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ER-061/03
March 25, 2003

Mr. Richard B. Provencher, Director
Miamisburg Closure Project
U. S. Department of Energy
P. O. Box 66
Miamisburg, OH 45343-0066

SUBJECT: Contract No. DE-AC24-03OH20152
**PHASE I PROPOSED PLAN, PUBLIC REVIEW DRAFT**

REFERENCE: Statement of Work Requirement 039 - PRS Documents

Dear Mr. Provencher:

Rob Rothman from your office has approved the release of the following document:

- Phase I Proposed Plan, Public Review Draft

If you have any questions regarding the document, please contact Dave Rakel at Extension 4203.

Sincerely,

DA Rakel for

Monte A. Williams
Deputy Project Manager, Environmental Restoration

MAW/DAR/jdg

Enclosure

Approved: Paul C Lucas 3/25/03
for Robert S. Rothman Date
CERCLA Program Manager

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# Phase I

# Proposed Plan

**Public Review Draft**
**March 2003**

**Miamisburg Closure Project**

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# Acronyms

| | |
|---|---|
| ARARs | Applicable or Relevant and Appropriate Requirements |
| BVA | Buried Valley Aquifer |
| CERCLA | Comprehensive Environmental Response, Compensation, & Liability Act |
| FFA | Federal Facilities Agreement |
| FOD | frequency of detection |
| GV | Guideline Value |
| HI | Hazard Index |
| HTO | tritium |
| MCL | maximum containment level |
| MCP | Miamisburg Closure Project |
| MMCIC | Miamisburg Mound Community Improvement Corporation |
| NCP | National Contingency Plan |
| NFA | No Further Assessment |
| NPL | National Priority List |
| O&M | Operation & Maintenance |
| OEPA | Ohio Environmental Protection Agency |
| ODH | Ohio Department of Health |
| OU | Operable Unit |
| ppb | parts per billion |
| PRS | Potential Release Site |
| RD/RA | Remedial Design/Remedial Action |
| RI/FS | Remedial Investigation/Feasibility Study |
| ROD | Record of Decision |
| RRE | Residual Risk Evaluation |
| RREM | Residual Risk Evaluation Methodology |
| RTG | Radioisotopic Thermal Generators |
| SM/PP | Special Metallurgical/Plutonium Processing |
| SVOC | semi-volatile organic compound |
| TCE | trichloroethene |
| 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, in southern Montgomery County, Ohio (Figure 1). The Site is approximately ten miles southwest of Dayton and 45 miles north of Cincinnati. Miamisburg 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 Mound Plant will remain in industrial/commercial use into the future. This future use has been determined based upon agreement among DOE, United States Environmental Protection Agency (USEPA), Ohio Environmental Protection Agency (OEPA), and interested stakeholders. This land use is reflected in the Mound Comprehensive Reuse Plan of the Miamisburg Mound Community Improvement Corporation (MMCIC) and is currently codified in the City of Miamisburg Zoning Ordinance for industrial use.

Mound Golf Course and Miamisburg Mound State Memorial Park, both directly east of the Mound Plant across Mound Road, are frequented during favorable weather. The park is the site of a 68-foot high ancient Indian mound, located 380 feet east of the Mound Plant boundary. Other recreational areas within one mile of the Mound Plant include the Miamisburg Community Park, Harmon Athletic Field, Library Park, Miamisburg Aquatic Center, Rice Field, and Bell Park. These areas are used extensively during the summer.

There are no large lakes within a 5-mile radius of the Mound Plant. Some vestiges of the old Miami-Erie Canal lie between the Norfolk Southern Railroad and Dayton-Cincinnati Pike west of the Mound Plant. This remnant of the old Miami-Erie Canal is designated as Operable Unit (OU) 4. 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.

Agricultural land within a 5-mile radius around the Mound Plant is primarily used for corn and soybean production and for livestock grazing. According to 2000 census figures, the population of Miamisburg is 19,489, Dayton is 166,179, and Montgomery County is 554,232.

This Proposed Plan addresses Phase I (Figure 2), which is located on the southern border of the Mound Plant. Phase I is generally bound to the south by Parcel 4, which was recently transferred to the MMCIC, to the west and north by the plant proper, and to the east by the transferred Release Block D.

Phase I lies within what was once called Operable Unit 5 (OU5). There are 10 buildings in Phase I. There are 40 Potential Release Sites (PRSs) in Phase I. All buildings and PRSs in Phase I were evaluated for protectiveness or remediated to be protective. The status of the PRSs in Phase I is summarized in Table 1. The status of the buildings in Phase I is summarized in Table 2. Any residual risks associated with remaining contamination in Phase I have been evaluated and are presented in the Phase I Residual Risk Evaluation (RRE).

## 2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

### 2.1 History

Mound was originally established by the DOE as an integrated research, development, and production facility that supported the nation's weapons and energy programs. To reconfigure and consolidate the nuclear complex, the DOE has decided to phase out the defense mission at Mound. As a result, the Mound has been designated an environmental management site and the plant is in the process of being remediated, transferred, and converted into a research and industrial/commercial site. Currently CH2MHill Mound, Inc. manages Mound for the DOE.

Early Mound programs investigated the chemical and metallurgical properties of polonium-210 and its applications; particularly, the fabrication of neutron and alpha sources for weapon and non-weapon use. Investigations involving uranium, protactinium-231, and plutonium-239 were performed from 1950 to 1963 as part of the national civilian power reactor program. In 1954, Mound began the separation of stable isotopes.

In the mid-1950s, Mound initiated efforts to develop a large-scale process for the recovery of thorium from a variety of thorium-bearing ores. Even though this project was canceled prior to full-scale operation, approximately 1,650 tons of sludge containing thorium were received at Mound. Due to its corrositivity, the thorium sludge was continually repackaged and relocated. This resulted in a number of thorium-contaminated areas around the site.

Plutonium-238 research and development activity began at Mound in the mid-1950s. From the early 1960s to the late 1970s, Mound processed plutonium-238 for use in heat sources within Radioisotopic Thermal Generators (RTGs). The fabrication of heat sources from plutonium metal was terminated in the mid-1960s. Oxide processes continued into the late 1970s. Since early 1979, Mound has not handled unencapsulated plutonium-238.

