.7 J	18.8	16.0 J	59.8	7.4	48.2	47.4	77.0	54.4	67.8	45.3 J	40.9 J	52.3	35.6 J
Beryllium	0.40 J	0.77 J	0.50 J	0.60 J	0.49 J	0.23 J	ND	0.36 J	0.67 J	0.34 J	0.27 J	ND	0.51	ND	0.24	ND	0.59	ND	0.43	0.87	0.51 J	0.46 J	0.35 J	0.45 J	0.50 J	0.29 J	0.34 J
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.24	ND	0.24	ND	ND	ND	ND	ND	0.31 J	ND	ND	ND	ND	0.17 J	ND
Calcium	128 J	358 J	324 J	341 J	145 J	76.3 J	127 J	190 J	480 J	256 J	516 J	132 J	201	176 J	92.1	239 J	773 J	164 J	602 J	415 J	642 J	380 J	334 J	114 J	123 J	297 J	141 J
Chromium	11.5 J	15.6 J	12.5 J	12.4 J	11.4 J	6.9 J	9.3 J	16.0 J	20.3 J	17.7 J	16.6 J	5.2 J	14.6 J	2.7 J	3.7	5.2	12.6 J	ND	5.3 J	13.5 J	27.1	21.7	17.5	9.6	19.2	19.1	11
Cobalt	7 J	10.5 J	9.1 J	8.8 J	11.0	4.0 J	10.6 J	16.6	18.9	19.7	18.0	6.1 J	10.5	1.9 J	3.2	2.6 J	10.7	4.3	6.2	18.9	14.4	13.2	6.9 J	6.5 J	10.1 J	8.9 J	6.7 J
Copper	7.9	17.6	11.2	11.3	10.7	5.8	6.0 J	9.0	21.5	11.6	8.3	4.4 J	9.4	4.7 J	4.0	5.9	6.1	2.4	5.6	17.3	9.0	8.5	6.1 J	4.8 J	5.6 J	7.2	4.8 J
Iron	16000 J	16400 J	15200 J	15400 J	15900 J	8620 J	8110 J	14200 J	18700 J	11100 J	6860 J	4980 J	18300 J	4740 J	8020	7920	11000 J	2740 J	9620 J	29600 J	13900	10600	10400	11100	14000	9680	10000
Lead	5.7	3.7	2.5 J	1.5	3.3	2.8	4.0	3.8 J	7.1 (6) J	21.2 (7) J	24.5 (7) J	7.5 (6) J	15.1 (6)	3.6 J	8.6 J	4.4 J	17.4 (7) J	7.0 (6) J	19.1 (7) J	14.6 (6) J	62.6	41.4	30.2	17.8	42.0	40.8	23.5
Magnesium	1180	3090	2010	1920	1660	943 J	1020 J	1720	2940	1800	1640	549 J	1810	816 J	533	839 J	728 J	245 J	739 J	2110 J	972 J	681 J	708 J	484 J	823 J	592 J	681 J
Manganese	205 J	218 J	358 J	355 J	362 J	155 J	193 J	368 J	357 J	211 J	638 J	202 J	636 J	108 J	114 J	105 J	593 J	191 J	619 J	1300 J	537 J	675 J	412 J	693 J	407 J	224 J	225 J
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.95 J	0.61 J	0.47 J	0.27 J	0.43 J	0.73 J	0.27 J
Nickel	13.6	24.5	19.0	18.8	17.0	12.0	27.4	39.5	50.6	59.8	76.7	5.0 J	15.3	5.3 J	4.8	6.1 J	13.4 J	2.0 J	9.2 J	24.7 J	76.7	63.8	60.7	26.0	57.2	96.8	25.2
Potassium	261 J	586 J	436 J	411 J	425 J	231 J	236 J	362 J	829 J	416 J	329 J	115 J	409	84.2 J	146	255 J	216 J	80.4 J	184 J	412 J	429 J	86.0 J	133 J	ND	244 J	231 J	102 J
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.24	ND	0.23 J	ND	R	ND	0.25 J	ND	1.4 J	ND	ND	ND	0.80 J	0.95 J	0.83 J
Silver	1.3 J	1.6 J	1.8 J	1.4 J	1.8 J	ND	0.83 J	1.3 J	1.5 J	0.72 J	1.1 J	ND	1.1 J	ND	0.76 J	1.1 J	1.1 J	R	R	2.6 J	ND	ND	ND	ND	ND	0.31 J	ND
Sodium	41.6 J	57.1 J	60.0 J	40.0 J	41.9 J	44.8 J	43.9 J	52.6 J	46.7 J	29.6 J	319 J	101 J	180	56.9 J	78.4	118 J	114 J	36.7 J	45.9 J	55.5 J	ND	67.6 J	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.24	ND	0.23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	14.2	12.9	11.3	11.0	11.4	8.7 J	8.1 J	10.3 J	13.6	7.9 J	19.9 J	4.1 J	21.7	3.8 J	6.7 J	8.4 J	11.0	3.2	11.2	16.9	18.3	10.3 J	10.9 J	10.6 J	15.1	12.8	12.5
Zinc	34.1 J	58.1 J	40.8 J	39.0 J	42.1 J	29.6 J	23.7 J	38.7 J	78.4 J	49.0 J	35.0 J	13.8 J	51.7 J	15.2 J	17.4 J	21.0 J	28.8 J	8.6 J	30.2 J	63.5 J	56.9	32.8	34.5	21.3	37.9	31.5	28.3
SEMI-VOLATILES (ug/kg)																											
