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Science Applications International Corporation
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June 3, 2004

Lynette Bennett
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Building 61
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RE: Public Review Final Proposed Plan for the Miami-Erie Canal Area

Dear Ms. Bennett,

Enclosed please find four copies of the Public Review Final Proposed Plan for the Miami-Erie Canal. The revision requested by U.S. EPA has been made so these reports supercede those sent to you on Monday, June 1, 2004. Please see that these reports are made available in the CERCLA Public Reading Room.

Thanks for all your help. If you have any questions or concerns feel free to contact me at (614) 791-3342 or (614)361-5969.

Sincerely,
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

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Project Manager

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240601-0406170016

MIAMI-ERIE CANAL

PROPOSED PLAN

PUBLIC REVIEW FINAL
JUNE, 2004

Miamisburg Closure Project

Prepared for:

U.S. Department of Energy

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Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
BaP	benzo(a)pyrene
BVA	Buried Valley Aquifer
CERCLA	Comprehensive Environmental Response, Compensation, & Liability Act
COPC	constituent of potential concern
DbA	dibenz(a,h)anthracene
ERA	Ecological Risk Assessment
ERE	Environmental Risk Evaluation
FOD	frequency of detection
HI	Hazard Index
MCP	Miamisburg Closure Project
mg/kg	milligrams per kilogram
NFA	No Further Assessment
NPDES	National Pollutant Discharge Elimination System
EPA	Environmental Protection Agency
OSC	On Scene Coordinator
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
ppb	parts per billion
ppm	parts per million
PCB	polychlorinated biphenyl
pCi/g	picocuries per gram
RBGV	Risk-Based Guideline Value
ROD	Record of Decision
RRE	Residual Risk Evaluation
RREM	Residual Risk Evaluation Methodology
SDWA	Safe Drinking Water Act
SM/PP	Special Metallurgical/Plutonium Processing
SVOC	semivolatile organic compound
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
UTL	upper tolerance limit
VOC	volatile organic compound

1.0 SITE NAME, LOCATION, AND DESCRIPTION

The U.S. Department of Energy (USDOE) Mound Plant (CERCLIS ID-04935) is located within the city limits of Miamisburg, approximately 10 miles southwest of Dayton and 45 miles north of Cincinnati (Figure 1). The site is predominantly a residential community with supportive commercial facilities and industrial development. The adjacent upland areas are used primarily for residences and agriculture or are unused open spaces. The only major water body in the vicinity of the Mound Plant is the Great Miami River located approximately 2,000 feet to the west. The river is approximately 150 to 200 feet wide in this area. Also to the west is a segment of the abandoned Miami-Erie Canal (Figure 2).

Remedial activities for the Mound site were originally organized into nine Operable Units (OU). A portion of the abandoned Miami-Erie Canal is a primary feature of OU4. OU4 (see Figure 3) was defined as: 1) the abandoned Miami-Erie Canal; 2) the Overflow Creek, which connects the canal to the river; 3) the Drainage Ditch from the site boundary to the canal; 4) the Runoff Hollow between the Conrail tracks and Mound Plant; and 5) the South Pond in the Miamisburg City Park. Within OU4, land use is a combination of a city park, conservancy district, and the railroad right-of-way.

The north-south trending canal area lies between the Conrail Railroad right-of-way to the east and the Dayton-Cincinnati Road to the west. The Miami-Erie Canal was constructed during the 1800s as a north-south transportation route, and abandoned in 1915. The segment of the canal within OU4, with the exception of the Miamisburg City Park, appears to have gone unmaintained since its abandonment. A drainage ditch separates the canal into two segments, the North and South Canal (Figure 3). All of the South Canal and a portion of the North Canal are within a floodplain.

The Miamisburg City Park, located immediately northeast of OU4, is used year-round, with a peak usage in the summer (basketball area and tennis courts). Residential buildings, a mobile home park, and light commercial businesses are located near the Overflow Creek and the west side of the northern portion of the canal.

The Drainage Ditch from the Mound Plant to the canal was utilized for surface water runoff from the elevated plant site. This Drainage Ditch is the separation point between the North and South Canal (Figure 3). Originally, the runoff flowed both north and south along the canal. In 1976, a flapper valve was installed, eliminating discharges to the North Canal, but allowing flow from the North Canal to the South Canal. The South Canal flows into the Overflow Creek, which empties into the Great Miami River.

The City of Miamisburg has a sanitary sewer line buried within the North Canal. The sanitary sewer line runs approximately the entire length of the North Canal. At the northern end, it connects to a pump station in the City Park. At the south end, it connects to a line running under Cincinnati-Dayton Road, via another pumping station located immediately north of the Canal/Drainage Ditch intersection. Several manholes access risers protrude from the sanitary sewer line several feet above the canal bed.

The South Canal was overgrown and not as easily accessible as the North Canal. The South Canal supported a continual flow of water and was used to drain surface water runoff from the plant. Water flowing from the Plant into the canal was monitored under an Ohio Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) permit.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 History

Historical operations and accidental releases from the Mound Plant have resulted in the discharge of contamination into the Miami-Erie Canal. The extent of this contamination consists primarily of plutonium and tritium. Although the potential for releases of non-radiological chemicals into the Drainage Ditch may have existed at one time, results of past characterization investigations do not indicate significant non-radiological contamination in the canal.

Plutonium-contaminated soil was conveyed by storm water into the canal and, to a lesser extent, into the Overflow Creek and the Great Miami River, as the result of a pipeline rupture at Mound Plant in 1969. The contaminated soils were deposited as sediments in the canal. Field investigations (Rogers 1975 and DOE 1993b) determined that the maximum plutonium contamination was less than 5,000 picocuries per gram (pCi/g), with an average concentration of less than 600 pCi/g.

The tritium contamination of OU4 primarily resulted from the pre-1970 disposal of tritiated process liquids. The depth distribution profiles for the tritium contamination were found to resemble those of the plutonium contamination. The highest concentrations of tritium in canal soil samples decreased over time from 7.0×10^5 pCi/g in 1974 and 1.1×10^5 pCi/g in 1976 (Kershner and Rhinehammer 1978) to 180 pCi/g in 1993 (DOE 1993b).

A fraction of the tritiated water that entered the canal percolated into the substrata where it could potentially migrate into the Buried Valley Aquifer (BVA). The results from groundwater samples collected from monitoring wells in the BVA during 1991 and 1992 indicated that the annual average tritium concentrations were below the Safe Drinking Water Act (SDWA) standard (EG&G 1992). Tritium concentrations in sampled drinking water wells were also below the SDWA standards (DOE 1999a).

The 1993 Special Canal Sampling Study (DOE 1993b) determined that little non-radiological contamination existed in the canal. The maximum concentrations of polychlorinated biphenyls [(PCBs),19 parts per million (ppm)] and polycyclic aromatic hydrocarbons (PAHs, 53 ppm) occurred at the northern end of the canal. The maximum concentration of lead (579 ppm) occurred along the west bank of the North Canal. These concentrations were within the normal range for a suburban setting, and none were suspected to be the result of emissions or releases from Mound Plant.

Further details of historic releases into the canal can be found in the Removal Site Evaluation (DOE 1993a), the Engineering Evaluation/Cost Analysis (DOE 1995a), the Action Memo (DOE 1995b), the Removal Action Design Document (DOE 1997c), and the On Scene Coordinator (OSC) Report (DOE 1999a).

Current groundwater was not included as a media of concern for the RRE since water at the Miami-Erie Canal area will be provided by the City of Miamisburg. No seeps were identified in the Miami-Erie Canal area. Incidental exposure to groundwater during excavation activities are expected to be infrequent and small enough not to warrant quantification. As indicated in the RRE Executive Summary, future potential risks due to exposure to BVA groundwater will be assessed prior to completion of the final Mound ROD.

2.2 Enforcement and Agreements

In July 1995 after considerable study, the DOE issued a Removal Action Memorandum proposing excavation of the Miami-Erie Canal to remove contaminated soils and sediments. The planning phase of the project was completed in 1996 as documented in the Removal Action Design Document (DOE 1997c). The project was executed over a period of about 18 months resulting in the removal of approximately 40,000 cubic yards of material (DOE 1999b).

Field activities in support of an Ecological Risk Assessment (ERA) were performed in February 2000. The ERA was a screening-level effort conducted to evaluate which contaminants pose a potential to adverse impact on ecological receptors inhabiting the Miami-Erie Canal, the South Pond, Overflow Creek and adjacent areas. Results of this study indicate that ecological risk is within acceptable levels and no further action is necessary (DOE 2003b).

The Residual Risk Evaluation (RRE) for the remediated portion of the Miami-Erie Canal found benzo(a)pyrene (BaP) and dibenz(a,h)anthracene (DbA) to be leading contributors to residual risk from soil (DOE 1999c). However, there was no OU4 site-specific (Mound) or OU4 background value for BaP or DbA in soil to use in the evaluation of the significance of these data. In early 2002, an investigation was conducted to determine OU4 site-specific background concentrations of PAHs, specifically BaP and DbA. This information was used to evaluate the contribution of PAHs from the Mound site in comparison to the contribution of PAHs from anthropogenic sources outside of Mound's influence. The results of this study indicate that the BaP and DbA levels observed in the Miami-Erie Canal site are typical of

this urban area and not the result of Mound operations (DOE 2002).

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Community participation will begin with public review of the Proposed Plan, ERA and RRE. The public will have 30 days to review and comment on these reports.

4.0 SCOPE AND ROLE OF THE MIAMI-ERIE CANAL AREA

This Proposed Plan addresses contaminated soils and sediment within OU4, the Miami-Erie Canal, as described in Section 1 of this document. The Proposed Plan and resulting ROD will select the most appropriate remedy that meets statutory requirements and ensures protection of human health and the environment. Ground water will be addressed in a future remedy decision.

DOE will make the final remedy selection decision in the Miami-Erie Canal Area ROD. The ROD will then be submitted to USEPA and Ohio EPA for review and comment. After reviewing and responding to comments, and revising the ROD, if necessary, the ROD will be submitted for signature to the USEPA Regional Administrator and the appropriate designated personnel from the Ohio EPA. Notice of the availability of the ROD will be published in a major local newspaper of general circulation and the ROD will be made available for public inspection and copying at or near the facility prior to implementation of the selected alternative.

Following the public review period for the Proposed Plan, a responsiveness summary will appear in the ROD to: (1) present stakeholder concerns about the site and preferences regarding the remedial alternatives ; and (2) explain how those concerns were addressed in the remedy selection process.

5.0 SITE CHARACTERISTICS

5.1 Geologic Setting

The bedrock section beneath the Mound Plant consists of thin, nearly flat-lying beds of alternating shale and limestone of the Richmond Stage of the Cincinnati Group (Upper Ordovician – about 450 million years ago). The Cincinnati Group is present at the surface of the Mound Plant. The limestone beds range from two to six inches in thickness and the shale layers are commonly five to eight feet thick.

Pleistocene age (less than about two million years old) glacial deposits at the Mound Plant include both till and outwash deposits. The till in the area of the Mound Plant is composed of an unsorted, unstratified mixture of clay, silt, sand, and coarser material. Water-lain deposits consist of outwash composed of well-sorted sand and gravel. The sand and gravel is horizontally layered, and commonly cross-bedded. The outwash in the vicinity of the Mound Plant occurs as restricted valley-train deposits that were formed by the aggregation of glacial meltwater streams.

The outwash deposited in the Miami River Valley and the associated tributary valley forms the BVA and contiguous deposits. A general discussion of the geology is presented in the Remedial Investigation/Feasibility Study, Site-Wide Work Plan (DOE 1992).