As a result of historic disposal practices and contaminant releases to the environment, the Mound Plant was placed on the National Priorities List (NPL) on November 21, 1989. The DOE signed a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 120 Federal Facility Agreement (FFA) with the USEPA, effective October 1990. In 1993, this agreement was modified and expanded to include the OEPA.

The PRSs at Mound were identified based on knowledge of historical land use that was considered potentially detrimental and/or an actual sampling result showing elevated concentrations of contaminants. Tables 1 and 2 contain information and closeout status for Phase I PRSs and buildings. Figure 3 depicts buildings and PRSs currently within Phase I.

A brief discussion of the histories of the PRSs and buildings (both past and present) located in Phase I is included in Appendices D and E, respectively.

### 2.2 Enforcement and Agreements - Mound 2000 Process

The DOE, the USEPA, and the OEPA had originally planned to address the Plant's environmental restoration issues under a set of OUs, each of which would include a

number of PRSs. For each OU, the site would follow the traditional CERCLA process: a Remedial Investigation/Feasibility Study (RI/FS) followed by a Record of Decision (ROD), followed by Remedial Design/Remedial Action (RD/RA). After initiating remedial investigations for several OUs, the DOE and its regulators realized during a strategic review in 1995 that, for Mound, the OU approach was inefficient. The DOE and its regulators agreed that it would be more appropriate to evaluate each PRS or building separately, use removal action authority to remediate them as needed, and establish a goal for no additional remediation other than institutional controls for the final remedy documented in the ROD. To evaluate any residual risk after all removals have been completed, a RRE is conducted to ensure the conditions at the parcel do not pose an unacceptable risk to human health when the parcel is used for industrial/commercial purposes. This process was named the Mound 2000 Process. DOE and its regulators pursued this approach with the understanding that USEPA and OEPA reserve all rights to enforce all provisions of the FFA and participation in the Mound 2000 Process does not constitute a waiver of USEPA and OEPA rights to enforce the FFA.

The Mound 2000 Process established a "Core Team" consisting of representatives of the DOE Miamisburg Closure Project, USEPA, and OEPA. The Core Team evaluates each of the PRSs and recommends the appropriate response. The Core Team uses process knowledge, site visits, and existing data to determine whether or not any action is warranted concerning the PRS. If a decision cannot be made, the Core Team identifies specific information needed to make a decision (e.g., data collection, investigations). The Core Team also receives input from technical experts as well as the general public and/or public interest groups. Thus, all stakeholders have the opportunity to express their opinions or suggestions involving each PRS. The details of this process are explained in the Work Plan for Environmental Restoration at the Mound Plant, The Mound 2000 Approach (Reference 1).

Originally, the Mound property was divided into nineteen "release blocks," which are contiguous tracts of property designated for transfer of ownership. Release Blocks D and H were transferred to MMCIC in 1999. The remaining release blocks were reconfigured and renamed parcels. Parcel 4 was transferred to MMCIC in 2001. Parcel 3 was transferred to MMCIC in 2002. Recently, the remaining parcels were reconfigured and renamed Phase I, Phase II, Phase III, and the NE Island.

The Mound 2000 Residual Risk Evaluation Methodology (RREM) (Reference 2) was developed as a framework for evaluating human health risks associated with residual levels of contamination. The RREM is applied to a parcel once necessary remediation has been completed, and the remaining PRSs or buildings in the parcel have been designated as No Further Assessment (NFA). Once the identified environmental concerns have been adequately addressed by the Core Team, a RRE is performed. The RRE documents whether the parcel is acceptable for industrial/commercial redevelopment. The results of the Phase I RRE are discussed in Section 4 through Section 6 of this Proposed Plan. A ROD will be generated for each release block/parcel to be transferred. The ROD will document the most appropriate remedy that meets statutory requirements and ensures protection of human health and the environment.

After the Phase I ROD is final, DOE will submit to USEPA and OEPA documentation that shows the property meets CERCLA 120 (h) (3) requirements. This documentation, Phase

I Environmental Summary, must be sent to the Administrator of USEPA for concurrence on the property transfer. After concurrence is obtained, the title of the property may be formally transferred. Prior to acceptance of the deed for any discrete parcel, the Buyer shall acknowledge that it has reviewed the Mound environmental reports provided by DOE. Acceptance of the deed thereby acknowledges and commits the Buyer to abiding by institutional controls specified in the ROD.

## 3.0 HIGHLIGHTS OF PREVIOUS COMMUNITY PARTICIPATION

The community has been an active participant in this process to date. Comments from the public on the PRS and building recommendations have been incorporated as part of the remedy evaluation. DOE believes all comments have been resolved with the commentor and the documents, comments, and responses have been placed in the CERCLA Public Reading Room. The Mound 2000 RREM has also gone through a public comment cycle and copies are in the CERCLA Public Reading Room.

Table 3 lists documents relevant to Phase I, along with the dates they were made available for public comment. Table 3 lists a Phase I Proposed Plan that was available for public review in October 2002. The Phase I Proposed Plan was reissued to enable public comment on the following changes in Phase I:

- The northeast boundary was adjusted to remove any influence of trichloroethene (TCE) from PRS 87 (see figure 5)
- The northwest boundary was adjusted to accommodate traffic safety during the remediation of the remainder of the site (see Figure 5)
- The description of the preferred alternative (see Sections 7 and 8) was changed from "Institutional Controls and Groundwater Monitoring" to "Institutional Controls and Monitored Natural Attenuation".

The residual soil risk in Phase I was recalculated using the data from the revised boundaries and compared to the results published previously in the Phase I Residual Risk Evaluation (Reference 18). Table 19 shows that the boundary changes do not impact the incremental residual risk from soil in Phase I.

This Proposed Plan will have a 30-day public comment period.

## 4.0 SCOPE AND ROLE OF PHASE I

This Proposed Plan addresses Phase I, which is one of four remaining parcels at Mound. A Proposed Plan and ROD will be generated for each parcel of property to be transferred. Each Proposed Plan and resulting ROD will document the most appropriate remedy that meets statutory requirements and ensures protection of human health and the environment. Once the ROD for Phase I is final and in effect, DOE could petition the USEPA to delist Phase I from the NPL.

After a ROD has been generated for each of the release blocks, the Core Team plans for a site wide ROD to address any areas or media associated with the Mound Plant that were not previously addressed.

## 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 and underlies Phase I. 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 Buried Valley Aquifer (BVA) and contiguous deposits. A general discussion of the geology is presented in the Remedial Investigation/Feasibility Study, Site-Wide Work Plan (Reference 3).