Bis(2-Ethylhexyl)phthalate	ND	6.200 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.100 J	ND	ND	ND	0.470	0.230 J	0.055 J	0.090 J	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.052 J	0.066 J	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.420 J	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	0.019 J	ND	0.024 J	0.035 J	ND	0.043 J	ND	0.024 J	0.025 J	0.039 J	0.160 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Phenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.026 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
PESTICIDES/PCBs (mg/kg)																											
Aldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	R	0.009	ND	ND	ND	ND	R	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Aroclor-1254	ND	ND	0.0280 J	0.015 J	1.7 J	0.26	2.8	3	2.8	3.4	10 J	0.21 J	0.04 J	ND	ND	ND	5.4	0.03 J	0.032 J	0.02 J	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	ND	ND	ND	0.00047 NJ	R	R	R	R	R	R	ND	R	R	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	ND	ND	ND	ND	ND	ND	0.012 NJ	0.016 NJ	0.015 NJ	0.02 NJ	ND	0.0063 NJ	0.00235 NJ	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Dieldrin	ND	ND	ND	0.00027 NJ	0.032 NJ	0.0059 NJ	0.039 NJ	0.046 NJ	0.048 NJ	0.061 NJ	ND	0.0044 NJ	0.00092 NJ	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	ND	ND	ND	ND	ND	ND -	ND	0.09 NJ	0.067 NJ	0.09 NJ	0.21 NJ	0.0074 NJ	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	ND	ND	0.0007 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.14 NJ	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Endrin	ND	ND	ND	ND	0.02 NJ	0.0041 NJ	0.044 NJ	0.057 NJ	0.044 NJ	0.059 NJ	ND	0.0052 NJ	0.00051 NJ	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.097 J	ND	ND	ND	ND	ND	0.019 NJ	0.00042 NJ	0.00036 NJ	ND	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	ND	ND	0.0007 J	0.00039 J	ND	0.0009 NJ	NJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.057 J	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	ND	ND	ND	R	ND	R	R	R	R	R	R	R	R	ND	0.001 J	0.003 NJ	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
RADIOISOTOPES (pCi/g)																	R	R	R	R	NA	NA	NA	NA	NA	NA	NA
CS-137	ND	NA	ND	NA	ND	NA	ND	NA	ND	NA	0.201 ± 0.044	NA	0.176 ± 0.039	NA	ND	NA	ND	NA	0.122 ± 0.033	NA	NA	NA	NA	NA	NA	NA	NA
Gross-alpha	13 ± 6	NA	17 ± 6	NA	18 ± 7	NA	25 ± 7	NA	13 ± 6	NA	17 ± 6	NA	13 ± 6	NA	13 ± 6	NA	12 ± 6	NA	11 ± 6	NA	NA	NA	NA	NA	NA	NA	NA
Gross-beta	20 ± 3	NA	48 ± 4	NA	41 ± 3	NA	50 ± 4	NA	63 ± 4	NA	39 ± 3	NA	27 ± 3	NA	32 ± 3	NA	32 ± 3	NA	46 ± 4	NA	NA	NA	NA	NA	NA	NA	NA
K-40	13 ± 0.88	NA	18 ± 1.8	NA	15 ± 1.5	NA	12 ± 1.2	NA	21.6 ± 2.2	NA	13.7 ± 1.3	NA	11.3 ± 1.1	NA	12.6 ± 1.2	NA	11.2 ± 1.1	NA	11.9 ± 1.2	NA	NA	NA	NA	NA	NA	NA	NA
RA-226	0 ± 0.313	NA	1.61 ± 0.41	NA	1.44 ± 0.42	NA	1.23 ± 0.56	NA	1.78 ± 0.43	NA	1.88 ± 0.67	NA	1.20 ± 0.57	NA	1.06 ± 0.48	NA	1.48 ± 0.41	NA	1.31 ± 0.59	NA	NA	NA	NA	NA	NA	NA	NA
TH-228	± 0.072	NA	1.17 ± 0.12	NA	1.10 ± 0.11	NA	1.20 ± 0.12	NA	1.39 ± 0.14	NA	1.15 ± 0.12	NA	0.925 ± 0.092	NA	0.887 ± 0.089	NA	0.852 ± 0.085	NA	0.904 ± 0.090	NA	NA	NA	NA	NA	NA	NA	NA