5.2 Hydrogeologic Setting

There are two hydrogeologic regimes at the Mound Plant: flow through the bedrock beneath the Main Hill and the Special Metallurgical/Plutonium Processing (SM/PP) Hill, and flow within the unconsolidated glacial deposits and alluvium associated with the BVA in the Great Miami River Valley and the tributary valley between the Main Hill and SM/PP Hill. The BVA is a USEPA-designated sole source aquifer. The bedrock system, an interbedded sequence of shale and limestone, is dominated by fracture flow especially in the upper portions of the bedrock. Groundwater movement within the till and sand and gravel, within the buried valley, is through porous media. Groundwater flow from the Mound Plant is

generally to the west and southwest toward the BVA of the Great Miami River Valley. A discussion of the hydrogeology of Mound is presented in the Remedial Investigation/Feasibility Study, Site-Wide Work Plan (DOE 1992) and the Hydrogeologic Investigation: Buried Valley Aquifer Report (DOE 1994a) and Hydrogeologic Investigation: Bedrock Report (DOE 1994b).

5.3 Wetlands

Four areas of the Miami-Erie Canal and Overflow Creek were studied for evidence of wetland communities: (1) the southern section of the Miami-Erie Canal, (2) the section of the Miami-Erie Canal between the confluence with the Overflow Creek and the intersection of Benner Road and the Dayton-Cincinnati Pike, (3) Overflow Creek, and (4) the South Pond located in the Miamisburg Municipal Park (DOE 1994c).

The southern section of the Miami-Erie Canal is within the 100-year floodplain of the Great Miami River. Wetland hydrological indicators were present at each study plot examined in the upper, middle and lower reaches of the channel. The other two wetland parameters, hydric soils and vegetation community dominated by hydrophytes, were present at some but not all of the areas examined. It was determined that along this reach of the canal, the areal extent of wetlands is limited to the water's edge and in some areas, a narrow capillary fringe. This area was not defined as a wetland, but is classified as a waterway or waters of the United States.

The section of the Miami-Erie Canal between the confluence with the Overflow Creek and the intersection of Benner Road and the Dayton-Cincinnati Pike does not carry water under normal flow conditions. Examination plots revealed upland soils and non-hydrophytic plant communities. Thus, this area is not designated as a wetland or waterway.

Overflow Creek carries water from the Miami-Erie Canal to the Great Miami River. Examination plots in both upstream and downstream locations were not dominated by hydrophytic vegetation and hydric soil parameters were absent. Thus, the Overflow Creek is designated as a waterway.

The South Pond lies adjacent to the northern section of the Miami-Erie Canal. Water depth in the center of the pond averages 3 to 4 feet. The vegetative community surrounding the pond is dominated by upland species. Sampling within the capillary fringe revealed the presence of all three wetland parameters. Because the center of the South Pond consists of unvegetated open water and wetland characteristics are restricted to the capillary fringe area, the South Pond is designated as waters of the United States.

5.4 Available Data

The following sections discuss the data relevant to the Miami-Erie Canal that are available from the general source documents. Data used to characterize the Miami-Erie Canal area were drawn from the following data sets:

DATA SET DESCRIPTION	REFERENCE
Canal Removal Action Verification Data *Includes samples from South Pond, Runoff Hollow, Overflow Creek, and portions of the Plant Drainage Ditch between the plant boundary and the canal*	On-Scene Coordinator Report, OU4 Miami-Erie Canal Removal Action, Final, June, 1999
Water Park/Tennis Court Sampling Results *Samples obtained in park area as part of previous investigations*	OU9 Regional Soils Investigation Report, August 1995, Final, Revision 2 Mound Laboratory Environmental Plutonium Study 1974 (MLM-02249), September 1975
Twin 60s Sediment Sampling	PRS 416 Data Package, June 24, 2000

5.4.1 Background Data

Soil and Sediment. Background concentrations measure the amount of a chemical that is naturally occurring (like metals) or anthropogenic (man-made but, for background purposes, originating from sources other than the Mound Plant). Background concentrations are used as a screening tool to determine which contaminants should be

carried through a risk evaluation as described in Section 2.4.1 of the RRE. OU4 background concentrations in soil were determined and are documented in the Background Soils Investigation Soil Chemistry Report (DOE 1994d) and Regional Soils Investigation Report (DOE 1995c).

PAHs, like BaP and DbA, are ubiquitous in many environments, particularly along railroad right-of-ways, such as the one running through the canal area. Since there were no OU4 site-specific (Mound) or OU4 (Miamisburg) background values for PAHs in soil, a study was completed in December 2002 to determine OU4 background levels of BaP and DbA. This information was used to evaluate the level of PAHs found in the Miami-Erie Canal verification samples in comparison to the level of PAHs from anthropogenic sources outside of Mound's influence (DOE 2002).

5.5 Summary of Contaminants Detected in the Miami-Erie Canal Area

The complete list of all contaminants detected at least once within the Miami-Erie Canal site is provided in the Miami-Erie Canal RRE (DOE 2003a) and in Tables 1 through 3 of this Proposed Plan.

Only contaminants exceeding (1) certain frequency of detection (FOD) criteria, (2) background, and (3) a base level of potential health concern are carried through the RRE process. In general, FOD criteria are used to screen out contaminants when the compound is infrequently detected and there is no reason to believe the compound is present. Infrequently is defined, for RRE screening purposes, as a detection rate below 5% (one sample in 20). Whether or not a contaminant is present at or above background is determined by comparing the sample result to the 95% upper tolerance limit (UTL) for background data for that contaminant. The levels of health concern used as screening criteria are the Guideline Values (GVs) established for Mound. GVs are media-specific concentrations of contaminants that correspond to certain risk levels for certain exposure scenarios. GVs for Mound were compiled in Risk-Based Guideline Values (DOE 1997b). A more detailed discussion of the screening process is located in the RREM.

Contaminants carried forward in the RRE for the Miami-Erie Canal Area are identified for the recreational, residential and off-site construction worker in Tables 1 through 3, respectively. Risk summary tables presented in the RRE are reproduced in Appendix B of this Proposed Plan as Tables 4 through 6.

5.5.1 Screening Results for Soil Contaminants

Residual contamination in the Miami-Erie Canal area was evaluated for three potential use scenarios. Residual contamination in the canal area was evaluated for recreational adults and children, for residential adults and children and for an adult off-site construction worker. Recreational use is the intended use. Although residential use of the canal area is unlikely, risk to residential receptors was included to evaluate the need for land use restrictions. The construction worker was also included to determine whether land use restrictions were needed. The RRE also includes a qualitative analysis of risks due to PAHs. The RRE shows that when risks due to PAHs are excluded, residual risks to all receptors fall within the acceptable risk range. Therefore no land use restrictions are needed for the Miami-Erie Canal area. All three scenarios assume exposure to soil and sediment.

For all three exposure scenarios, 3 volatile organic compounds (VOCs), 27 semivolatile organic compounds (SVOCs), 25 inorganics (metals), 3 pesticides, and 13 radiological compounds were considered as potential contaminants of concern for the soil component of the RRE.

Organic compounds. Because the organic contaminants found at Mound are generally not naturally-occurring substances, background concentrations were not available. The organic compounds were therefore screened against Guideline Values. The screening reduced the number of VOCs from 3 to zero for all three exposure scenarios. The number of SVOCs was reduced from 27 to 9 for the off-site construction worker scenario, 11 for the residential scenario and 9 for the recreational scenario.

Inorganic compounds. Inorganic compounds were screened against background concentrations and Guideline Values. Compounds classified as essential human nutrients were eliminated from further consideration. Using these screening criteria, the number of inorganic compounds was reduced from 25 to 6 for the construction worker scenario, 6 for the residential scenario and 5 for the recreational scenario.

Pesticides. Pesticides were screened against background and Guideline Values. Using these criteria, the number of pesticides was reduced from 3 to one for the construction worker and recreational scenarios, and from 3 to 2 for the residential scenario.

Radiological compounds. Radiological contaminants were screened against background and Guideline Values. Using these screening criteria, the number of radionuclides was reduced from 13 to one for the construction worker and recreational scenarios, and from 13 to 2 for the residential scenario.

6.0 SUMMARY OF SITE RISKS

For the Mound Plant, the human health risk associated with exposure to residual levels of contamination was evaluated pursuant to the RREM (DOE 1997a). The RREM is applied to limited areas, such as a parcel, after all necessary remediation has been completed and the remaining potential release sites (PRSs) or buildings within that parcel have been designated as No Further Assessment (NFA). Once DOE, USEPA and Ohio EPA have determined that all environmental concerns have been adequately addressed, the residual risk evaluation is performed for confirmation and to assess residual risk. The RRE consists of five steps:

Step 1: Identification of Contaminants to be Evaluated

Step 2: Exposure Assessment

Step 3: Toxicity Assessment

Step 4: Risk Characterization

Step 5: Evaluation of Potential Residual Risks

The information needed for Step 1 was presented in Section 5 of this Proposed Plan. Steps 2 through 5 are described below. After the Core Team reviews and approves an RRE, it is placed in the public reading room for a formal 30-day public review period.

6.1 Exposure Assessment

The three exposure scenarios examined in the Miami-Erie Canal area involve recreational adults and children, residential adults and children, and an off-site construction worker. All receptors were assumed to be exposed to soil contaminated at the levels described by currently available data. The receptors were assumed to be exposed to existing levels of soil and sediment contamination both now and into the future.

6.1.1 Recreational Adults and Children Scenario

Since recreational activities are planned within the canal area, recreational adults and children were identified as potential receptors. During recreational activities these receptors could be exposed to residual contamination present in soil 0-2 feet below land surface including sediment. It was assumed that recreational users would use municipally supplied water. The City of Miamisburg obtains its drinking water from five (5) wells completed in the Great Miami Buried River Valley aquifer. Municipal supply wells are hydraulically up gradient of the Mound Facility. No indications of impacts from the Mound Facility have been detected in the municipal supply wells. The recreational users were assumed to be on the property four hours per day, 52 days per year over a six year period for children and over a 24 year period for adults. Adults were assumed to weigh 70-kilograms while children were assumed to weigh 15 kilograms.

Current and future exposure scenarios for the recreational scenario are identical. Exposure pathways evaluated for the recreational user for both current and future scenarios, include:

- incidental ingestion of sediment or soil 0-2 feet below land surface;
- external exposure to ionizing radiation from radionuclides in sediment or soil 0-2 feet below land surface;
- dermal contact with contaminants in sediment or soil 0-2 feet below land surface;
- inhalation of airborne contaminated soil particulates; and
- inhalation of volatile emissions from soil.

All parameters needed to calculate intakes are listed in the Miami-Erie Canal Area RRE.

6.1.2 Residential Adults and Children Scenario

In order to calculate risk under a residential use scenario, hypothetical residents were assumed to live at the site for 24 years and hypothetical resident children were assumed to live at the site for 6 years. Allowing for a two-week vacation, site residents have an exposure frequency of 350 days/year. During home construction, excavation for basement construction could bring subsurface soil to the land surface. Therefore, potential direct soil exposure pathways were evaluated assuming that site residents could be exposed to residual contamination present in sediment or soil at any depth. It was assumed that canal area residents would use municipally supplied water for potable supply. The City of Miamisburg obtains its drinking water from five (5) wells completed in the Great Miami Buried River Valley aquifer. Municipal supply wells are hydraulically up gradient of the Mound Facility. No indications of impacts from the Mound Facility have been detected in the municipal supply wells.

There are currently no site residents, so the site resident scenario was conducted for a hypothetical future use. The exposure pathways evaluated for the future site resident include:

- incidental ingestion of sediment or soil at or below land surface;
- external exposure to ionizing radiation from radionuclides in sediment or soil at or below land surface;

- dermal contact with contaminants in sediment or soil at or below land surface;
- inhalation of airborne contaminated soil particulates; and
- inhalation of volatile emissions from soil.

All parameters needed to calculate intakes are listed in the Miami-Erie Canal Area RRE.

6.1.3 Construction Worker Scenario

Since it is reasonable to assume that construction activities could occur within the canal area, adult construction workers were identified as potential receptors. During construction activities these receptors could be exposed to residual contamination present in soil at or below land surface. Potential exposure pathways include incidental soil ingestion, external radiation exposure, and inhalation of airborne dust and vapors. Off-site construction workers were assumed to be on the property 8 hours per day, 250 days per year over a 1-year period. Since construction workers are assumed to be adults, a body weight of 70-kilogram was used to assess exposure to chemical contaminants. It was assumed that an off-site construction worker would use municipally supplied water for potable supply. The City of Miamisburg obtains its drinking water from five (5) wells completed in the Great Miami Buried River Valley aquifer. Municipal supply wells are hydraulically up gradient of the Mound Facility. No indications of impacts from the Mound Facility have been detected in the municipal supply wells.