### 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 (Reference 3) and the Hydrogeologic Investigation: Buried Valley Aquifer Report (Reference 4) and Hydrogeologic Investigation: Bedrock Report (Reference 5).

### 5.3 Wetlands

A small portion (0.03 acres) of the Phase I property is classified as wetlands, i.e., those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction (Reference 6).

## 5.4 Available Data for Phase I

The PRSs in Phase I have been evaluated by the Core Team. The following sections discuss the data relevant to Phase I that are available from the general source documents and the Potential Release Site packages.

### 5.4.1 Background Data

**Soils.** 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 5.5 of this Proposed Plan. Regional background concentrations in soil were determined and are documented in the Background Soils Investigation Soil Chemistry Report (Reference 7) and Regional Soils Investigation Report (Reference 8).

**Groundwater.** Background concentrations for groundwater were identified in the RREM (Reference 2). These background values were originally reported in the Hydrologic Investigation: Groundwater Sweeps Report (Reference 9).

### 5.4.2 Groundwater Contaminant Data

Groundwater data consist of water analyses of the Mound Plant production wells (wells 0076 and 0271) screened within the BVA, and analyses of groundwater from the Mound Plant monitoring wells screened in the bedrock aquifer. These wells are sampled as part of the site-wide groundwater monitoring network. The RRE for Phase I documents the specific groundwater data used to evaluate the current and future groundwater profiles for Phase I.

### 5.4.3 PRS Contaminant Data

Soil data can be divided into three types: (1) data obtained through commercial analytical laboratory analysis, (2) data obtained through "screening" techniques conducted in a DOE laboratory, and (3) data obtained through screening techniques conducted in the field. Analytical laboratory data are obtained using strict methods and are subjected to exacting quality control procedures. These data are of the highest quality, and are quantitative. The laboratory screening data are considered to be of lower quality because sample preparation does not occur, and the measuring instruments are less precise. The field screening techniques are the least accurate due to instrument limitations and the effects of ambient conditions on field measurements. Due to these limitations, field screening data were not used for any calculations in the RRE for Phase I.

Soil contaminant data for Phase I collected prior to the Mound 2000 Process are documented in the following reports:

- Miscellaneous Sites Limited Field Investigation Report, Volumes 1, 2, and 3

(Purpose was to address areas noted in previous surveys but not thought to endanger human health or the environment.) (Reference 10),

- New Property Extended Phase I Field Investigation Report (Purpose was to augment previous reconnaissance survey with surface and subsurface sampling, groundwater sampling, and sediment sampling in ephemeral streams.) (Reference 11),

- Remedial Investigation Report (Identifies nature and extent of contamination in groundwater, surface water, soils, and sediment in Operable Unit 5.) (Reference 12),

- Operational Area Phase I Investigation Area 22 (Purpose was to present results of the radiological and soil gas reconnaissance surveys conducted in Area 22 as part of the larger OU5 Phase I investigation and identify potential areas of radiological and chemical contamination. Provide a qualitative screen that can be used to determine a strategy for directing additional investigations.) (Reference 13),

- Operational Area Phase I Investigation Area 13 (Purpose was to present results of the radiological and soil gas reconnaissance surveys conducted in Area 13 as part of the larger OU5 Phase I investigation and identify potential areas of radiological and chemical contamination. Provide a qualitative screen that can be used to determine a strategy for directing additional investigations.) (Reference 14),

- Reconnaissance Sampling Report Decontamination and Decommissioning Areas (Purpose was to characterize the non-radioactive hazardous constituents in the soil areas that were included in the D&D Program as of 1989. Some onsite analyses for plutonium-238 and thorium-232 were also reported.) (Reference 15),

- Regional Soils Investigation Report (Purpose was to give a regional soil description without including the impacts of Mound operations) (Reference 8),

- Site Scoping Report, Volume 3 - Radiological Site Survey (a compendium of existing data) (Reference 16).

In the Mound 2000 Process, radionuclide and chemical contaminants were studied on a PRS basis. There are 40 PRSs located within Phase I. The locations of these PRSs are shown in Figure 3. The rationale for designation of the PRSs is outlined in Appendix D.

### 5.4.4 Building Contaminant Data

The final radiological surveys for the ten buildings remaining in Phase I met all surface contamination guidelines. This information is available in the building data packages (BDPs) listed in Table 2.

### 5.4.5 Air Contaminant Data

For purposes of evaluating cumulative residual risk, air pathway data are also reported in

each RRE. Per the RREM (Reference 2), 1994 data collected at the Mound Plant perimeter air sampling stations are used to bound the concentrations, and, therefore, the risks from inhalation of radionuclides present in the ambient air. The risk data for tritium (HTO), plutonium-238, and plutonium-239/240 reported in the Residual Risk Evaluation, Release Block D (Reference 17) were reviewed and found to require no update or changes. It was observed, however, that the site employee risk calculations did not include an adjustment factor to account for the time spent indoors. While this approach is inconsistent with that applied to analogous outdoor pathways, it is conservative in nature.

## 5.5 Summary of Contaminants Detected in Phase I

The complete list of all contaminants detected at least once within Phase I is provided in the Phase I RRE (Reference 18) in Appendix I.

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 on 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 (Reference 19). These values have been revised to reflect revised toxicity values and/or include the effect of additional decay products. A more detailed discussion of the screening process is located in the RREM.

Contaminants carried forward in the RRE for Phase I are identified in the Phase I RRE in Tables 2-13. These tables document the results of the screening process by listing the reason specific contaminants were screened out of the RRE. These tables are reproduced in Appendix B of this Proposed Plan as Tables 7-18.

### 5.5.1 Screening Results for Soil Contaminants

For the construction worker scenario, nine volatile organic compounds (VOCs), fourteen semivolatile organic compounds (SVOCs), twenty-nine inorganic (metal), two pesticides, and twenty-two radiological compounds were considered as potential contaminants of concern for the soil component of the RRE. For the site worker scenario, nine VOCs, sixteen SVOCs, twenty-nine inorganic, two pesticides, one explosive, and twenty-three radiological compounds were considered as potential contaminants of concern for the soil component of the RRE after screening against the FOD factor. Soil concentrations of those compounds were compared to the other screening criteria listed above to determine if a given compound should be included in 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 number of

VOCs was reduced from nine to none for both the construction worker and site employee scenarios. The number of SVOCs was reduced from fourteen to four for the construction worker scenario and from sixteen to three for the site employee scenario. (See Tables 3 and 5 of the RRE, reproduced in Appendix B of this report as Tables 8 and 10.)