Data as presented in the Remedial Investigation Report (O'Brien & Gere, 1996)
Format modified by Ohio EPA - 5/2002

NOTES: (1) ND - The analyte was analyzed for, but not detected.
(2) J - Indicates an estimated value.
(3) R - Data was rejected.
(4) N - Indicates presumptive evidence of a compound.
(5) Data was analyzed using Contract Laboratory Procedures.
(6) This sample was analyzed at a 1/2 dilution for lead. Lead concentrations were recalculated and are reported as undiluted concentrations
(7) This sample was analyzed at a 1/5 dilution for lead. Lead concentrations were recalculated and are reported as undiluted concentrations
(8) NA - Not analyzed.

TABLE 2
ZEIDRICH SITE
MINERVA, OHIO
MERCURY "HOT SPOT" ANALYTICAL DATA
MERCURY (ppm)

	0.0-2.0'	2.0-4.0'	4.0-6.0'	6.0-8.0'	8.0-10.0'
	6/15/93	6/15/93	6/15/93	6/15/93	6/15/93
Location Name					
MB-1	19.3 (5) J	0.25 J	0.06 J	0.32 J	0.08 J
MB-2	0.17 (5) J	0.43 J	0.06 UJ	(6)	0.16 J
MB-3	21.8 (5) J	0.32 J	1.1 J	0.37 J	0.25 UJ
MB-4	1.2	1.0	0.25 U	0.11 U	0.17 U
MB-5	0.20 U	0.20 U	0.13 U	0.14 U	0.36 U

Data as presented in the Remedial Investigation Report (O'Brien & Gere, 1996)
Format modified by Ohio EPA - 5/2002

NOTES:

(1) U - The analyte was analyzed for, but not detected.
(2) J - Indicates an estimated value.
(3) Data was analyzed using Contract Laboratory Procedures.
(4) All concentrations are expressed in parts per million (mg/kg) unless otherwise noted.
(5) This sample was analyzed at a 1/10 dilution for mercury. Mercury concentrations were recalculated and are reported as undiluted concentrations.
(6) A sample was not obtained at this depth.

TABLE 3
ZEIDRICH SITE
MINERVA, OHIO
GROUND WATER ANALYTICAL DATA SUMMARY

PARAMETERS	MW-1 6/24/93	MW-1 11/8/95	MW-2 6/24/93	MW-3D 6/24/93	MW-3S 6/24/93	MW-4D 6/24/93	MW-4S 6/24/93	MW-5D 6/25/93	MW-5S 6/25/93	MW-6D 6/25/93	MW-6S 6/25/93	MW-7 6/25/93	MW-8D 6/25/93	MW-8S 6/25/93	MW-9 6/25/93
METALS															
Aluminum	1.05 J	ND	2.91 J	ND	7.06 J	0.599 J	2.64 J	0.437 J	(8)	ND	3.85 J	12.4 J	0.445 J	2.97 J	7.2 J
Arsenic	0.0022 J	ND	ND	0.0024 J	0.0032 J	ND	0.0025 J	0.0033 J	(8)	0.0033 J	0.0176	0.0038 J	0.0025 J	0.002 J	0.0036 J
Barium	0.165 J	0.0931 J	0.465	0.176 J	0.446	0.243	0.203	0.324	(8)	0.0494 J	0.024 J	0.533	0.025 J	0.124 J	0.167 J
Calcium	41.6 J	7.8	110 J	43.1 J	45 J	42 J	73.6 J	36.2 J	(8)	9.4 J	15.5 J	42.7 J	20.9 J	9.87 J	24.3 J
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	(8)	ND	ND	0.0077	ND	ND	0.0016 J
Chromium	ND	ND	0.0429	ND	0.0059 J	ND	0.0063 J	ND	(8)	ND	0.153	0.0217	ND	ND	ND
Cobalt	ND	ND	0.0092 J	ND	0.0197 J	ND	ND	ND	(8)	ND	0.0097 J	0.0374 J	0.0035 J	0.0038 J	0.0132 J
Copper	0.0142 J	ND	0.0215 J	ND	0.0357	ND	0.005 J	ND	(8)	0.0305	0.0101 J	0.27	0.0049 J	0.0247 J	0.0211 J
Iron	5 J	0.0972 J	14.3 J	0.385 J	18.5 J	4.6	5.25 J	2.08 J	(8)	1.01 J	2.71 J	45.8 J	14.4 J	7.66 J	8.55 J
Lead	0.0032	ND	0.0226	ND	0.0293	0.0019 J	0.0029 J	0.0042	(8)	0.0031	0.0058 J	0.226 (7)	0.001 J	0.0178	0.0295 (6)
Magnesium	5.14	1.72 J	2.18 J	6.64	8.54	8.89	7.91	7.01	(8)	0.686 J	8.45	9.64	5.29	2.68 J	5.44
Manganese	0.141 J	0.0038 J	0.939 J	0.286 J	1.45 J	0.339 J	0.467 J	0.102 J	(8)	ND	0.609 J	10.1 J	0.962 J	0.616 J	1.55 J
Nickel	0.005 J	ND	0.0378 J	ND	0.0148 J	ND	ND	ND	(8)	ND	0.014 J	0.0554	ND	0.0056 J	0.0216 J
Potassium	2.99 J	2.58 J	3.98 J	1.34 J	1.26 J	1.84 J	5.48	2.19 J	(8)	2.68 J	2.27 J	3.35 J	1.15 J	1.5 J	1.31 J
Sodium	28.5 J	28.7	15.1 J	7.04 J	7.02 J	23.7 J	23.3 J	37.7 J	(8)	19.0 J	287 J	56.3 J	ND	50.6 J	5.21 J
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	(8)	ND	ND	0.0516 J	ND	ND	ND
Zinc	0.0371 J	ND	0.0651 J	ND	0.0833 J	0.0195 J	0.056 J	0.0382 J	(8)	0.0488 J	0.118 J	0.683 J	0.0207 J	0.0579 J	0.0805 J
VOLATILES															
Trichloroethene	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	10	ND	ND	ND	ND
SEMI-VOLATILES															
bis(2-Ethylhexyl)phthalate	0.5 J	NA	ND	ND	ND	2 J	ND	ND	(8)	0.7 J	1 J	ND	ND	ND	ND
2-Methylnaphthalene	0.6 J	NA	ND	ND	ND	ND	ND	ND	(8)	ND	ND	ND	ND	ND	ND
PCBS															
Aroclor-1254	ND	NA	ND	ND	ND	ND	ND	ND	(8)	ND	0.26 J	ND	ND	ND	ND
4,4'-DDE	ND	NA	ND	ND	ND	ND	ND	ND	(8)	ND	0.017 J	ND	ND	ND	ND
gamma-Chlordane	ND	NA	ND	ND	ND	ND	ND	ND	(8)	ND	0.021 J	ND	ND	ND	ND
RADIOCHEMISTRY															
Gross-alpha	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14 ± 7	11 ± 6	7.9 ± 4.5	10 ± 5
Gross-beta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25 ± 5	32 ± 5	11 ± 4	34 ± 5
TH-228	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22.7 ± 4.5	ND	ND	ND