Current and future exposure scenarios for the construction worker scenario are identical. Exposure pathways evaluated for the construction worker for both current and future scenarios, include:

- incidental ingestion of soil and sediment at or below land surface;
- external exposure to ionizing radiation from radionuclides in soil and sediment at or below land surface;
- inhalation of airborne contaminated dust;
- inhalation of volatile emissions from soil and sediment;

All parameters needed to calculate intakes are listed in the Miami-Erie Canal Area RRE.

6.2 Identification of Exposure Pathways

An exposure pathway describes the course a chemical or radionuclide takes from a source to an exposed individual. An exposure pathway generally consists of a source and mechanism of release, an environmental medium in which the contaminant is contained or transported, a human or environmental receptor, and an exposure route. As an example, a source of contamination could be shallow soil that received a spill, a release mechanism could be resuspension of the soil by wind action, the affected environmental medium would be the atmosphere into which the soil was suspended, and a construction worker would be the receptor. In this example, the exposure route would be inhalation. Other typical exposure routes include uptake by ingestion, dermal contact, and/or external exposure to radiation.

6.3 Residual Risk Evaluation

To estimate the residual risks associated with the use of the Miami-Erie Canal area, toxicity and exposure assessments were summarized and integrated into quantitative expressions of risks and hazards. Both a risk characterization and a hazard characterization were performed. The first is the calculation of carcinogenic risk associated with cancer-causing compounds, including radionuclides. The second is the calculation of a Hazard Index (HI) for noncarcinogens. These calculations are performed for the hypothetical off-site construction worker, recreational adult and child, and residential adult and child. The results for the Miami-Erie Canal area are summarized below. Tables 4 through 6 present a summary of total, background and incremental risk for all receptors in the Miami-Erie Canal area.

Concentrations of PAHs above risk-based guideline values were detected in some verification samples. Based on process knowledge, Mound was not expected to be a source of PAH contamination in the OU-4 area. To evaluate whether detected PAH concentrations were due to a release from the Mound facility or were indicative of ambient

background conditions, a study of the background levels of PAHs in the Miami-Erie Canal Area was completed to in December 2002. The following sections include a qualitative assessment of site-specific background levels of PAHs as compared to the PAH concentrations detected in verification samples."

6.3.1 Hazards and Risks for the Recreational Adult and Child

6.3.1.1 Recreational Adult

The total, background and incremental non-cancer risk for the recreational adult is less than 1 indicating that non-cancer risk is at an acceptable level. Total cancer risk for a recreational adult is 1.3×10^{-5}, which falls within the target risk range of 10^{-4} to 10^{-6}. The only constituent to exceed 1×10^{-6} risk level was radium-226. Residual risk due to radium-226 was driven by external exposure to radium-226 in soil. The majority of this risk is due to background levels (8.6×10^{-6}). The incremental risk due to radium-226 in the canal area to a recreational adult is 4.5×10^{-6}, which again falls within the target risk range.

6.3.1.2 Recreational Child

The total, background and incremental non-cancer risk for the recreational child is less than 1 indicating that non-cancer risk is at an acceptable level. Total cancer risk for a recreational child is 3.6×10^{-6}, which falls within the target risk range of 10^{-4} to 10^{-6}. The only constituent to exceed 10^{-6} was radium-226. Residual risk due to radium-226 was driven by external exposure to radium-226 in soil. The majority of this risk is due to background levels (2.4×10^{-6}). The incremental risk due to radium-226 in the canal area to a recreational child is 1.2×10^{-6}, which falls within the target risk range.

6.3.2 Hazards and Risks for the Residential Adult and Child

6.3.2.1 Residential Adult

The total, background, and incremental non-cancer risk for the resident adult is less than 1 indicating that non-cancer risk is at an acceptable level. Total chemical and radiological cancer risk of $3.9x10^{-4}$ for the residential adult exceeds the target cancer risk range of $1x10^{-4}$ to $1x10^{-6}$. Of this total risk, constituents that exceed the $1x10^{-6}$ cancer risk level include BaP, DbA, arsenic, plutonium-238 and radium-226 with risk levels of $1.3x10^{-4}$, $4.4x10^{-5}$, $1.6x10^{-5}$, $5.2x10^{-6}$, and $1.9x10^{-4}$, respectively. Background cancer risk to a residential adult is $1.4x10^{-4}$. Constituents with approved background concentrations for Mound that exceed the $1x10^{-6}$ risk level include arsenic and radium-226 with risks of $1.4x10^{-5}$ and $1.3x10^{-4}$, respectively. Incremental residual cancer risk for a residential adult in the canal area is $2.4x10^{-4}$, which exceeds the target risk range. Of the incremental risk the constituents that exceed the target risk level include BaP ($1.3x10^{-4}$), radium-226 ($6.7x10^{-5}$), DaB ($4.4x10^{-5}$), plutonium-238 ($5.2x10^{-6}$), and arsenic ($1.5x10^{-6}$), in descending order of risk. The background risks for arsenic and radium-226 are similar to total risks for each of these constituents and result in incremental risks lower than background.

The largest contributor to incremental cancer risk is BaP at a level of $1.3x10^{-4}$. In the OU4 background PAH study, the range of detected concentrations of BaP was 56 µg/kg to 7700 µg/kg and in the Miami-Erie Canal samples the range was 21 µg/kg to 7900 µg/kg. Since the concentrations of BaP found in the OU4 background PAH study are comparable to levels found in the remediated area of the canal, if the background levels of PAHs were accounted for in the risk calculations, incremental risk for the hypothetical residential receptors would fall within the target risk range. This indicates that the existing levels of residual contamination detected in the canal area are protective of current and potential future users and that no further remedial action is warranted.

6.3.2.2 Residential Child

The total, background and incremental non-cancer risk for the resident child is less than 1 indicating that non-cancer risk is at an acceptable level. Total chemical and radiological cancer risk for a residential child is $1.6x10^{-4}$, which exceeds the target risk range of 10^{-4} to 10^{-6}. Constituents that exceed $1x10^{-6}$ include BaP, DbA, arsenic, plutonium-238 and radium-226 with risk levels of $6.2x10^{-5}$, $2.2x10^{-5}$, $2.0x10^{-5}$, $2.6x10^{-6}$, and $5.1x10^{-4}$, respectively. Background cancer risk to a residential child is $5.1x10^{-5}$. Constituents with approved background concentrations for Mound that exceed the $1x10^{-6}$ risk level include arsenic and radium-226 with risks of $1.8x10^{-5}$ and $3.3x10^{-5}$, respectively. Incremental residual cancer risk for a residential child in the canal area is $1.1x10^{-4}$, which exceeds the target risk range. Of the incremental risk, the constituents that exceed the target risk level include BaP ($6.2x10^{-5}$), DaB ($2.2x10^{-5}$), radium-226 ($1.7x10^{-5}$), plutonium-238 ($2.6x10^{-6}$), and arsenic ($1.9x10^{-6}$), in descending order of risk. The background risks for arsenic and radium-226 are similar to total risks for each of these constituents and result in incremental risks that are lower than background risks.

The largest contributor to incremental cancer risk is BaP at a level of $6.2x10^{-5}$. In the OU4 background PAH study, the range of detected concentrations of BaP was 56 µg/kg to 7700 µg/kg and in the Miami-Erie Canal samples the range was 21 µg/kg to 7900 µg/kg. Since the concentrations of BaP found in the OU4 background PAH study are comparable to levels found in the remediated area of the canal, if the background levels of PAHs were accounted for in the risk calculations, incremental risk for the hypothetical residential receptors would fall within the target risk range. This indicates that the existing levels of residual contamination detected in the canal area are protective of current and potential future users and that no further remedial action is warranted.

6.3.3 Hazards and Risks for the Off-Site Construction Worker

The total, background and incremental non-cancer risk for the off-site construction worker is less than 1 indicating that non-cancer risk is at an acceptable level. Total chemical and radiological cancer risk for an off-site construction worker is $1.0x10^{-5}$, and the only

constituent that exceeds $1x10^{-6}$ is radium-226. Background and incremental cancer risk to an off-site construction worker are $6.8x10^{-6}$ and $3.2x10^{-6}$, respectively. Both these values fall within the target risk range of 10^{-4} to 10^{-6}.

6.4 Conclusions

Total, background and incremental non-carcinogenic risks for all receptors in all scenarios were below the target hazard level. This suggests that non-carcinogenic risks are within acceptable levels. Total, background and incremental carcinogenic risks for the recreational scenario (adult and child), and the adult off-site construction worker are within the acceptable risk range of 10^{-4} to 10^{-6}. Background carcinogenic risk for the hypothetical child residential scenario was within the acceptable carcinogenic risk range. Total, background: and incremental carcinogenic risk for the hypothetical resident adult, and total and incremental carcinogenic risk for the hypothetical resident child exceed the target carcinogenic range of 10^{-4} to 10^{-6}. However, these analyses did not include any information on OU4 background levels of PAHs.

Incremental cancer risk for the hypothetical adult resident was $2.4x10^{-4}$ Of this risk, BaP, radium-226, DbA, plutonium-238 and arsenic concentrations resulted in incremental cancer risks of $1.3x10^{-4}$, $6.7x10^{-5}$, $4.4x10^{-5}$, $5.2x10^{-6}$, and $1.5x10^{-6}$, respectively, in descending order of contribution to overall incremental cancer risk. For the resident child, incremental cancer risk was $1.1x10^{-4}$. Of this risk, in descending order of contribution, $6.2x10^{-5}$ was due to BaP, $2.2x10^{-5}$ was due to DbA, $1.7x10^{-5}$ was due to radium-226, $2.6x10^{-6}$ was due to plutonium-238, and $1.9x10^{-6}$ was due to arsenic.

To allow for a comparison of the concentration of PAHs detected during the Miami-Erie Canal verification sampling with site-specific anthropogenic background levels a study titled the *Determination of Site-Specific Benzo(a)pyrene and Dibenzo(a,h,)anthracene Background Levels for the Miami-Erie Canal* was released in December 2002. The Miami-Erie Canal RRE report (DOE 2003) includes a qualitative discussion of the PAH background results, however, risks due to background levels of PAHs were not quantified or subtracted from the reported risk levels.

The BaP and DbA results from the December 2002 background PAH study and the Miami-Erie Canal verification sampling are very similar. The range of detected concentrations from the December 2002 OU4 background sampling are 56 to 7700 µg/kg BaP and 27 to 400 µg/kg DbA. The range of detected concentrations from the Miami-Erie Canal verification data set are 21 to 7900 µg/kg BaP and 20 to 1500 µg/kg DbA. Since the concentrations of PAHs detected in the OU4 background study are similar to levels found in the remediated area of the canal, if the background levels of PAHs were accounted for in the risk calculations, incremental risk for the hypothetical residential receptors would fall within the target risk range. This indicates that the existing levels of residual contamination detected in the canal area are protective of current and potential future users and that no further remedial action is warranted.

6.5 Ecological Risk

A screening-level ERA was conducted to evaluate contaminants which could adversely impact ecological receptors inhabiting the Miami-Erie Canal, the South Pond, Overflow Creek and adjacent areas (DOE 2003b). Birds, such as the mallard, northern robin, and belted kingfisher, and mammals, such as the meadow vole, short-tailed shrew, muskrat, and mink, which represent several trophic levels, were selected as target receptors. Direct ingestion of constituents of potential concern (COPCs) in soil, sediment, and surface water, and indirect ingestion through the food chain via ingestion of plants, insects, and fish were considered in this assessment. External exposure through direct radiation from soil and inhalation of radionuclide-contaminated dust were also considered for radiological COPCs. Direct impacts on fish and benthic organisms were evaluated for both chemicals and radionuclides (DOE 2003b).