**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 twenty-nine to three for the construction worker scenario and from twenty-nine to two for the site employee scenario. (See Tables 3 and 5 of the RRE, reproduced in Appendix B of this report as Tables 8 and 10.)

**Explosive compounds.** For the site worker scenario, one explosive compound was screened against Guideline Values and eliminated from further evaluation. (See Table 5 of the RRE, reproduced in Appendix B of this report as Table 10.)

**Pesticides.** Pesticides were screened against background and Guideline Values. Using these criteria, the number of pesticides was reduced from two to one for the construction worker and site employee scenarios. (See Tables 3 and 5 of the RRE, reproduced in Appendix B of this report as Tables 8 and 10.)

**Radiological compounds.** Radiological contaminants were screened against background and Guideline Values. Using these screening criteria, the number of radionuclides was reduced from twenty-two to four for the construction worker scenario and from twenty-three to four for the site employee scenario. (See Tables 3 and 5 of the RRE, reproduced in Appendix B of this report as Tables 8 and 10.)

### 5.5.2 Screening Results for Current Groundwater Contaminants

"Current" groundwater contaminants are defined as those found in the Mound Plant production wells (0076 and 0271). After screening for FOD, ten organic, twenty-three inorganic, and sixteen radiological compounds were identified as potential contaminants of concern. Similar to the approach for soils data, current groundwater concentrations were screened against background, Guideline Values and on the basis of whether they are common water quality parameters, such as alkalinity or dissolved solids that are not health-related parameters.

For both scenarios, the screening process reduced the number of organic contaminants from ten to two. For both scenarios, the screening process reduced the number of inorganic contaminants from twenty-three to four. For the construction worker scenario, the screening process reduced the number of radiological contaminants from sixteen to one. For the site employee scenario, the screening process reduced the number of radiological contaminants from sixteen to four. (See Tables 7 and 9 of the RRE, reproduced in Appendix B of this report as Tables 12 and 14.)

### 5.5.3 Screening Results for Future Groundwater Contaminants

Future groundwater contaminants are defined as those currently in the Mound Plant production wells, combined with contaminants measured in Mound Plant bedrock

monitoring wells. This definition assumes that all contaminants in the bedrock aquifer water (that exceed background) will migrate to the production wells within the BVA in the future. To create this combined list of contaminants, the bedrock contaminants were screened against BVA background concentrations. This list was combined with the current groundwater list. These contaminants were screened with respect to BVA background concentrations, Guideline Values, frequency of detection, and whether they are common water quality parameters not associated with health impacts. The screening reduced the number of future VOC contaminants for the construction worker scenario from eleven to seven, the inorganic contaminants from thirty-one to thirteen, the radiological contaminants from nineteen to eight, and the SVOC contaminants from two to one. The screening reduced the number of future VOC contaminants for the site employee scenario from eleven to seven, the inorganic contaminants from thirty-one to thirteen, the radiological contaminants from eighteen to eight, and the SVOC contaminants from two to one. (See Tables 11 and 13 of the RRE, reproduced in Appendix B of this report as Tables 16 and 18.)

### 5.5.4 Comparison of Groundwater Contaminants to MCLs

In addition to the above screening against RBGVs and background values, the groundwater constituents are compared to Maximum Contaminant Levels (MCLs). These results are used in evaluating compliance with Applicable, or Relevant and Appropriate Requirements (ARARs, see Section 8.1.2).

There are currently six groundwater monitoring wells and one seep located within the boundary of Phase I that show MCL exceedances. Four of the monitoring wells (0411, 0443, 0445, and 0399) are screened in the bedrock groundwater system, and two of the monitoring wells (0319 and 0400) are screened in the BVA. Wells 0411, 0443, and Seep 0617 exceed the MCL (5 parts per billion (ppb)) for TCE. Well 0445 exceeds the MCL for barium (2 parts per million (ppm)) and the MCL for radium-226 and 228 (5 pCi/L combined). Wells 0400, 0319, 0399, and 0411 exceed the MCLs for nickel (100 ppb) and chromium (100 ppb). The locations of the wells in Phase I are shown in Figure 4. In the last two years (September 2000 to present), the TCE concentrations at well 0411 have ranged from 8 to 16 ppb. The most recent result (Summer 2002) was 14 ppb.

Collectively, the soil data and groundwater data from the wells in the vicinity of well 0411 suggest that the TCE contamination is most likely limited to the area adjacent to well 0411. There is no known continuing source of TCE contamination in the soil in Phase I. However, TCE is not naturally occurring and was widely used in plant operations. Therefore, TCE is a contaminant of concern (COC) for the groundwater in Phase I and is addressed by the selected remedy.

Collectively, the soil data and groundwater data in the vicinity of well 0445 suggest that the elevated barium concentrations are most likely limited to the area immediately adjacent to well 0445. Other properties (high levels of total dissolved solids, very low tritium level, elevated levels of radium-226 and radium-228) of the groundwater observed at well 0445 are unlike the values typically observed in the bedrock groundwater at Mound, indicating that the groundwater at well 0445 may be neither representative of overall site conditions nor the result of plant operations. Therefore, barium, radium-226, and radium-228 in the Phase I property are not considered contaminants of concern to be addressed in the

proposed remedies. To provide assurance that the understanding of the barium, radium-226, and radium-228 in groundwater situation is correct, DOE will continue to monitor for them. The specifics of the monitoring will be established in the Phase I Groundwater Monitoring Plan that will require approval by USEPA and OEPA. This will become part of the O&M Plan required by the ROD. With four consecutive quarters of consistent results for barium, radium-226, and radium-228, DOE could petition USEPA and OEPA to decrease the sampling frequency.

Limited Field Investigations (References 20 and 21) indicate the nickel and chromium concentrations observed at wells 0400, 0319, 0399, and 0411 are the likely result of corrosion of the wellcasing and not the result of plant operations. Therefore, nickel and chromium are not considered contaminants of concern to be addressed in the proposed remedies. However, because the data set supporting this conclusion is limited, DOE will continue to monitor for nickel and chromium. The specifics of the monitoring will be established in the Phase I Groundwater Monitoring Plan that will require approval by USEPA and OEPA. With four consecutive quarters of consistent or decreasing nickel and chromium results, DOE could, with the concurrence of USEPA and OEPA, discontinue monitoring groundwater in Phase I for nickel and chromium.