Data as presented in the Remedial Investigation Report (O'Brien & Gere, 1996)
Format modified by Ohio EPA - 5/2002.

NOTES: (1) ND - The analyte was analyzed for, but not detected.
(2) J - Indicates an estimated value.
(3) R - Data was rejected.
(4) N - Indicates presumptive evidence of a compound.
(5) Data was analyzed using Contract Laboratory Procedures.
(6) This sample was analyzed at a 1/2 dilution for lead. Lead concentrations were recalculated and are reported as undiluted concentrations.
(7) This sample was analyzed at a 1/10 dilution for lead. Lead concentrations were recalculated and are reported as undiluted concentrations.
(8) A sample was not collected from MW-5S due to insufficient water in the well.
(9) NA - Not analyzed.
(10) VOC samples were obtained 8/3/93.

TABLE 4
ZEIDRICH SITE
MINERVA, OHIO
RESIDENTIAL WELL ANALYTICAL DATA SUMMARY

PARAMETERS	McCloskey 7/21/98	Tarbet 7/21/98	Tarbet 9/26/94	Cross 7/21/98	Reed 7/21/98	Hunter 7/21/98	McClure 7/21/98	Morte 7/21/98
METALS (ppm)								
Aluminum	0.0323 J	0.0749 J	NA	0.0278 J	ND	ND	ND	ND
Antimony	ND	0.023 J	NA	ND	ND	ND	ND	ND
Arsenic	0.006 J	0.005 J	NA	ND	ND	ND	0.002 J	ND
Barium	0.0106 J	0.294	NA	0.319	0.25	0.219	0.317	0.0243 J
Calcium	12.6	41.6	NA	48.4	14.4	45.3	48.6	49.7
Cobalt	ND	0.0031 J	NA	ND	ND	ND	ND	ND
Copper	0.0053 J	0.483	NA	ND	ND	0.0107 J	ND	0.0327
Iron	9.17 J	71.2 J	NA	0.323 J	0.926 J	0.577 J	0.802 J	0.564 J
Lead	ND	0.0191	0.0036	ND	ND	ND	ND	ND
Magnesium	3.72 J	7.62	NA	8.15	2.93 J	7.85	8.86	13.4
Manganese	0.877 J	2.19 J	NA	0.375 J	0.0467 J	0.309 J	0.257 J	0.391 J
Potassium	0.493 J	1.12 J	NA	1.47 J	1.43 J	1.44 J	1.8 J	1.28 J
Silver	ND	0.0043 J	NA	ND	ND	ND	ND	ND
Sodium	5.98	4.34 J	NA	21.8	73.6	21	23.7	5.59
Zinc	ND	0.0762 J	NA	0.0389 J	0.0487 J	0.403 J	0.0258 J	0.025 J
VOC's (ppb)								
1,2,3 Trichlorobenzene	ND	2 J	NA	2 J	ND	ND	ND	2 J
Naphthalene	ND	2 J	NA	2 J	ND	ND	ND	2 J
SEMIVOLATILES (ppb)								
1,4-Dichlorobenzene	ND	ND	NA	ND	ND	0.5 J	ND	ND
PCBS/PESTICIDES (ppb)	ND	ND	NA	ND	ND	ND	ND	ND
RADIOACTIVITY (pC/L)	ND	ND	NA	ND	ND	ND	ND	ND

Data as presented in the Remedial Investigation Report (O'Brien & Gere, 1996)
Format modified by Ohio EPA - 5/2002

NOTES:
(1) ND - The analyte was analyzed for, but not detected.
(2) J - Indicates an estimated value.
(3) Data was analyzed using Contract Laboratory Procedures.
(4) VOC samples were obtained on December 6, 1993.