For the ecological assessment, information on the extent of residual contamination within the Canal was summarized from data presented in the *Verification Sampling Report* (DOE 1998). Information on removal activities and field sampling methods were presented in the *On-Scene Coordinators Report* (DOE 1999a). All Canal soil data used in the ecological evaluation was obtained from these reports. In addition to data provided in the reports mentioned above, sediment and surface water data collected in 1994 and 1995 from the Overflow Creek and South Pond included in the OU *9 Surface Water and Sediment*

Investigation Report (DOE 1996b) were used in the ecological assessment.

The conservative screening level ERA found that there is a potential for adverse effects on terrestrial organisms from residual chemical contamination (i.e., PAHs, phthalate esters, and metals). However, refinement of the preliminary COPCs found that negligible ecological risk is posed by these contaminants. The refinement included a background evaluation, re-calculation of HQs using an average exposure point concentration (i.e., 95% UCL), evaluation of bioavailability of COPCs, adjustment of the area use factor, and a re-evaluation of ecological screening levels. These are shown in ERA tables 5-22, 5-23, and 5-24 for the Meadow Vole, Short Tailed Shrew and American Robin respectively. The ecological risk is within acceptable levels and no further action is necessary. Detailed results of ecological risks are presented in the Screening Level Ecological Risk Assessment for the Miami-Erie Canal Area (DOE 2003b).

7.0 DESCRIPTIONS OF ALTERNATIVES

In light of the results of the RRE and ERA, and the residual levels of contaminants in the soil at the Miami-Erie Canal area, no remedy is needed to protect human health and the environment into the future. Residual risk quantified using the Miami-Erie Canal soil verification samples indicate that residual risk exceeds the target risk range for the resident adult and child. The RRE shows that PAHs are leading contributors to residual risk. However, a study of OU4 site-specific background levels of BaP and DbA indicated that the level of PAHs observed in Miami-Erie Canal verification samples are typical for the urban area surrounding the Mound facility and are not the result of Mound operations. Background risks presented in the RRE are based on OU4 site-specific background values provided in the Mound 2000 RREM (DOE 1997a). Since this report did not include background values for PAHs, incremental risks for the hypothetical residential scenarios are probably over estimated. Therefore, only one alternative was considered for Miami-Erie Canal area:

Alternative 1: No Action

Regulations governing the Superfund program require that the "no action" alternative be evaluated at every site to establish a baseline for comparison. Under this alternative, DOE would take no action at the Miami-Erie Canal area to prevent exposure to soil contamination.

8.0 EVALUATION OF ALTERNATIVES

The USEPA has developed threshold, balancing, and modifying criteria to aid in the evaluation of alternatives. There are two (2) threshold criteria, five (5) balancing criteria, and two (2) modifying criteria. An evaluation of the alternatives in terms of these criteria follows.

8.1 THRESHOLD CRITERIA - must be met for an alternative to be eligible for selection:

8.1.1 CRITERIA 1: Overall protection of human health and the environment

This criterion addresses whether an alternative provides adequate protection of human health and the environment. The "no action" alternative meets this criterion since the level of risk to human health posed by the site was found to be acceptable for the receptors evaluated.

8.1.2 CRITERIA 2: Compliance with applicable or relevant and appropriate requirements (ARARs)

Section 121(d) of CERCLA requires that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA Section 121(d)(4).

Applicable requirements are those substantive environmental protection requirements,

criteria, or limitations promulgated under Federal or State law that specifically address hazardous substances, the remedial action to be implemented at the site, the location of the site, or other circumstances present at the site. Relevant and Appropriate Requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law which, while not applicable to the hazardous materials found at the site, the remedial action itself, the site location, or other circumstances at the site, nevertheless address problems or situations sufficiently similar to those encountered at the site that their use is well-suited to the site.

Compliance with ARARs addresses whether a remedy will meet all the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides the basis for invoking a waiver.

ARARs are of several types: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs are usually health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. Chemical-specific ARARs are available for three constituents of concern for the Miami-Erie Canal area. These constituents, which include arsenic, copper and lead, have ARARs of 80 mg/kg, 2,960 mg/kg, and 400 mg/kg, respectively (DOE 1999b). The exposure point concentrations for each of these constituents at the Miami-Erie Canal area [arsenic (9.5 mg/kg), copper (34.7 mg/kg), lead (226 mg/kg)] do not exceed the chemical-specific ARARs. These standards were identified from Appendix A of EPA's 1990 proposed rule for establishing procedures and technical requirements for implementing corrective actions for solid waste management units (55 Federal Register 30798) (EPA 1990)."
No ARARs are available for other constituents of concern.

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are located in specific locations, e.g., floodplains, wetlands, historic places, etc. No location-specific ARARs have been identified for the Miami-Erie Canal area and thus, this ARAR criterion does not require

further evaluation.

Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy. As no remedy is required for the Miami-Erie Canal area, this ARAR criterion does not require further evaluation.

8.2 BALANCING CRITERIA - used to weigh major trade-offs among alternatives:

8.2.1 CRITERIA 3: Long-term effectiveness and permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk and the adequacy and reliability of controls. As no remedy or institutional control is needed for long-term effectiveness and permanence at the Miami-Erie Canal area, this criterion does not require further evaluation.

8.2.2 CRITERIA 4: Reduction of toxicity, mobility, or volume through treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of the remedy.

Because Alternative 1 does not include treatment, this criterion does not require further evaluation. All necessary remediation in the Miami-Erie Canal area was accomplished through the removal action in 1999 (DOE 1999a).

8.2.3 CRITERIA 5: Short-term effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers and the community during construction and operation of the remedy until clean-up goals are achieved.

Because Alternative 1 does not require a remedy, this criterion does not require further evaluation. All necessary remediation in the Miami-Erie Canal area was accomplished previously.

8.2.4 CRITERIA 6: Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered. Because Alternative 1 involves no action, there is no time or cost required for implementation.

8.2.5 CRITERIA 7: Cost

The cost is zero dollars ($0) for Alternative 1, No Action.

8.3 MODIFYING CRITERIA - to be considered after public comment is received on the Proposed Plan and of equal importance to the balancing criteria:

8.3.1 CRITERIA 8: State/Support Agency Acceptance

Upon receiving the results of a PAH background study that indicate BaP and DbA levels observed in the Miami-Erie Canal site are typical of this urban area and not the result of

Mound operations (DOE 2002), both USEPA and the Ohio EPA believe that Alternative 1, No Action, provides adequate protection of human health and the environment in the future.

8.3.2 CRITERIA 9: Community Acceptance

To evaluate community acceptance, this Proposed Plan will be the subject of a formal public comment and review period of 30 days.

9.0 THE PREFERRED ALTERNATIVE

The preferred alternative is Alternative 1, No Action.

10.0 OPPORTUNITIES FOR COMMUNITY PARTICIPATION

This Proposed Plan will be available for public review and comment from September 3, 2003 through August 3, 2003. During this time, a public meeting will be held to discuss the Proposed Plan.

All of the supporting documentation for this Proposed Plan is located in the Administrative Record File, which is available for public review at the Mound CERCLA Public Reading Room located at the Miamisburg Senior Adult Center. Any questions or comments related to this Proposed Plan should be forwarded to Ms. Jane Greenwalt, Public Affairs Officer, DOE/MCP at (513) 246-0026 or via e-mail at jane.greenwalt@em.doe.gov. Should you have questions or comments you wish to present directly to the regulators, the points-of-contact are Mr. David Seely and Mr. Brian Nickel of the USEPA and Ohio EPA, respectively. Mr. Seely can be reached at (312) 886-7058; Mr. Nickel can be reached at (937) 285-6468.