## 6.0 SUMMARY OF SITE RISKS

For the Mound Plant, the human health risk associated with exposure to residual levels of contamination is evaluated pursuant to the RREM (Reference 2). The RREM is applied to a limited area, such as a parcel, after all necessary remediation has been completed and the remaining PRSs or buildings within that parcel have been designated as NFA. Once the Core Team has 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 two exposure scenarios examined in the Phase I RRE involve an onsite construction worker, and a site employee engaged in non-construction activities (office work). The construction worker and site employee are assumed to be exposed to soil contaminated at the levels described by currently available data. The workers are assumed to be

exposed to the existing soil contamination both now and into the future. For the groundwater pathways, both current and future exposures are assumed. Current groundwater exposures are estimated based on the concentration levels in the Mound Plant production wells 0076 and 0271 (which are screened in the BVA) because they supply potable water to the Mound Plant and represent a potential future potable water supply. The bedrock water under Phase I is not a current source of drinking water.

Future groundwater contamination is assumed to be appropriately represented by combining current BVA contamination with additional contamination currently in the nearby bedrock aquifer. Bedrock aquifer groundwater from across the entire Mound Plant is assumed to eventually mix with BVA water, and thereby contribute bedrock aquifer contamination to the BVA. It is this mix of BVA and bedrock contaminated water to which the future construction worker and site employee are assumed to be exposed.

### 6.1.1 Construction Worker Scenario

It is assumed that activities requiring earth-moving, such as construction of new buildings, will occur in Phase I. These construction activities could result in worker exposure to contaminants in soil, on dust particles, in air, and in groundwater. This scenario characterizes the potential exposure to a construction worker by assuming the worker is onsite eight hours per day, 250 days per year, for five years. The construction worker is assumed to be an adult weighing 70 kg. The amount of soil ingested is assumed to be 480 mg/day based on "heavy" construction work. All parameters needed to calculate intakes are listed in Table 14 of the Phase I RRE.

### 6.1.2 Site Employee Scenario

It is assumed that normal activities associated with light industry, small business, and general office work will occur on the Phase I property. These activities could result in worker exposure to contaminants in soil, on dust particles, in air, and in groundwater. This scenario characterizes the potential exposure of a site employee assumed to work on the property eight hours per day, 250 days per year, for 25 years. No exposure to potential interior building contamination is assumed or addressed here. The site employee is assumed to be an adult weighing 70 kg. The site employee is assumed to ingest 50 mg/day of contaminated soil, the amount incidentally ingested while working at the site. All parameters needed to calculate intakes are listed in Table 14 of the Phase I 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 Phase I, 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 both the hypothetical construction worker and the hypothetical site employee. The results for Phase I are summarized below.

### 6.3.1 Hazards and Risks for the Construction Worker

The RRE methodology established for Mound is intentionally conservative and tends to over-estimate hazards and risk. For the construction worker-related scenarios, a conservative assumption of daily exposure to Phase I contamination throughout a five-year period was used.

#### 6.3.1.1 Non-Cancer Hazards

Overall hazards across all pathways, soil + air + current groundwater and soil + air + future groundwater, were summed to provide a cumulative HI. Cumulative HIs were developed for incremental, background, and total exposures. See Tables 4, 5, and 6. USEPA guidance sets a limit of 1.0 for the cumulative HI. The current cumulative incremental HI (1) is at this limit. The future cumulative incremental HI (5.7) exceeds this limit.

The soil + air + future groundwater cumulative incremental HI (5.7) is due primarily to future groundwater (5.5). The future groundwater HI is due to a predicted increase in contaminant concentrations at the BVA from bedrock water that is assumed to eventually mix with BVA groundwater. The BVA groundwater is the potable water supply for the Mound Plant. The actual concentrations in the BVA groundwater are likely to be less than assumed here as the hazards were calculated assuming no dilution and using only the highest concentrations of contaminants detected in the bedrock groundwater. The uncertainties associated with this predictive model are discussed in greater detail in the RRE. Chromium, TCE, thallium, antimony and others contribute to the future groundwater HI. At 3.5, chromium is the largest contributor to the HI because all chromium is assumed to be the more toxic (hexavalent) form of chromium. Without the chromium contribution, the future groundwater HI is 2 which exceeds the limit (1). It should be noted that the elevated levels of chromium and other metals in the bedrock and BVA groundwater are currently under investigation. No contaminant source areas are known to exist in Phase I.

#### 6.3.1.2 Cancer Risks

Risks from carcinogenic, including radiological, contaminants across all pathways were summed to provide a cumulative risk based on incremental (i.e., above background), background, and total exposures. The results from the RRE are also shown in Tables 4, 5, and 6.

Currently, cumulative incremental cancer risk for the Phase I construction worker ($2.2x10^{-5}$) is within the $10^{-4}$ to $10^{-6}$ (1 human in 10,000 to 1 human in 1,000,000 incremental cancer incidence) acceptable risk range established by CERCLA and the National Contingency Plan (NCP). The risk for this scenario is primarily attributable to radionuclides observed in the soil ($1.7x10^{-5}$; uranium-238 long-lived decay, plutonium-238, and thorium-232 long-lived decay chain).

Future cumulative incremental cancer risk for the Phase I construction worker ($4.0x10^{-5}$) is within the $10^{-4}$ to $10^{-6}$ (1 human in 10,000 to 1 human in 1,000,000 incremental cancer incidence) acceptable risk range established by CERCLA and the National Contingency Plan. The risk for this scenario is also primarily attributable to radionuclides predicted in future groundwater ($2.2x10^{-5}$; uranium-238 long-lived decay, tritium, and thorium-232 long lived decay).

### 6.3.2 Hazards and Risks for the Site Employee

The RRE methodology established for Mound is intentionally conservative and tends to overestimate hazards and risk. For the site employee-related scenarios, a conservative assumption of daily exposure to Phase I contamination throughout a 25-year period was used.

#### 6.3.2.1 Non-Cancer Hazards

Overall hazards across all pathways for soil + air + current groundwater, and for soil+ air + future groundwater, were summed to provide a cumulative HI. Cumulative HIs were developed for incremental, background, and total exposures. See Tables 4, 5, and 6. Background exposure and hazards are minimal.