TABLE 5
ZEIDRICH SITE
MINERVA, OHIO
SURFACE WATER ANALYTICAL DATA SUMMARY

PARAMETERS	SW-1 6/17/93	SW-2 11/23/93	SW-3 11/23/93	SW-4 11/23/93	SW-5 11/23/93	SW-6 11/23/93	SW-7 11/23/93	SW-8 11/22/93	SW-9 6/17/93	SW-9A 11/23/93	SW-10 11/23/93	SW-10A 11/23/93	SW-11 11/23/93	SW-12 10/30/95	SW-13 10/30/95	SW-14 10/30/95	SW-15 10/30/95	SW-16 10/30/95	SW-17 10/30/95	SW-18 10/30/95
METALS																				
Aluminum	0.11 J	62.8 J	41.5 J	8.83 J	4.05	10.6 J	1.45 J	9.25 J	0.564 J	2.42 J	0.262 J	8.89 J	3.76 J	0.163 J	0.335	6.18 J	ND	2.61	0.881	18.1
Arsenic	ND	0.0338	0.0251	0.0116	0.0087	0.0057 J	0.0152	0.0054 J	0.0045 J	ND	0.0049 J	ND	0.0118	ND	ND	0.0066 J	ND	ND	ND	0.0099 J
Barium	0.0688 J	0.222	0.194 J	0.0808 J	0.0651	0.0748 J	0.0208 J	0.152 J	0.0226 J	0.039 J	0.0219 J	0.103 J	0.0711 J	0.0105 J	0.0148 J	0.0795 J	0.012 J	0.0396 J	0.022 J	0.225
Beryllium	ND	0.0019 J	0.0014 J	ND	0.001	ND	ND	0.0013 J	ND	ND	ND	0.0015 J	ND	ND	ND	0.00048 J	ND	ND	ND	0.0018 J
Aluminum	ND	ND	ND	ND	0.0035	ND	ND	ND	ND	ND	ND	0.0046 J	ND	ND	ND	ND	ND	ND	ND	0.0016 J
Calcium	10.6 J	8.98	10.2	10.8	12.1	10.9	24.5	18.9	9.58 J	7.41	10.6 J	9.14	13.8 J	9.990	9.4	10.8	10.2	9.41	9.54	13.8
Chromium	ND	0.194	0.189	0.176	0.154	0.152	0.234	0.169	0.0064 J	0.0764	0.0066 J	0.113	0.0443 J	ND	ND	0.0074 J	ND	0.0046 J	ND	0.0229
Cobalt	ND	0.0367 J	0.0253 J	0.0114 J	0.009	0.01 J	ND	0.0087 J	ND	ND	ND	0.0114 J	0.0056 J	ND	ND	0.0047 J	ND	0.0017 J	ND	0.0163 J
Copper	ND	0.0703	0.05	0.0237 J	0.0164	0.0207 J	0.0049 J	0.0146 J	ND	0.0113 J	0.004 J	0.0192 J	0.0073 J	0.0088 J	0.0053 J	0.0228 J	ND	0.0067 J	0.0047 J	0.0488
Iron	0.17 J	64.3	40.5	8.64	4.3	9.6	2.12	13.1	1.79 J	4.22	1.45 J	10.8	8.33 J	0.617	0.599	10.3 J	0.175	2.74	0.998	23.1
Lead	ND	0.0107 J	R	R	R	R	R	0.0386 J	ND	0.0135 J	ND	0.0603 J	0.0136 J	0.0242	0.0086	0.161 J	0.0017 J	0.0134	0.0069	0.162
Magnesium	3.37 J	56.1	64.4	57.7	52.7	48.2	12.1	8.08	4.48 J	3.22 J	4.4 J	3.06 J	10.9	3.49 J	3.27 J	4.46 J	3.57 J	3.71 J	3.53 J	6.75
Manganese	0.0202 J	0.967	1.04	0.17	0.119	0.102	0.106	1.11	0.187 J	0.154	0.0953 J	0.744	1.38 J	0.0222	0.0326	0.204 J	0.0157	0.0757	0.0459	1.18
Mercury	0.00014 J	0.00082	0.00068	0.00056	0.00037	0.00046	0.00021	0.00035	0.0001 J	0.00024	0.00013 J	0.0003	0.00014 J	ND	ND	ND	ND	ND	ND	0.00020
Nickel	ND	0.0681	0.0409	0.0143 J	0.0101	0.0168 J	0.0187 J	0.0281 J	ND	0.0117 J	ND	0.0173 J	0.0045 J	0.0027 J	0.0021 J	0.013 J	0.0015 J	0.006 J	0.0021 J	0.0424
Potassium	1.51 J	19.7	18.6	14.6	13.8	13.1	2.88 J	4.34 J	1.08 J	1.66 J	1.29 J	1.86 J	2.36 J	1.67 J	1.58 J	2.6 J	2.11 J	2.22 J	2.23 J	3.87 J
Selenium	ND	ND	ND	0.0013 J	ND	ND	ND	0.0013 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	2.9 J	1140	1190	1140	973	943	335	208	47	86.5	48.2	73	137	3.10 J	3.07 J	3.11 J	2.87 J	2.96 J	2.99 J	3.07 J
Thallium	ND	ND	0.0014 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	0.103	0.0719	0.0114 J	0.003	0.0038 J	0.0054 J	0.0143 J	ND	0.0075 J	ND	0.0332 J	ND	ND	ND	0.011 J	ND	0.0047 J	ND	0.0345 J
Zinc	0.0418 J	0.203	0.131	ND	0.0218	ND	ND	0.109	0.0316 J	0.056	0.0344 J	0.117	0.0897 J	0.0212	0.0175 J	0.122 J	0.019 J	0.0354	0.0242	0.320
WET CHEMISTRY																				
SEMI-VOLATILES (5)																				
Diethylphthalate	ND	ND	ND	1 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
PESTICIDES (5)																				
Aroclor-1254	ND	1.8	0.32 J	ND	ND	ND	1.4	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	ND	0.014 NJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.026 J	ND	NA	NA	NA	NA	NA	NA	NA
RADIOCHEMISTRY																				
Gross-alpha	ND	56 ± 27	ND	ND	ND	ND	10 ± 7	ND	ND	ND	ND	5.4 ± 4.0	ND	NA	NA	NA	NA	NA	NA	NA
Gross-beta	4.0 ± 2	61 ± 11	17 ± 5	21 ± 6	35 ± 7	37 ± 7	13 ± 4	8.7 ± 3.1	11 ± 3	5.4 ± 2.5	ND	17 ± 3	11 ± 4	NA	NA	NA	NA	NA	NA	NA
K-40	ND	1510 ± 150	ND	ND	ND	ND	67.8 ± 31.1	ND	ND	ND	ND	ND	48.7 ± 25.3	NA	NA	NA	NA	NA	NA	NA
RA-226	ND	163 ± 59	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
TH-228	ND	122 ± 12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA

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NOTES:
(1) ND - The analyte was analyzed for, but not detected.
(2) J - Indicates an estimated value.
(3) R - Data was rejected.
(4) N - Indicates presumptive evidence of a compound.
(5) Data was analyzed using Contract Laboratory Procedures.

TABLE 6
ZEIDRICH SITE
MINERVA, OHIO
SEDIMENT ANALYTICAL DATA SUMMARY

PARAMETERS	SED-1	SED-2	SED-3	SED-4	SED-5	SED-6	SED-7	SED-8	SED-9	SED-9A	SED-10	SED-10A	SED-11	SED-12	SED-13	SED-14	SED-15	SED-16	SED-17	SED-18
	6/17/93	11/23/93	11/23/93	11/23/93	11/23/93	11/23/93	11/22/93	11/22/93	6/17/93	11/23/93	6/17/93	11/23/93	6/17/93	10/30/95	10/30/95	10/30/95	10/30/95	10/30/95	10/30/95	10/30/95
METALS (ppm)																				
Aluminum	12500	20000	19500	25500	16800	8340	18800	22900	2350	25200	5870	36200	5310	2770	2070	2920	3640	4590	6930	3290
Arsenic	2.4	14.7 J	6.6 J	19.3 J	12.9	13.5 J	6.1 J	5.0 J	1.4	3.1 J	2.4	ND	1.1	3.9	5.3	2.8 J	2.7 J	3.4 J	5.2	2.0 J
Barium	96.2	91.7	131	146	74.3	63.0	89.2 J	202	33.5	185	74.9	249	87.0	31.2 J	25.8 J	26.3 J	38.7 J	57.2 J	69.1	30.8 J
Beryllium	1.0	0.75 J	0.72 J	0.95 J	0.72	0.62 J	0.79 J	2.2 J	ND	1.5 J	0.73	1.6 J	0.59	0.36 J	0.39 J	0.43 J	0.50 J	0.57 J	0.63 J	0.49 J
Calcium	490 J	307 J	397 J	185 J	238	240 J	2460	6570	2080 J	3520	2120 J	3030	2020 J	532 J	558 J	488 J	863 J	1090 J	1010 J	584 J
Cadmium	ND	ND	ND	ND	1.1	ND	ND	ND	ND	ND	ND	ND	0.55	0.18 J	0.19 J	0.21 J	0.26 J	0.27 J	ND	0.20 J
Chromium	12.9 J	25.3	27.5	30.3	21.6	18.5	61.6	156	51.3 J	229	34.3 J	46.0	13.7 J	8.3	5.3	6.6	6.5	7.6	9.5	6.1
Cobalt	15.6	15.1	13.3	10.7 J	17.1	10.5 J	5.2 J	10.2 J	1.7 J	9.7 J	3.0	8.3 J	2.1	3.2 J	3.8 J	3.6 J	3.7 J	4.4 J	6.2 J	4.2 J
Copper	10.4	15.5	18.4	24.7	14.4	6.0	8.6 J	25.7	4.6	16.5	11.6	18.0	7.5	46.8	25.0	10.3	14.1	11.9	10.2	6.8 J
Cyanide	ND	ND	ND	ND	1.6	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Iron	21000 J	28500	28900	34200	27000	23200	8350	13300	3000 J	12100	7540 J	18800	3960 J	13600	12800	7160	6880	7120	9480	6830
Lead	7.8 J	14.8 J	7.7 J	18.3 J	- 16.0	12.1 J	28.3 J	62.2 J	20.9 (7) J	32.7 J	19.8 (7) J	R	13.1 (6) J	241 J	102 J	57.0 J	63.6 J	45.2 J	35.6 J	28.5 J
Magnesium	1630 J	3560	3890	4470	3180	1660	1770 J	2440 J	631 J	2630	1110 J	2860	705 J	641 J	418 J	546 J	712 J	934 J	1270 J	665 J
Manganese	1320 J	702 J	629 J	431 J	662	849 J	52.7 J	319 J	64.4 J	237 J	113 J	126 J	184 J	97.7	143	82.0	98.0	151	141	72.7
Mercury	0.1 J	0.13 J	ND	ND	0.20	ND	0.23 J	ND	0.13 J	ND	3.2	0.19 J	ND	ND	0.06 J	0.08 J	ND	0.12 J	0.08 J	0.13 J
Nickel	17.7 J	21.3	20.0	23.2	19.5	9.5	11.5 J	29.8 J	7.3 J	24.8	10.6 J	17.6	4.8 J	9.8 J	7.2 J	8.3 J	9.1 J	10.6 J	14.2	8.6 J
Potassium	362 J	2310	2120	2320	1350	759 J	1720 J	1950 J	205 J	1640 J	376 J	1790 J	363 J	ND	ND	ND	ND	ND	ND	ND
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	0.48 J	ND	0.50 J	ND	0.39 J	ND	ND	ND	ND	ND	ND	ND
Silver	1.3 J	ND	ND	ND	1.1	ND	ND	ND	R	ND	R	ND	R	ND	ND	ND	ND	ND	ND	ND
Sodium	73.3 J	2400	2190	3290	2010	732 J	963 J	1980 J	218 J	900 J	425 J	933 J	544	ND	ND	ND	ND	ND	ND	ND