11.0 REFERENCES

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APPENDIX A

Figures

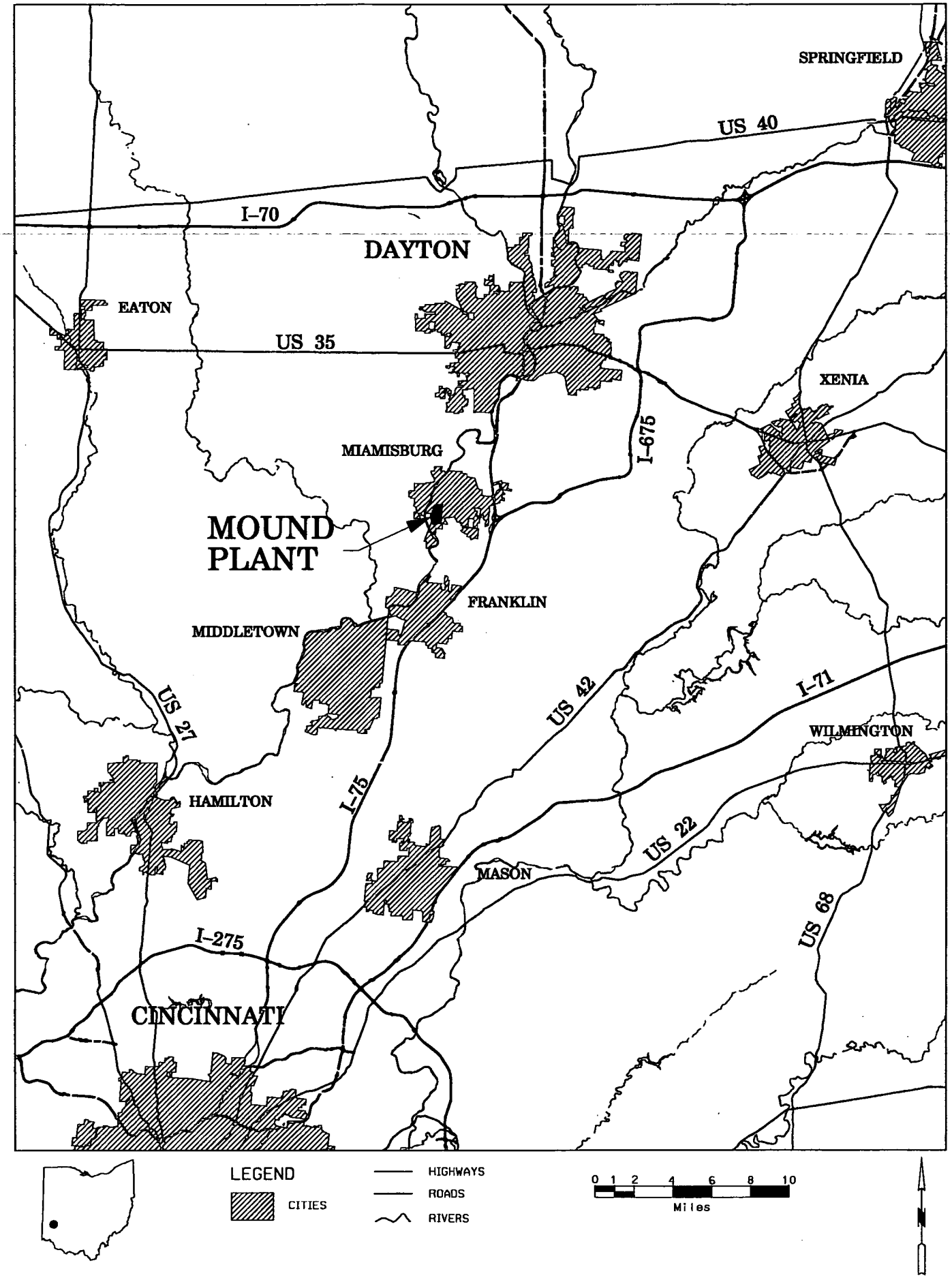

Figure 1. Regional Context of Mound Plant

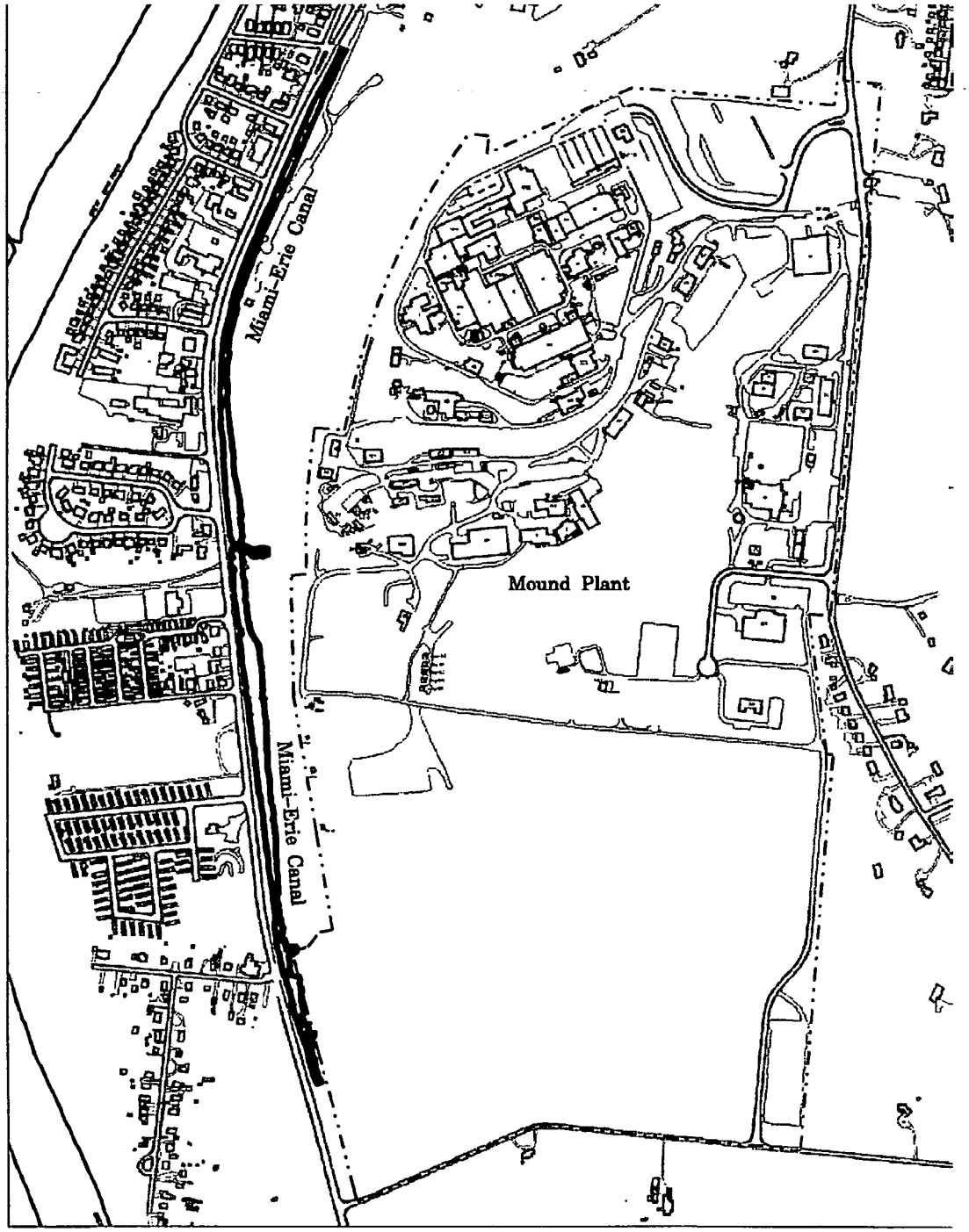

Figure 2. Location of Miami-Erie Canal

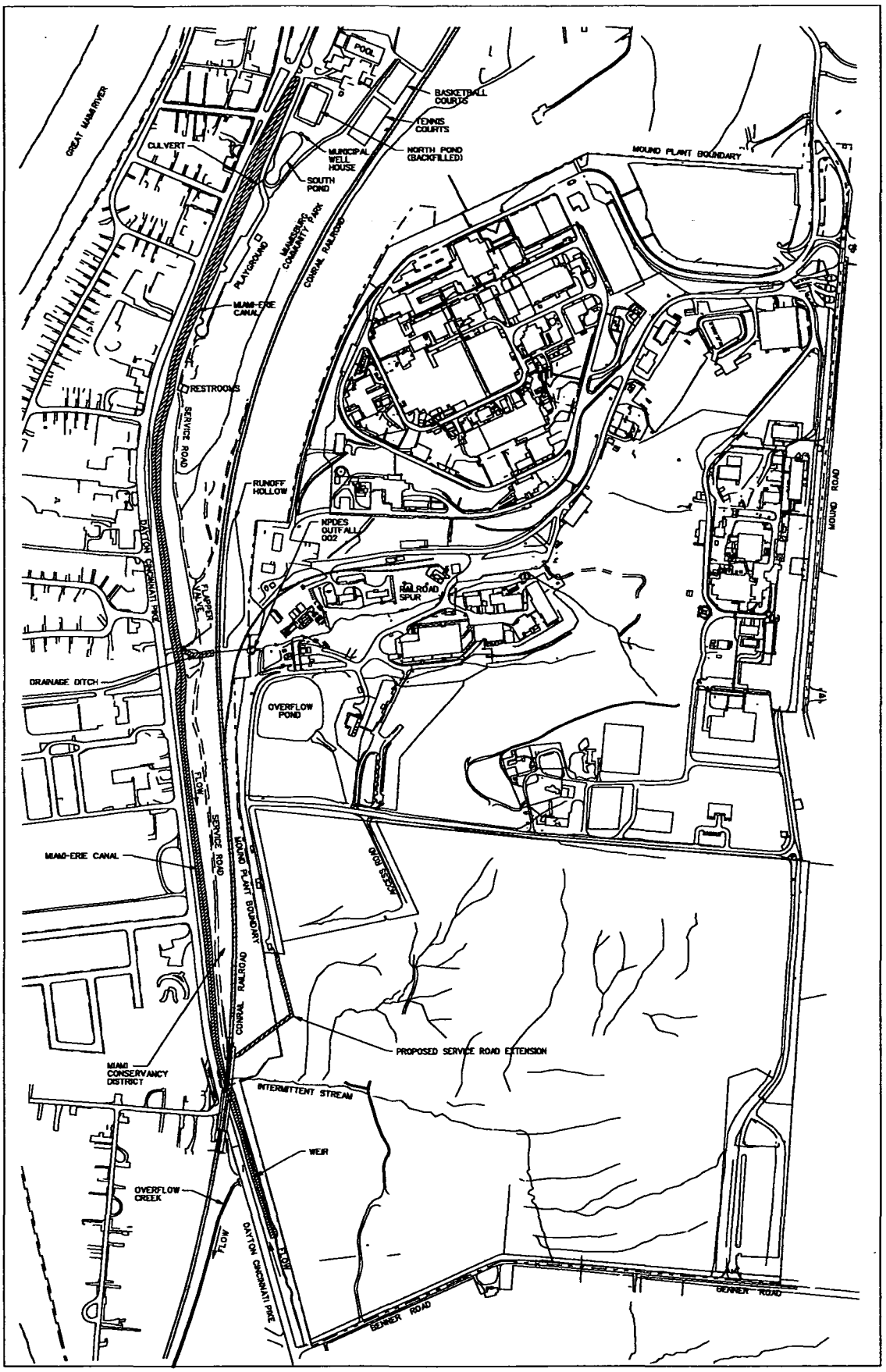

Figure 3. Miami-Erie Canal Site Feature

APPENDIX B

Tables

Table 1: Identification of Constituents of Potential Concern for the Recreational RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Inorganics (mg/kg)									
Aluminum	7429-90-5	3080.00	15300.00	128-128	9890.00	9890.00	19000		NO:2
Antimony	7440-36-0	0.45	81.10	31-128	2.15	2.15		44.0	NO:3
Arsenic	7440-38-2	3.70	27.00	128-128	9.50	9.50	8.6	33.0	NO:3
Barium	7440-39-3	24.00	234.00	128-128	88.40	88.40	180	77000.0	NO:2,3
Beryllium	7440-41-7	0.17	1.10	127-128	0.62	0.62	1.3	6.0	NO:2,3
Bismuth	7440-69-9	1.20	63.9	17-128	3.10	3.10			YES
Cadmium	7440-43-9	0.08	4.20	65-128	0.34	0.34	2.1	1100.0	NO:2,3
Calcium	7440-70-2	4080.00	144000.00	128-128	43200.00	43200.00	310000		NO:2,4
Chromium	7440-47-3	4.50	126.00	128-128	22.40	22.40	20	5500.0	NO:3
Cobalt	7440-48-4	3.40	15.50	128-128	9.21	9.21	19		NO:2
Copper	7440-50-8	9.90	141.00	128-128	34.70	34.70	26		YES
Cyanide	57-12-5	0.36	6.80	6-128	0.30	0.30		22000.0	NO:1
Iron	7439-89-6	7040.00	46800.00	128-128	20500.00	20500.00	35000		NO:2,,4
Lead	7439-92-1	5.50	8190.00	128-128	226.00	226.00	48		YES
Magnesium	7439-95-4	2080.00	83200.00	128-128	16700.00	16700.00	40000		NO:2,4
Manganese	7439-96-5	213.00	1130.00	128-128	551.00	551.00	1400	130000.0	NO:2,3
Mercury	7439-97-6	0.05	1.30	97-128	0.21	0.21		330.0	NO:3
Nickel	7440-02-0	7.50	31.80	128-128	19.30	19.30	32	22000.0	NO:2,3
Potassium	7440-09-7	529.00	2690.00	128-128	1600.00	1600.00	1900		NO:2,4
Selenium	7782-49-2	0.51	2.20	62-128	0.91	0.91			YES
Silver	7440-22-4	0.20	11.20	21-128	0.44	0.44	1.7	5500.0	NO:2,3
Sodium	7440-23-5	72.50	600.00	125-128	180.00	180.00	240		NO:2
Thallium	7440-28-0	0.94	3.20	33-128	0.88	0.88	0.46		YES
Vanadium	7440-62-2	8.40	34.40	128-128	22.00	22.00	25	7700.0	NO:2,3
Zinc	7440-66-6	28.30	481.00	128-128	91.00	91.00	140	330000.0	NO:2,3

Table 1: Identification of Constituents of Potential Concern for the Recreational RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Semi-Volatile Organic Compounds (ug/kg)									
2-Methylnaphthalene	91-57-6	23	150	25-128	229.00	150.00			YES
4-Methylphenol	106-44-5	64	64	1-128	262.00	64.00		5500000.00	NO:1
Acenaphthene	83-32-9	20	750	30-128	195.00	195.00			YES
Acenaphthylene	208-96-8	19	650	41-128	213.00	213.00			YES
Anthracene	120-12-7	23	2300	59-128	254.00	254.00		330000000.00	NO:3
Benzo(a)anthracene	56-55-3	21	7300	117-128	654.00	654.00		35000.00	NO:3
Benzo(a)pyrene	50-32-8	21	7900	111-128	688.00	688.00		3500.00	NO:3
Benzo(b)fluoranthene	205-99-2	23	7100	117-128	681.00	681.00		35000.00	NO:3
Benzo(g,h,i)perylene	191-24-2	22	4700	110-128	477.00	477.00			YES
Benzo(k)fluoranthene	207-08-9	22	7000	113-128	669.00	669.00		350000.00	NO:3
Benzoic Acid	65-85-0	20	220	37-125	1070.00	220.00		4400000000.00	NO:3
Bis(2-ethylhexyl)phthalate	117-81-7	20	44000	68-128	1070.00	1070.00		1800000.00	NO:3
Butyl Benzyl Phthalate	85-68-7	20	380	11-128	257.00	257.00		220000000.00	NO:3
Carbazole	86-74-8	22	930	48-128	191.00	191.00			YES
Chrysene	218-01-9	25	8100	120-128	747.00	747.00		3500000.00	NO:3
Di-n-butyl Phthalate	84-74-2	22	4300	31-128	368.00	368.00		110000000.00	NO:3
Dibenz(a,h)anthracene	53-70-3	20	1500	59-128	240.00	240.00		3500.00	NO:3
Dibenzofuran	132-64-9	20	510	26-128	195.00	195.00			YES
Diethyl Phthalate	84-66-2	44	59	2-128	262.00	59.00			NO:1
Fluoranthene	206-44-0	20	17000	122-128	1440.00	1440.00		44000000.00	NO:3
Fluorene	86-73-7	20	1200	34-128	210.00	210.00			YES
Indeno(1,2,3-cd)pyrene	193-39-5	20	4600	109-128	462.00	462.00		35000.00	NO:3
Naphthalene	91-20-3	19	140	24-128	229.00	140.00			YES
Pentachlorophenol	87-86-5	30	70	2-128	658.00	70.00		210000.00	NO:1
Phenanthrene	85-01-8	21	13000	113-128	773.00	773.00			YES
Phenol	108-95-2	21	270	16-128	248.00	248.00		660000000.00	NO:3
Pyrene	129-00-0	28	17000	121-128	1310.00	1310.00		33000000.00	NO:3
Volatile Organic Compounds (ug/kg)									
1,2-Dichloroethane	107-06-2	1	1	1-3	3.92	1.00		63000.00	NO:3
Methylene Chloride	75-09-2	2	2	1-3	3.34	2.00		100000.00	NO:3
Toluene	108-88-3	1	1	1-3	3.92	1.00		220000000.00	NO:3
Pesticides/PCBS (ug/kg)									
Dieldrin	60-57-1	1.100	1.100	1-3	1.33	1.10		1600.00	NO:3
Endrin Ketone	53494-70-5	0.430	2.000	3-3	2.47	2.00			YES
Gamma Chlordane	5103-74-2	0.300	0.300	1-3	0.34	0.30			YES

Table 1: Identification of Constituents of Potential Concern for the Recreational RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?