For current exposure conditions, the cumulative incremental HI (0.55) is within the acceptable limit. The future cumulative incremental HI (4.6) exceeds the acceptable limit (1).

As discussed previously, the primary difference between the calculated current and future groundwater cumulative incremental HI (0.55 and 4.6, respectively) is due to the potential presence of hexavalent chromium in modeled future groundwater. Thallium, antimony and other contaminants also contribute to the future cumulative incremental HI for groundwater. Without the contribution from hexavalent chromium, the future cumulative incremental HI for groundwater is 1.5 which exceeds the limit (1).

#### 6.3.2.2 Cancer Risks

The current incremental cancer risk for the Phase I site employee scenario ($4.3x10^{-5}$) is within the $10^{-4}$ to $10^{-6}$ (1 in 10,000 to 1 in 1,000,000 incremental cancer incidence) acceptable risk range established by CERCLA and the NCP. The future incremental cancer risk for the Phase I site employee ($1.1x10^{-4}$) is at the limit of the acceptable risk range. Risks from carcinogenic contaminants across all pathways were summed to provide a cumulative risk based on incremental exposures (above background), background, and total exposures. See Tables 4, 5, and 6.

For incremental cancer risk, the soil and groundwater pathways make the following contributions to the incremental risk ($1.6x10^{-5}$ from soil, and $2.6x10^{-5}$ from current groundwater, and $9.3x10^{-5}$ from future groundwater). Much of the risk for this scenario is attributable to uranium-238 long-lived decay in the soil; thorium-232 and uranium-238 long-lived decay chains in current groundwater; and uranium-238 long-lived decay chain and tritium in the modeled future groundwater.

## 6.4 Conclusions

Overall total, background, and incremental carcinogenic and non-carcinogenic risks are presented in Tables 4 through 6. The risk values in the tables are broken out by media (i.e., groundwater, air, and soil) and are the sum of risks for all pathways for the construction worker and site employee scenarios.

For the Construction Worker scenario, the current ($2.2x10^{-5}$) and future ($4.0x10^{-5}$) cumulative incremental risks are acceptable. The current HI (1) is at the acceptable limit (1). The future incremental HI (5.7) is above the acceptable limit (1). For the Site Employee scenario, the current ($4.3x10^{-5}$) cumulative incremental risk is acceptable. Future incremental cancer risk for the Phase I site employee ($1.1x10^{-4}$) is at the limit of the acceptable risk range. The current cumulative HI (0.55) is acceptable. The future cumulative HI (4.6) is above the acceptable limit.

Where overall risk exceeds acceptable levels, these risks are driven by exposure to groundwater. These exceedances result from the conservative nature of the groundwater analysis. The groundwater model does not take into account natural physical and chemical processes such as dilution, dispersion, adsorption, and soil properties that may reduce contaminant levels by the time they reach the BVA. As a result, the future groundwater exposure point concentration is biased high and conservative. Given the conservative nature of the RRE and the associated uncertainties, the risks presented in Tables 4, 5, and 6 represent the upper-bound plausible limit of risks (worst case scenario). Based on the protective measures presented in the Proposed Plan for Phase I and the conservative nature of the RRE, the future groundwater risks presented will be managed to be protective of human and environmental health.

Because the scope of the RRE was limited to industrial/commercial use, the soils within Phase I have not been evaluated for unrestricted release (e.g. residential use). Disposition of Phase I soils without proper handling, sampling, and management could create an unacceptable risk to human health and the environment.

Collectively, the soil data and groundwater data from the wells in the vicinity of well 0411 suggest that the TCE contamination is most likely limited to the area adjacent to well 0411. TCE is a contaminant of concern (COC) at Mound and should be addressed by the proposed remedies.

Collectively, the soil data and groundwater data in the vicinity of well 0445 suggest that the elevated barium concentrations are most likely limited to the area immediately adjacent to well 0445. Other properties (high levels of total dissolved solids, very low tritium level) of the groundwater observed at well 0445 are unlike the values typically observed in the bedrock groundwater at Mound. Barium in the Phase I property is considered a constituent

of interest. To provide assurance that the understanding of the barium in groundwater situation is correct, DOE will continue to monitor for barium. The specifics of the monitoring will be established in the Phase I Groundwater Monitoring Plan that will require approval by USEPA and OEPA. This will become part of the Operation & Maintenance (O&M) Plan required by the ROD. With four consecutive quarters of consistent barium results, DOE could petition USEPA and OEPA to decrease the sampling frequency.

Limited Field Investigations (Reference 20 and 21) indicate the nickel and chromium concentrations observed at wells 0400, 0319, 0399, and 0411 are the likely result of corrosion of the wellcasing. Therefore, nickel and chromium are not considered contaminants of concern to be addressed in the proposed remedies. However, because the data set supporting this conclusion is limited, DOE will continue to monitor for nickel and chromium. The specifics of the monitoring will be established in the Phase I Groundwater Monitoring Plan that will require approval by USEPA and OEPA. With four consecutive quarters of consistent nickel and chromium results, DOE could, with the concurrence of USEPA and OEPA, discontinue monitoring groundwater in Phase I for nickel and chromium.

### 6.5 Ecological Risk

Based on the site visit that is part of the OEPA procedure; the fact that no threatened or endangered species were observed within Phase I; the fact that no sensitive environments or ecologically important resources were identified within Phase I; the future reuse of Phase I as a research and industrial park; the information developed during the Final Environmental Impact Statement (Reference 22), OU 9 Ecological Characterization Report (Reference 23), Parcel 4 Ecological Assessment (Reference 24), Environmental Assessment for the Commercialization of the Mound Plant (Reference 25), and the several characterization investigations and removal actions performed in the Phase I area; a more detailed assessment of the ecological risk is not warranted. (Reference 26)

## 7.0 DESCRIPTIONS OF ALTERNATIVES

In light of the planned exit of DOE from the site, and the residual levels of contaminants in the soil and groundwater in Phase I, a remedy must be implemented to protect human heath and the environment into the future. Two alternatives were considered for Phase I:

**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 Phase I to prevent exposure to soil and groundwater contamination.