Thallium	ND	0.80 J	0.53 J	0.86 J	0.85	0.43 J	0.65 J	1.0 J	ND	1.0 J	ND	1.2 J	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	23.1	45.2	44.5	51.0	35.3	28.3	24.6	31.6 J	5.4	37.5	11.0	52.4	9.3	8.1 J	7.3 J	7.8 J	7.7 J	11.4 J	13.1 J	8.3 J
Zinc	55.6 J	82.4 J	52.2 J	82.6 J	61.7	34.6 J	53.6 J	150 J	40.3 J	107 J	47.8 J	85.5 J	29.0 J	101	63.4	61.4	76.9	65.8	67.6	68.9
VOLATILES (ppm)																				
Acetone	0.043 J	ND	ND	ND	ND	ND	0.055 J	0.74 J	R	ND	R	ND	0.036 J	NA	NA	NA	NA	NA	NA	NA
2-Butanone	0.012 J	ND	ND	ND	ND	ND	0.020 J	0.170	R	0.012 J	R	ND	0.009 J	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	ND	ND	ND	ND	0.002 J	0.011 J	ND	ND	R	0.032	R	0.017 J	ND	NA	NA	NA	NA	NA	NA	NA
SEMI-VOLATILES (ppm)																				
Benzo(b)fluoranthene	0.056 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.6 J	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	ND	ND	ND	ND	ND	ND	ND	ND	0.068 J	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND	ND	ND	0.033 J	ND	0.099 J	ND	ND	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	0.042 J	0.094 J	0.087 J	ND	ND	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	0.31 J	ND	ND	ND	ND	ND	ND	0.210 J	ND	ND	2.7	ND	ND	NA	NA	NA	NA	NA	NA	NA
Naphthalene	ND	ND	ND	ND	ND	ND	ND	ND	0.042 J	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	0.086 J	ND	ND	ND	ND	ND	ND	ND	0.033 J	0.110 J	0.053 J	ND	ND	NA	NA	NA	NA	NA	NA	NA
Pyrene	0.099 J	ND	ND	ND	ND	ND	ND	ND	0.068 J	0.150 J	0.098 J	ND	ND	NA	NA	NA	NA	NA	NA	NA
PESTICIDES (ppm)																				
Aroclor-1248	ND	ND	R	ND	ND	ND	0.13 ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Aroclor-1254	ND	0.024 J	0.088	ND	ND	ND	0.32	0.12 J	ND	0.063 J	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	0.0048 J	ND	ND	ND	ND	ND	ND	ND	ND	R	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	0.0024 NJ	ND	ND	ND	ND	ND	ND	0.0044 JN	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00079 J	ND	ND	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	ND	ND	ND	ND	ND	ND	ND	ND	0.0016 J	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
RADIOLOGICAL (pCi/g)																				
Gross-alpha	11 ± 5	12 ± 6	14 ± 6	21 ± 7	15 ± 6	7.1 ± 4.8	11 ± 5	15 ± 6	13 ± 6	21 ± 7	10 ± 5	13 ± 6	15 ± 6	NA	NA	NA	NA	NA	NA	NA
Gross-beta	29 ± 3	31 ± 3	36 ± 3	38 ± 3	38 ± 3	28 ± 3	41 ± 3	40 ± 3	44 ± 4	31 ± 3	44 ± 4	38 ± 3	31 ± 3	NA	NA	NA	NA	NA	NA	NA
K-40	10.7 ± 1.1	14.8 ± 1.5	14.3 ± 1.4	13.6 ± 1.4	15.3 ± 1.5	11.0 ± 1.1	11.7 ± 1.2	13.8 ± 1.4	16.7 ± 1.7	12.8 ± 1.3	14 ± 1.4	12.2 ± 12	11.6 ± 1.2	NA	NA	NA	NA	NA	NA	NA
CS-137	0.271 ± 0.044	ND	ND	ND	ND	ND	0.942 ± 0.094	0.64 ± 0.064	1.32 ± 0.13	ND	1.03 ± 0.10	0.559 ± 0.056	0.0607 ± 0.0264	NA	NA	NA	NA	NA	NA	NA
RA-226	1.73 ± 0.52	2.16 ± 0.58	1.98 ± 0.82	2.06 ± 0.54	1.77 ± 0.51	1.45 ± 0.40	2.62 ± 0.73	2.52 ± 0.67	2.64 ± 0.78	3.44 ± 0.71	3.23 ± 0.67	2.88 ± 0.74	2.06 ± 0.63	NA	NA	NA	NA	NA	NA	NA
TH-228	0.783 ± 0.078	1.00 ± 0.10	1.46 ± 0.15	1.16 ± 0.12	1.07 ± 0.11	0.733 ± 0.073	0.996 ± 0.10	1.08 ± 0.11	0.993 ± 0.099	1.23 ± 0.12	1.25 ± 0.13	1.16 ± 0.12	0.892 ± 0.089	NA	NA	NA	NA	NA	NA	NA