Table 1: Identification of Constituents of Potential Concern for the Recreational RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Radionuclides (pCi/g)									
Cesium-137	10045-97-3	0.19	0.19	1-3	0.25	0.19	0.42	0.84	NO:2,3
Plutonium-238	13981-16-3	0.01	715.00	683-702	23.00	23.00	0.13	110.00	NO:3
Plutonium-239/240	PU-239/240	0.00	4.17	412-680	0.10	0.10	0.18	100.00	NO:2,3
Potassium-40	13966-00-2	11.10	14.90	3-3	16.00	14.90	37		NO:2
Radium-226	13982-63-3	1.84	3.04	2-3	4.09	3.04	2	0.26	YES
Strontium-90	10098-97-2	0.52	7.20	3-3	9.22	7.20	0.72	570.00	NO:3
Thorium-228	14274-82-9	0.61	7.67	126-126	1.27	1.27	1.5	1.70	NO:2,3
Thorium-230	14269-63-7	0.87	7.99	126-126	1.57	1.57	1.9	820.00	NO:2,3
Thorium-232	7440-29-1	0.51	2.17	126-126	1.00	1.00	1.4	950.00	NO:2,3
Tritium	10028-17-8	0.05	79.60	106-124	5.96	5.96	1.6	45000.00	NO:3
Uranium-234	13966-29-5	0.62	1.28	126-126	0.95	0.95	1.1	710.00	NO:2,3
Uranium-235	15117-96-1	0.01	0.10	97-126	0.05	0.05	0.11	6.60	NO:3
Uranium-238	7440-61-1	0.64	1.62	126-126	1.03	1.03	1.2	31.00	NO:2,3

CAS - Chemical Abstract Service
COPC - Constituents of Potential Concern
EPC - Exposure Point Concentration
mg/kg - milligram per kilogram
ug/kg - microgram per kilogram
pCi/g - picocurie per gram
RBGV - Risk Based Guideline Value
RRE - Residual Risk Evaluation
UCL - Upper Confidence Limit

NO:1 - <5% Detects
NO:2 - <Background
NO:3 - < Risk-Based Guideline Value
NO:4 - Essential Human Nutrient
1.00E-06 is equivalent to 1.00 x 10-6

In cases where the 95%UCL of the arithmetic mean falls below the maximum detected value, the 95%UCL is compared to background. If the 95%UCL is below the background value, the contaminant is not carried forward through the rest of the RRE process because this would result in negative incremental risk.

Table 2: Identification of Constituents of Potential Concern for the Residential RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Inorganics (mg/kg)									
Aluminum	7429-90-5	3080.00	15300.00	128-128	9890.00	9890.00	19000		NO:2
Antimony	7440-36-0	0.45	81.10	31-128	2.15	2.15		11.00	NO:3
Arsenic	7440-38-2	3.70	27.00	128-128	9.50	9.50	8.6	8.20	YES
Barium	7440-39-3	24.00	234.00	128-128	88.40	88.40	180	1900.00	NO:2,3
Beryllium	7440-41-7	0.17	1.10	127-128	0.62	0.62	1.3	0.15	NO:2
Bismuth	7440-69-9	1.20	63.9	17-128	3.10	3.10			YES
Cadmium	7440-43-9	0.08	4.20	65-128	0.34	0.34	2.1	27.00	NO:2,3
Calcium	7440-70-2	4080.00	144000.00	128-128	43200.00	43200.00	310000		NO:2,4
Chromium	7440-47-3	4.50	126.00	128-128	22.40	22.40	20	140.00	NO:3
Cobalt	7440-48-4	3.40	15.50	128-128	9.21	9.21	19		NO:2
Copper	7440-50-8	9.90	141.00	128-128	34.70	34.70	26		YES
Cyanide	57-12-5	0.36	6.80	6-128	0.30	0.30		550.00	NO:1
Iron	7439-89-6	7040.00	46800.00	128-128	20500.00	20500.00	35000		NO:2,4
Lead	7439-92-1	5.50	8190.00	128-128	226.00	226.00	48		YES
Magnesium	7439-95-4	2080.00	83200.00	128-128	16700.00	16700.00	40000		NO:2
Manganese	7439-96-5	213.00	1130.00	128-128	551.00	551.00	1400	3800.00	NO:2,3
Mercury	7439-97-6	0.05	1.30	97-128	0.21	0.21		8.20	NO:3
Nickel	7440-02-0	7.50	31.80	128-128	19.30	19.30	32	550.00	NO:2,3
Potassium	7440-09-7	529.00	2690.00	128-128	1600.00	1600.00	1900		NO:2,4
Selenium	7782-49-2	0.51	2.20	62-128	0.91	0.91			YES
Silver	7440-22-4	0.20	11.20	21-128	0.44	0.44	1.7	140.00	NO:2,3
Sodium	7440-23-5	72.50	600.00	125-128	180.00	180.00	240		NO:2,4
Thallium	7440-28-0	0.94	3.20	33-128	0.88	0.88	0.46		YES
Vanadium	7440-62-2	8.40	34.40	128-128	22.00	22.00	25	190.00	NO:2,3
Zinc	7440-66-6	28.30	481.00	128-128	91.00	91.00	140	8200.00	NO:2,3

Table 2: Identification of Constituents of Potential Concern for the Residential RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Semi-Volatile Organic Compounds (ug/kg)									
2-Methylnaphthalene	91-57-6	23	150	25-128	229.00	150.00			YES
4-Methylphenol	106-44-5	64	64	1-128	262.00	64.00		140.00	NO:1
Acenaphthene	83-32-9	20	750	30-128	195.00	195.00			YES
Acenaphthylene	208-96-8	19	650	41-128	213.00	213.00			YES
Anthracene	120-12-7	23	2300	59-128	254.00	254.00		8200000.00	NO:3
Benzo(a)anthracene	56-55-3	21	7300	117-128	654.00	654.00		880.00	NO:3
Benzo(a)pyrene	50-32-8	21	7900	111-128	688.00	688.00		88.00	YES
Benzo(b)fluoranthene	205-99-2	23	7100	117-128	681.00	681.00		880.00	NO:3
Benzo(g,h,i)perylene	191-24-2	22	4700	110-128	477.00	477.00			YES
Benzo(k)fluoranthene	207-08-9	22	7000	113-128	669.00	669.00		8800.00	NO:3
Benzoic Acid	65-85-0	20	220	37-125	1070.00	220.00		110000000.00	NO:3
Bis(2-ethylhexyl)phthalate	117-81-7	20	44000	68-128	1070.00	1070.00		46000.00	NO:3
Butyl Benzyl Phthalate	85-68-7	20	380	11-128	257.00	257.00		5500000.00	NO:3
Carbazole	86-74-8	22	930	48-128	191.00	191.00			YES
Chrysene	218-01-9	25	8100	120-128	747.00	747.00		88000.00	NO:3
Di-n-butyl Phthalate	84-74-2	22	4300	31-128	368.00	368.00		2700000.00	NO:3
Dibenz(a,h)anthracene	53-70-3	20	1500	59-128	240.00	240.00		88.00	YES
Dibenzofuran	132-64-9	20	510	26-128	195.00	195.00			YES
Diethyl Phthalate	84-66-2	44	59	2-128	262.00	59.00			NO:1
Fluoranthene	206-44-0	20	17000	122-128	1440.00	1440.00		1100000.00	NO:3
Fluorene	86-73-7	20	1200	34-128	210.00	210.00			YES
Indeno(1,2,3-cd)pyrene	193-39-5	20	4600	109-128	462.00	462.00		880.00	NO:3
Naphthalene	91-20-3	19	140	24-128	229.00	140.00			YES
Pentachlorophenol	87-86-5	30	70	2-128	658.00	70.00		5300.00	NO:1
Phenanthrene	85-01-8	21	13000	113-128	773.00	773.00			YES
Phenol	108-95-2	21	270	16-128	248.00	248.00		16000000.00	NO:3
Pyrene	129-00-0	28	17000	121-128	1310.00	1310.00		820000.00	NO:3
Volatile Organic Compounds (ug/kg)									
1,2-Dichloroethane	107-06-2	1	1	1-3	3.92	1.00		1600.00	NO:3
Methylene Chloride	75-09-2	2	2	1-3	3.34	2.00		100000.00	NO:3
Toluene	108-88-3	1	1	1-3	3.92	1.00		25000.00	NO:3
Pesticides/PCBS (ug/kg)									
Dieldrin	60-57-1	1.100	1.100	1-3	1.33	1.10		40.00	NO:3
Endrin Ketone	53494-70-5	0.430	2.000	3-3	2.47	2.00			YES
Gamma Chlordane	5103-74-2	0.300	0.300	1-3	0.34	0.30			YES

Table 2: Identification of Constituents of Potential Concern for the Residential RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?

Table 2: Identification of Constituents of Potential Concern for the Residential RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Radionuclides (pCi/g)									
Cesium-137	10045-97-3	0.19	0.19	1-3	0.25	0.19	0.42	0.05	NO:2
Plutonium-238	13981-16-3	0.01	715.00	689-718	22.50	22.50	0.13	2.70	YES
Plutonium-239/240	PU-239/240	0.00	4.17	412-680	0.10	0.10	0.18	2.50	NO:2,3
Potassium-40	13966-00-2	11.10	14.90	3-3	16.00	14.90	37		NO:2
Radium-226	13982-63-3	1.84	3.04	2-3	4.09	3.04	2	0.02	YES
Strontium-90	10098-97-2	0.52	7.20	3-3	9.22	7.20	0.72	14.00	NO:3
Thorium-228	14274-82-9	0.61	7.67	126-126	1.27	1.27	1.5	0.11	NO:2
Thorium-230	14269-63-7	0.87	7.99	126-126	1.57	1.57	1.9	21.00	NO:2,3
Thorium-232	7440-29-1	0.51	2.17	126-126	1.00	1.00	1.4	24.00	NO:2,3
Tritium	10028-17-8	0.05	79.60	106-124	5.96	5.96	1.6	11000.00	NO:3
Uranium-234	13966-29-5	0.62	1.28	126-126	0.95	0.95	1.1	18.00	NO:2,3
Uranium-235	15117-96-1	0.01	0.10	97-126	0.05	0.05	0.11	0.41	NO:2,3
Uranium-238	7440-61-1	0.64	1.62	126-126	1.03	1.03	1.2	1.80	NO:2,3

CAS - Chemical Abstract Service
COPC - Constituents of Potential Concern
EPC - Exposure Point Concentration
mg/kg - milligram per kilogram
ug/kg - microgram per kilogram
pCi/g - picocurie per gram
RBGV - Risk Based Guideline Value
RRE - Residual Risk Evaluation
UCL - Upper Confidence Limit

NO:1 - <5% Detects
NO:2 - <Background
NO:3 - < Risk-Based Guideline Value
NO:4 - Essential Human Nutrient
1.00E-06 Is equivalent to 1.00 x 10-6

In cases where the 95%UCL of the arithmetic mean falls below the maximum detected value, the 95%UCL is compared to background. If the 95%UCL is below the background value, the contaminant is not carried forward through the rest of the RRE process because this would result in negative incremental risk.