**Alternative 2: Institutional Controls and Monitored Natural Attenuation**
Institutional controls in the form of deed restrictions on future land use would be placed on Phase I. The objective of these institutional controls is to prevent an unacceptable risk to human health and the environment by restricting the use of Phase I, including Phase I soils, to that which is consistent with assumptions in the Phase I RRE. DOE or its successors would retain the right and responsibility to monitor, maintain, and enforce these institutional controls. In order to maintain protection of human health and the environment

at Phase I in the future, the institutional controls (in the form of deed restrictions) would be adopted.

The deed restrictions include:

- maintenance of industrial/commercial land use;
- prohibition against residential use;
- prohibition against the use of groundwater;
- site access for federal and state agencies for the purpose of sampling and monitoring; and
- prohibition against removal of Phase I soils from the DOE Mound property (as owned in 1998) boundary without approval from the Ohio Department of Health and the Ohio Environmental Protection Agency.

In addition, DOE will continue to monitor groundwater in the vicinity of Phase I for TCE to verify that the concentration of TCE is decreasing due to natural attenuation.

According to the guidance *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites, April 1999, EPA/540/R-99/009,* there are generally ten factors that should be considered to evaluate the appropriateness of a Monitored Natural Attenuation remedy. The factors, along with a brief explanation of how they relate to Phase I, are presented below:

1. *Whether the contaminants present in soil or groundwater can be effectively remediated by natural attenuation processes*

   The concentration of TCE in the groundwater is expected to decrease to a concentration less than the MCL through a naturally-occurring biodegradation process called reductive dehalogenation. In this process, chlorinated solvent compounds (such as TCE) gradually break down by having a halogen, in this case chlorine atoms, replaced with a hydrogen atom. This progression results in a successively lower number of halogens (chlorine atoms) attached to the compound structure, shown by:

   Trichloroethene (TCE)→ Dichloroethene (DCE) →Vinyl Chloride→ Ethene + $Cl^-$

   The assumption that this process is already taking place in the area is supported by the fact that dichloroethene (DCE) has been detected consistently along with the TCE in Well 0411.

2. *Whether or not the contaminant plume is stable and the potential for the environmental conditions that influence plume stability to change over time*

   The wells in the Phase I area have been sampled over a period of several years. Sample results have consistently shown that the TCE contamination is not present as a plume, but is limited to a small area near the location of Well 0411.

3. *Whether human health; drinking water supplies, other groundwaters, surface*

*waters, ecosystems, sediments, air, or other environmental resources could be adversely impacted as a consequence of selecting MNA as the remediation option*

There is no indication that the BVA or other environmental resources in the area of Phase I will be adversely affected by selecting MNA as the remediation option for TCE in Phase I.

4. *Current and projected demand for the affected resource over the time period that the remedy will remain in effect*

The bedrock aquifer, where the TCE has been detected above MCLs, is not currently used as a groundwater resource for the Mound Plant, nor is it anticipated to be used in the future. In fact, the Phase I area will be tied into the City of Miamisburg municipal water supply in the near future, further decreasing the likelihood that the bedrock aquifer would be used as a potable water source. Finally, the selected remedy calls for a restriction to be placed on the deed for Phase I that will prohibit the installation of wells in the Phase I area in the future.

5. *Whether the contamination, either by itself or as an accumulation with other nearby sources (on-site or off-site), will exert a long-term detrimental impact on available water supplies or other environmental resources*

The BVA is designated as a sole source aquifer and serves as the primary potable water supply for the City of Miamisburg. Based upon years of groundwater data collected downgradient of Well 0411, there is no indication that the BVA is threatened by the TCE contamination in the Well 0411 area. These downgradient locations will be monitored as part of the selected remedy to verify that the BVA remains unaffected.

6. *Whether the estimated timeframe of remediation is reasonable compared to timeframes required for other more active methods of remediation*

The fact that the concentrations are just slightly above the MCL of 5 ppb for TCE (15 ppb in Well 0411 and 9 ppb in Well 0443) would suggest that the timeframe for remediation should be fairly short. These relatively low concentrations, along with the fact that the bedrock aquifer exhibits relatively low yield rates, make remediation of the bedrock by more active methods an impractical option at this time. If concentrations were to increase, more active treatment methods may be evaluated.

7. *The nature and distribution of sources of contamination and whether these sources have been, or can be, adequately controlled*

There are no known sources of TCE contamination in soil in the Phase I area.

8. *Whether the resulting transformation products present a greater risk, due to*

*increased toxicity and/or mobility, than do the parent contaminants*

Although vinyl chloride, a breakdown product of TCE, generally presents a higher risk to human receptors than TCE and is more persistent in groundwater, it is not anticipated that the original concentration of TCE (15 ppb) will support the production of high enough concentrations of vinyl chloride in the bedrock aquifer in Phase I to pose an unacceptable risk. In any event, there is no current exposure pathway to Phase I groundwater, and the selected remedy prohibits the installation of wells in the Phase I area.

9. *The impact of existing and proposed active remediation measures upon the MNA component of the remedy, or the impact of remediation measures or other operations/activities (e.g. pumping wells) in close proximity to the site*

   There are no operations or activities in close proximity to Wells 0411 and 0443 that would impact the MNA component of the selected remedy

10. *Whether reliable site-specific mechanisms for implementing institutional controls (e.g. zoning ordinances) are available, and if an institution responsible for their monitoring and enforcement can be identified*

    Institutional Controls will be implemented as part of the selected remedy for the Phase I property. The use of the bedrock groundwater will be prohibited as part of the selected remedy, and DOE, or its successors, have the responsibility to monitor, maintain and enforce these institutional controls in the future.

Based on these factors, it has been determined that Monitored Natural Attenuation is an appropriate remedy for the TCE in the groundwater in Phase I. The specifics of the monitoring will be established in a Phase I Groundwater Monitoring Plan that will require approval by USEPA and OEPA. This will become part of the O&M Plan required by the ROD. Key elements of the monitoring are outlined here.

TCE MONITORING

Objective
Protect the BVA by verifying that the concentrations of TCE in the vicinity of wells 0411, 0443 and seep 0617 are decreasing and that TCE is not impacting the BVA. Demonstrate the TCE in the groundwater of wells 0411, 0443 and seep 0617 does not exceed the MCL.