Data as presented in the Remedial Investigation Report (O'Brien & Gere, 1996)
Format modified by Ohio EPA - 5/2002.

NOTES: (1) ND - The analyte was analyzed for, but not detected.
(2) J - Indicates an estimated value.
(3) R - Data was rejected.
(4) N - Indicates presumptive evidence of a compound.
(5) Data was analyzed using Contract Laboratory Procedures.
(6) This sample was analyzed at a 1/2 dilution for lead. Lead concentrations were recalculated and are reported as undiluted concentrations.
(7) This sample was analyzed at a 1/5 dilution for lead. Lead concentrations were recalculated and are reported as undiluted concentrations

TABLE 7
ZEIDRICH SITE
MINERVA, OHIO
AMBIENT AIR DATA SUMMARY

PARAMETERS	ZD-1	ZD-2	ZD-3
	7/21/93	7/21/93	7/21/93
VOCs (ug/m3)			
Benzene	1.2	ND	ND
1,1,1-Trichloroethane	1.9	2.5	1.8
Toluene	9.1	3.9	5.1

Data as presented in the Remedial Investigation Report (O'Brien & Gere, 1996)
Format modified by Ohio EPA - 5/2002.

NOTES:

(1) ND - The analyte was analyzed for, but not detected.
(2) Data was analyzed using Contract Laboratory Procedures.

TABLE 8
CONTAMINANTS OF POTENTIAL CONCERN (COPCs)
ZEIDRICH DUMP SITE
MINERVA, OHIO

Soils	Surface Water	Ground Water
Aluminum	Aluminum	Aluminum
Antimony	Arsenic	Antimony
Mercury	Barium	Arsenic
Thallium	Cobalt	Barium
Vanadium	Copper	Cadmium
4,4-DDT	Iron	Copper
Aroclor-1254	Mercury	Chromium
Bis(2-ethylhexyl)phthalate	Vanadium	Cobalt
1,4-Dichlorobenzene	Aroclor-1254	Iron
Di-n-butylphthalate	Diethylphthalate	Lead
Diethylphthalate	Endosulfan	Manganese
Dieldrin	Endrin aldehyde	Nickel
Endosulfan		Zinc
Endosulfan II		4,4-DDE
Endrin ketone		Aroclor-1254
Methoxychlor		g-Chlordane
Phenol		Trichloroethene
K-40		