Table 3: Identification of Constituents of Potential Concern for the Off-Site Construction Worker RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Inorganics (mg/kg)									
Aluminum	7429-90-5	3080.00	15300.00	128-128	9890.00	9890.00	19000		NO:2
Antimony	7440-36-0	0.45	81.10	31-128	2.15	2.15		8.50	NO:3
Arsenic	7440-38-2	3.70	27.00	128-128	9.50	9.50	8.6	6.40	YES
Barium	7440-39-3	24.00	234.00	128-128	88.40	88.40	180	1500.00	NO:2,3
Beryllium	7440-41-7	0.17	1.10	127-128	0.62	0.62	1.3	3.50	NO:2,3
Bismuth	7440-69-9	1.20	63.9	17-128	3.10	3.10			YES
Cadmium	7440-43-9	0.08	4.20	65-128	0.34	0.34	2.1	21.00	NO:2,3
Calcium	7440-70-2	4080.00	144000.00	128-128	43200.00	43200.00	310000		NO:2,4
Chromium	7440-47-3	4.50	126.00	128-128	22.40	22.40	20	110.00	NO:3
Cobalt	7440-48-4	3.40	15.50	128-128	9.21	9.21	19		NO:2
Copper	7440-50-8	9.90	141.00	128-128	34.70	34.70	26		YES
Cyanide	57-12-5	0.36	6.80	6-128	0.30	0.30		430.00	NO:1
Iron	7439-89-6	7040.00	46800.00	128-128	20500.00	20500.00	35000		NO:2,4
Lead	7439-92-1	5.50	8190.00	128-128	226.00	226.00	48		YES
Magnesium	7439-95-4	2080.00	83200.00	128-128	16700.00	16700.00	40000		NO:2
Manganese	7439-96-5	213.00	1130.00	128-128	551.00	551.00	1400	2700.00	NO:2,3
Mercury	7439-97-6	0.05	1.30	97-128	0.21	0.21		6.40	NO:3
Nickel	7440-02-0	7.50	31.80	128-128	19.30	19.30	32	430.00	NO:2,3
Potassium	7440-09-7	529.00	2690.00	128-128	1600.00	1600.00	1900		NO:2,4
Selenium	7782-49-2	0.51	2.20	62-128	0.91	0.91			YES
Silver	7440-22-4	0.20	11.20	21-128	0.44	0.44	1.7	110.00	NO:2,3
Sodium	7440-23-5	72.50	600.00	125-128	180.00	180.00	240		NO:2,4
Thallium	7440-28-0	0.94	3.20	33-128	0.88	0.88	0.46		YES
Vanadium	7440-62-2	8.40	34.40	128-128	22.00	22.00	25	150.00	NO:2,3
Zinc	7440-66-6	28.30	481.00	128-128	91.00	91.00	140	6400.00	NO:2,3

Table 3: Identification of Constituents of Potential Concern for the Off-Site Construction Worker RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Inorganics (mg/kg)									
Aluminum	7429-90-5	3080.00	15300.00	128-128	9890.00	9890.00	19000		NO:2
Antimony	7440-36-0	0.45	81.10	31-128	2.15	2.15		8.50	NO:3
Arsenic	7440-38-2	3.70	27.00	128-128	9.50	9.50	8.6	6.40	YES
Barium	7440-39-3	24.00	234.00	128-128	88.40	88.40	180	1500.00	NO:2,3
Beryllium	7440-41-7	0.17	1.10	127-128	0.62	0.62	1.3	3.50	NO:2,3
Bismuth	7440-69-9	1.20	63.9	17-128	3.10	3.10			YES
Cadmium	7440-43-9	0.08	4.20	65-128	0.34	0.34	2.1	21.00	NO:2,3
Calcium	7440-70-2	4080.00	144000.00	128-128	43200.00	43200.00	310000		NO:2,4
Chromium	7440-47-3	4.50	126.00	128-128	22.40	22.40	20	110.00	NO:3
Cobalt	7440-48-4	3.40	15.50	128-128	9.21	9.21	19		NO:2
Copper	7440-50-8	9.90	141.00	128-128	34.70	34.70	26		YES
Cyanide	57-12-5	0.36	6.80	6-128	0.30	0.30		430.00	NO:1
Iron	7439-89-6	7040.00	46800.00	128-128	20500.00	20500.00	35000		NO:2,4
Lead	7439-92-1	5.50	8190.00	128-128	226.00	226.00	48		YES
Magnesium	7439-95-4	2080.00	83200.00	128-128	16700.00	16700.00	40000		NO:2
Manganese	7439-96-5	213.00	1130.00	128-128	551.00	551.00	1400	2700.00	NO:2,3
Mercury	7439-97-6	0.05	1.30	97-128	0.21	0.21		6.40	NO:3
Nickel	7440-02-0	7.50	31.80	128-128	19.30	19.30	32	430.00	NO:2,3
Potassium	7440-09-7	529.00	2690.00	128-128	1600.00	1600.00	1900		NO:2,4
Selenium	7782-49-2	0.51	2.20	62-128	0.91	0.91			YES
Silver	7440-22-4	0.20	11.20	21-128	0.44	0.44	1.7	110.00	NO:2,3
Sodium	7440-23-5	72.50	600.00	125-128	180.00	180.00	240		NO:2,4
Thallium	7440-28-0	0.94	3.20	33-128	0.88	0.88	0.46		YES
Vanadium	7440-62-2	8.40	34.40	128-128	22.00	22.00	25	150.00	NO:2,3
Zinc	7440-66-6	28.30	481.00	128-128	91.00	91.00	140	6400.00	NO:2,3

Table 3: Identification of Constituents of Potential Concern for the Off-Site Construction Worker RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Semi-Volatile Organic Compounds (ug/kg)									
2-Methylnaphthalene	91-57-6	23	150	25-128	229.00	150.00			YES
4-Methylphenol	106-44-5	64	64	1-128	262.00	64.00		110000.00	NO:1
Acenaphthene	83-32-9	20	750	30-128	195.00	195.00			YES
Acenaphthylene	208-96-8	19	650	41-128	213.00	213.00			YES
Anthracene	120-12-7	23	2300	59-128	254.00	254.00		6400000.00	NO:3
Benzo(a)anthracene	56-55-3	21	7300	117-128	654.00	654.00		20000.00	NO:3
Benzo(a)pyrene	50-32-8	21	7900	111-128	688.00	688.00		2000.00	NO:3
Benzo(b)fluoranthene	205-99-2	23	7100	117-128	681.00	681.00		20000.00	NO:3
Benzo(g,h,i)perylene	191-24-2	22	4700	110-128	477.00	477.00			YES
Benzo(k)fluoranthene	207-08-9	22	7000	113-128	669.00	669.00		200000.00	NO:3
Benzoic Acid	65-85-0	20	220	37-125	1070.00	220.00		85000000.00	NO:3
Bis(2-ethylhexyl)phthalat	117-81-7	20	44000	68-128	1070.00	1070.00		430000.00	NO:3
Butyl Benzyl Phthalate	85-68-7	20	380	11-128	257.00	257.00		4300000.00	NO:3
Carbazole	86-74-8	22	930	48-128	191.00	191.00			YES
Chrysene	218-01-9	25	8100	120-128	747.00	747.00		2000000.00	NO:3
Di-n-butyl Phthalate	84-74-2	22	4300	31-128	368.00	368.00		2100000.00	NO:3
Dibenz(a,h)anthracene	53-70-3	20	1500	59-128	240.00	240.00		2000000.00	NO:3
Dibenzofuran	132-64-9	20	510	26-128	195.00	195.00			YES
Diethyl Phthalate	84-66-2	44	59	2-128	262.00	59.00			NO:1
Fluoranthene	206-44-0	20	17000	122-128	1440.00	1440.00		850000.00	NO:3
Fluorene	86-73-7	20	1200	34-128	210.00	210.00			YES
Indeno(1,2,3-cd)pyrene	193-39-5	20	4600	109-128	462.00	462.00		20000.00	NO:3
Naphthalene	91-20-3	19	140	24-128	229.00	140.00			YES
Pentachlorophenol	87-86-5	30	70	2-128	658.00	70.00		120000.00	NO:1
Phenanthrene	85-01-8	21	13000	113-128	773.00	773.00			YES
Phenol	108-95-2	21	270	16-128	248.00	248.00		13000000.00	NO:3
Pyrene	129-00-0	28	17000	121-128	1310.00	1310.00		640000.00	NO:3
Volatile Organic Compounds (ug/kg)									
1,2-Dichloroethane	107-06-2	1	1	1-3	3.92	1.00		55000.00	NO:3
Methylene Chloride	75-09-2	2	2	1-3	3.34	2.00		100000.00	NO:3
Toluene	108-88-3	1	1	1-3	3.92	1.00		25000.00	NO:3

Table 3: Identification of Constituents of Potential Concern for the Off-Site Construction Worker RRE of the Miami-Erie Canal Area

Analyte	CAS Number	Minimum Concentration	Maximum Concentration	Detection Frequency	95% UCL	EPC	Background Value	RBGV	COPC?
Pesticides/PCBS (ug/kg)									
Dieldrin	60-57-1	1.100	1.100	1-3	1.33	1.10		930.00	NO:3
Endrin Ketone	53494-70-5	0.430	2.000	3-3	2.47	2.00			YES
Gamma Chlordane	5103-74-2	0.300	0.300	1-3	0.34	0.30			YES
Radionuclides (pCi/g)									
Cesium-137	10045-97-3	0.19	0.19	1-3	0.25	0.19	0.42	2.30	NO:2,3
Plutonium-238	13981-16-3	0.01	715.00	689-718	22.50	22.50	0.13	28.00	NO:3
Plutonium-239/240	PU-239/240	0.00	4.17	412-680	0.10	0.10	0.18	26.00	NO:2,3
Potassium-40	13966-00-2	11.10	14.90	3-3	16.00	14.90	37		NO:2
Radium-226	13982-63-3	1.84	3.04	2-3	4.09	3.04	2	0.70	YES
Strontium-90	10098-97-2	0.52	7.20	3-3	9.22	7.20	0.72	150.00	NO:3
Thorium-228	14274-82-9	0.61	7.67	126-126	1.27	1.27	1.5	4.30	NO:2,3
Thorium-230	14269-63-7	0.87	7.99	126-126	1.57	1.57	1.9	220.00	NO:2,3
Thorium-232	7440-29-1	0.51	2.17	126-126	1.00	1.00	1.4	250.00	NO:2,3
Tritium	10028-17-8	0.05	79.60	106-124	5.96	5.96	1.6	120000.00	NO:3
Uranium-234	13966-29-5	0.62	1.28	126-126	0.95	0.95	1.1	190.00	NO:2,3
Uranium-235	15117-96-1	0.01	0.10	97-126	0.05	0.05	0.11	17.00	NO:2,3
Uranium-238	7440-61-1	0.64	1.62	126-126	1.03	1.03	1.2	55.00	NO:2,3

CAS - Chemical Abstract Service
COPC - Constituents of Potential Concern
EPC - Exposure Point Concentration
mg/kg - milligram per kilogram
ug/kg - microgram per kilogram
pCi/g - picocurie per gram
RBGV - Risk Based Guideline Value
RRE - Residual Risk Evaluation
UCL - Upper Confidence Limit

NO:1 - <5% Detects
NO:2 - <Background
NO:3 - < Risk-Based Guideline Value
NO:4 - Essential Human Nutrient
1.00E-06 Is equivalent to 1.00 x 10-6

In cases where the 95%UCL of the arithmetic mean falls below the maximum detected value, the 95%UCL is compared to background. If the 95%UCL is below tl background value, the contaminant is not carried forward through the rest of the RRE process because this would result in negative incremental risk.

Table 4: Total Residual Risk Summary

Scenario and Receptor	Media	Constituents	Pathway	Total Noncancer Hazard or HI	Total Cancer Risk ELCR
Resident Adult Scenario	Soil (all sample depths)	Chemical	Ingestion	6.0E-02	**9.9E-06**
			Dermal	1.2E-01	**1.8E-04**
			Inhalation of Dust	3.4E-08	1.0E-08
			Inhalation of VOCs	NAP	NAP
			TOTAL	1.8E-01	**1.9E-04**
		Radionuclides	Ingestion	NAP	**1.4E-05**
			Inhalation of Dust	NAP	1.1E-07
			External	NAP	**1.9E-04**
			TOTAL	NAP	**2.0E-04**
		Chemical & Radionuclide Total		1.8E-01	**3.9E-04**
Resident Child Scenario	Soil (all sample depths)	Chemical	Ingestion	5.6E-01	**2.3E-05**
			Dermal	2.1E-01	**8.0E-05**
			Inhalation of Dust	6.9E-08	5.1E-09
			Inhalation of VOCs	NAP	NAP
			TOTAL	7.7E-01	**1.0E-04**
		Radionuclides	Ingestion	NAP	**6.9E-06**
			Inhalation of Dust	NAP	1.2E-08
			External	NAP	**4.6E-05**
			TOTAL	NAP	**5.3E-05**
		Chemical & Radionuclide Total		7.7E-01	**1.6E-04**
Recreational Adult Scenario	Soil (0-2 ft bls)	Chemical	Ingestion	2.5E-03	2.7E-10
			Dermal	8.7E-03	4.6E-09
			Inhalation of Dust	8.5E-10	1.9E-16
			Inhalation of VOCs	NAP	NAP
			TOTAL	1.1E-02	4.9E-09
		Radionuclides	Ingestion	NAP	**1.3E-06**
			Inhalation of Dust	NAP	2.4E-10
			External	NAP	**1.2E-05**
			TOTAL	NAP	**1.3E-05**
		Chemical & Radionuclide Total		1.1E-02	**1.3E-05**

Table 4: Total Residual Risk Summary

Scenario and Receptor	Media	Constituents	Pathway	Total Noncancer Hazard or HI	Total Cancer Risk ELCR
Recreational Child Scenario	Soil (0-2 ft bls)	Chemical	Ingestion	2.3E-02	6.4E-10
			Dermal	1.6E-02	2.1E-09
			Inhalation of Dust	1.7E-09	9.4E-17
			Inhalation of VOCs	NAP	NAP
			TOTAL	3.9E-02	2.7E-09
		Radionuclides	Ingestion	NAP	6.4E-07
			Inhalation of Dust	NAP	2.7E-11
			External	NAP	**2.9E-06**
			TOTAL	NAP	**3.6E-06**
		Chemical & Radionuclide Total		3.9E-02	**3.6E-06**
Off Site Construction Worker Scenario	Soil (0-10 ft bls	Chemical	Ingestion	2.1E-01	9.6E-07
			Dermal	1.5E-02	4.9E-08
			Inhalation of Dust	2.8E-06	3.0E-10
			Inhalation of VOCs	NAP	NAP
			TOTAL	2.2E-01	**1.0E-06**
		Radionuclides	Ingestion	NAP	**1.2E-06**
			Inhalation of Dust	NAP	2.9E-10
			External	NAP	**7.7E-06**
			TOTAL	NAP	**9.0E-06**
		Chemical & Radionuclide Total		2.2E-01	**1.0E-05**

bls - below land surface
ECLR - Excess Cancer Lifetime Risk
HI - Hazard Index
HI values which exceed the target risk level of one and ELCR values which exceed 10^{-6} are presented in bold text.
NAP - Not Applicable pathway
1E-01 is equivalent to 1.00×10^{-1}

Table 5: Background Residual Risk Summary

Scenario and Receptor	Media	Constituents	Pathway	Background Noncancer Risk HI	Background Cancer Risk ELCR
Resident Adult Scenario	Soil (all sample depths)	Chemical	Ingestion	4.8E-02	**6.1E-06**
			Dermal	8.3E-02	**8.1E-06**
			Inhalation of Dust	NA	9.2E-09
			Inhalation of VOCs	NAP	NAP
			TOTAL [a]	1.3E-01	**1.4E-05**
		Radionuclides	Ingestion	NAP	**5.7E-06**
			Inhalation of Dust	NAP	7.0E-09
			External	NAP	**1.2E-04**
			TOTAL	NAP	**1.3E-04**
		Chemical & Radionuclide Total		1.3E-01	**1.4E-04**
Resident Child Scenario	Soil (all sample depths)	Chemical	Ingestion	4.5E-01	**1.4E-05**
			Dermal	1.5E-01	**3.6E-06**
			Inhalation of Dust	NA	4.7E-09
			Inhalation of VOCs	NAP	NAP
			TOTAL [b]	6.0E-01	**1.8E-05**
		Radionuclides	Ingestion	NAP	**2.9E-06**
			Inhalation of Dust	NAP	7.7E-10
			External	NAP	**3.1E-05**
			TOTAL	NAP	**3.3E-05**
		Chemical & Radionuclide Total		6.0E-01	**5.1E-05**
Recreatonal Adult Scenario	Soil (0-2 ft bls)	Chemical	Ingestion	1.3E-03	NA
			Dermal	4.5E-03	NA
			Inhalation of Dust	NA	NA
			Inhalation of VOCs	NAP	NAP
			TOTAL	5.8E-03	NA
		Radionuclides	Ingestion	NAP	8.5E-07
			Inhalation of Dust	NAP	1.6E-10
			External	NAP	**7.7E-06**
			TOTAL	NAP	**8.6E-06**
		Chemical & Radionuclide Total		5.8E-03	**8.6E-06**

Table 5: Background Residual Risk Summary

Scenario and Receptor	Media	Constituents	Pathway	Background Noncancer Risk HI	Background Cancer Risk ELCR
Recreational Child Scenario	Soil (0-2 ft bls)	Chemical	Ingestion	1.2E-02	NA
			Dermal	8.2E-03	NA
			Inhalation of Dust	NA	NA
			Inhalation of VOCs	NAP	NAP
			TOTAL	2.0E-02	NA
		Radionuclides	Ingestion	NAP	4.2E-07
			Inhalation of Dust	NAP	1.8E-14
			External	NAP	**1.9E-06**
			TOTAL	NAP	**2.4E-06**
		Chemical & Radionuclide Total		2.0E-02	**2.4E-06**
Off Site Construction Worker Scenario	Soil (0-10 ft bls)	Chemical	Ingestion	1.6E-01	8.7E-07
			Dermal	1.1E-02	4.4E-08
			Inhalation of Dust	2.5E-06	2.7E-10
			Inhalation of VOCs	NAP	NAP
			TOTAL	1.8E-01	9.1E-07
		Radionuclides	Ingestion	NAP	8.1E-07
			Inhalation of Dust	NAP	1.9E-10
			External	NAP	**5.1E-06**
			TOTAL	NAP	**5.9E-06**
		Chemical & Radionuclide Total		1.8E-01	**6.8E-06**

bls - below land surface
ECLR - Excess Cancer Lifetime Risk
HI - Hazard Index
HI values which exceed the target risk level of one and ELCR values which exceed 10^{-6} are presented in bold text.
NA - Not Applicable
NAP - Not Applicable pathway
1E-01 is equivalent to 1.00×10^{-1}
a - Total chemical cancer risk to the resident adult for polycyclic aromatic hydrocarbons (PAHs) from the data in the December 2002 PAHs study is 1.5E-03.
b - Total chemical cancer risk to the resident child for polycyclic aromatic hydrocarbons (PAHs) from the data in the December 2002 PAHs study is 7.3E-04.

Table 6: Incremental Residual Risk Summary

Scenario and Receptor	Media	Constituents	Pathway	Incremental Noncancer Hazard or HI	Incremental Cancer Risk ELCR
Resident Adult Scenario	Soil (all sample depths)	Chemical	Ingestion	1.2E-02	**3.8E-06**
			Dermal	3.3E-02	**1.7E-04**
			Inhalation of Dust	3.4E-08	9.6E-10
			Inhalation of VOCs	NAP	NAP
			TOTAL	4.5E-02	**1.7E-04** [a]
		Radionuclides	Ingestion	NAP	**8.1E-06**
			Inhalation of Dust	NAP	9.9E-08
			External	NAP	**6.4E-05**
			TOTAL	NAP	**7.2E-05**
		Chemical & Radionuclide Total		4.5E-02	**2.4E-04** [a]
Resident Child Scenario	Soil (all sample depths)	Chemical	Ingestion	1.1E-01	**8.9E-06**
			Dermal	6.0E-02	**7.6E-05**
			Inhalation of Dust	6.9E-08	4.9E-10
			Inhalation of VOCs	NAP	NAP
			TOTAL	1.7E-01	**8.5E-05** [a]
		Radionuclides	Ingestion	NAP	**4.0E-06**
			Inhalation of Dust	NAP	1.1E-08
			External	NAP	**1.6E-05**
			TOTAL	NAP	**2.0E-05**
		Chemical & Radionuclide Total		1.7E-01	**1.1E-04** [a]
Recreational Adult Scenario	Soil (0-2 ft bls)	Chemical	Ingestion	1.2E-03	2.7E-10
			Dermal	4.1E-03	4.6E-09
			Inhalation of Dust	8.5E-10	1.9E-16
			Inhalation of VOCs	NAP	NAP
			TOTAL	5.3E-03	4.9E-09
		Radionuclides	Ingestion	NAP	4.4E-07
			Inhalation of Dust	NAP	8.4E-11
			External	NAP	**4.0E-06**
			TOTAL	NAP	**4.5E-06**
		Chemical & Radionuclide Total		5.3E-03	**4.5E-06**

Table 6: Incremental Residual Risk Summary

Scenario and Receptor	Media	Constituents	Pathway	Incremental Noncancer Hazard or HI	Incremental Cancer Risk ELCR
Recreational Child Scenario	Soil (0-2 ft bls)	Chemical	Ingestion	1.1E-02	6.4E-10
			Dermal	7.5E-03	2.1E-09
			Inhalation of Dust	1.7E-09	9.4E-17
			Inhalation of VOCs	NAP	NAP
			TOTAL	1.8E-02	2.7E-09
		Radionuclides	Ingestion	NAP	2.2E-07
			Inhalation of Dust	NAP	9.1E-12
			External	NAP	**1.0E-06**
			TOTAL	NAP	**1.2E-06**
		Chemical & Radionuclide Total		1.8E-02	**1.2E-06**
Off Site Construction Worker Scenario	Soil (0-10 ft bls)	Chemical	Ingestion	4.1E-02	9.1E-08
			Dermal	4.4E-03	4.8E-09
			Inhalation of Dust	2.9E-07	2.9E-11
			Inhalation of VOCs	NAP	NAP
			TOTAL	4.5E-02	9.6E-08
		Radionuclides	Ingestion	NAP	4.2E-07
			Inhalation of Dust	NAP	1.0E-10
			External	NAP	**2.7E-06**
			TOTAL	NAP	**3.1E-06**
		Chemical & Radionuclide Total		4.5E-02	**3.2E-06**

bls - below land surface
ECLR - Excess Cancer Lifetime Risk
HI - Hazard Index
HI values which exceed the target risk level of one and ELCR values which exceed 10^{-6} are presented in bold text.
NAP - Not Applicable pathway
1E-01 is equivalent to 1.00×10^{-1}
a - The cancer risk to the resident adult and child for polycyclic aromatic hydrocarbons (PAHs) from the data in the December 2002 PAH study and using the methodolgy presented in this RRE are 1.5E-03 and 7.3E-04, respectively. These cancer risks are greater than the total chemical incremental cancer risk level from all chemical contaminants of potential concern in the Miami-Erie Canal samples. Furthermore, this demonstrates that PAH levels observed in the Miami-Erie Canal samples are typical of this urban area and not the result of Mound operations. With consideration of these regional background levels of PAHs, incremental cancer risk to these receptors and all contaminants falls within the acceptable risk range.