Locations
Bedrock monitoring wells 0411and 0443 will be monitored to provide spatial coverage of flow paths in the immediate vicinity of the well 0411. Bedrock monitoring wells 0444, 0445, 0353, and seep 0617 will be monitored to provide spatial coverage of flow paths downgradient of the well 0411 area. BVA wells 0402, P033, and 0400 will be monitored to assess potential impacts of the bedrock flow system on the BVA flow system.

Frequency
All groundwater wells noted above will be analyzed quarterly for TCE and its degradation products (1,2-dichloroethene, 1,2-cis-dichloroethene, 1,2-trans-dichloroethene, and vinyl chloride) for at least one year. At that point, the frequency may be adjusted.

Termination
When the TCE concentrations observed at wells 0411, 0443 and seep 0617 meet the MCL for four consecutive sampling events, the TCE monitoring may be decreased or discontinued upon concurrence with USEPA and OEPA.

Contingencies
If quarterly monitoring results for wells 0444, 0445, 0353 exceed the MCL (5 ppb) or if the quarterly monitoring result for Seep 0617 exceeds twice the initial baseline concentration of 8 ppb, DOE will notify USEPA and OEPA. Collectively, they will re-evaluate the situation and determine a course of action which could include the following; increase the frequency of sampling to monthly, evaluate VOC levels in BVA wells, and/or increase frequency of their sampling to monthly.

If the quarterly monitoring result for well 0411 exceeds twice the initial baseline concentration of 15 ppb, or if the quarterly monitoring result for well 0443 exceeds twice the initial baseline concentration of 9 ppb, DOE will notify USEPA and OEPA. Collectively, they will re-evaluate the situation and determine a course of action which could include the following; immediately resample monitoring well, evaluate VOC levels in downgradient flow path wells and BVA wells, and increase frequency of sampling to monthly.

If quarterly monitoring results for wells 0400, 0402 and P033 equal or exceed the MCL (5 ppb), DOE will notify USEPA and OEPA. Collectively, they will re-evaluate the situation and determine a course of action which could include the following; increase frequency of sampling to monthly, and evaluate upgradient well data to determine if a change has occurred in the bedrock system

If the monitoring results for the above wells show increases for four consecutive sampling events, DOE will notify USEPA and OEPA. Collectively they will re-evaluate the situation and determine a course of action.

## 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 does not meet this criterion in that

the level of risk to human health posed by the site was found to be unacceptable for an industrial/commercial scenario primarily due to potential groundwater exposure. In addition, no evaluation was made of the risks posed by unrestricted use of the property. Alternative 2, Institutional Controls and Monitored Natural Attenuation, does meet Criteria 1. Deed restrictions are required as a mechanism to ensure the continued future use of Phase I is limited to industrial/commercial purposes, to prohibit soil removed offsite, and to prohibit groundwater usage. The groundwater monitoring specified for TCE provides the mechanism to demonstrate that the TCE remains localized, does not affect drinking water, and therefore does not impact human health.

### 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. For Phase I, maximum contaminant levels or "MCLs" established under the Safe Drinking Water Act constitute chemical-specific ARARs and are listed in Appendix C. They apply to the groundwater beneath Phase I. MCL exceedances for TCE have been observed in groundwater within the Phase I boundary. In the last two years (September 2000 to present), the TCE concentrations at well 0411 have ranged from 8 to 16 ppb. The most recent result (Summer 2002) was 14 ppb. Recent investigations concluded that the TCE contamination is localized and does "not present an unacceptable risk unless it migrates to the BVA in concentrations that would cause levels to rise above the drinking water MCL of 5 parts per billion (ppb)." (References 21) The potential for migration appears minimal but will continue to be assessed by monitoring. Although there are currently exceedances of the MCL for TCE in groundwater at Phase I, there are no known remaining sources of contamination in soil and these concentrations should eventually fall and remain below the

MCL for this contaminant. Only Alternative 2 includes the groundwater monitoring necessary to demonstrate that groundwater ARARs will be met in the future at Phase I.

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. For Phase I, Ohio has identified two statutory provisions that describe site conditions that would prompt certain response actions. (See Appendix C.) These provisions are similar to location-specific ARARs. Alternative 2 meets both of these requirements.

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. For Alternative 2, the remedy is an institutional control - deed restrictions. The ARARs are applicable State requirements concerning the recording of deeds. (See Appendix C.) Alternative 2 meets these requirements.

It should be noted that any onsite management of Phase I soils, not associated with a CERCLA removal action, in a manner inconsistent with State law or any disposition of Phase I soils away from the DOE Mound property (as owned in 1998) would be subject to applicable Ohio regulations, which are enforceable independent of CERCLA.

## 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. Only Alternative 2, Institutional Controls and Monitored Natural Attenuation, provides the means to demonstrate long-term protectiveness. The implementation of institutional controls in the form of land use restrictions is necessary to ensure that future use remains compatible with the evaluated residual risk associated with Phase I Monitored Natural Attenuation is necessary to demonstrate that the TCE remains localized, its concentration does not increase, and the BVA is not impacted.

This remedy will result in hazardous substances remaining in Phase I above levels that allow for unlimited use and unrestricted exposure. An annual review and report will be submitted to OEPA, Ohio Department of Health (ODH), and USEPA (pursuant to CERCLA) determining whether or not the remedy is in effect and being complied with to ensure that it is adequately protective of human health and the environment. DOE reserves the right to petition the USEPA, OEPA, and ODH for a modification to the frequency established for conducting the effectiveness reviews.

### 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.

Since neither of the alternatives includes treatment, this criterion does not require further evaluation. All necessary remediation in Phase I was accomplished previously on an individual PRS or building basis.

### 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.

Alternative 1, No Action, would not provide short-term effectiveness because there is no assurance of protection of human health and the environment after the property is transferred. Alternative 2, Institutional Controls and Monitored Natural Attenuation, provides this assurance.

### 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. Since Alternative 1 involves no action, there is no time or cost required for implementation. The Institutional Controls portion of Alternative 2 is expected to require approximately one month and minimal cost to implement in accordance with the memorandum to file from Randolph Tormey, Deputy Chief Counsel, Ohio Field Office, US DOE dated February 17, 1999 (Reference 27). The Groundwater Monitoring portion of Alternative 2 is readily implementable. All of the wells identified in this Proposed Plan are already installed and have been sampled. The services required to collect groundwater samples, analyze, and report TCE results are readily available.

### 8.2.5 CRITERIA 7: Cost

The range of costs is zero dollars ($0) for Alternative 1, No Action, to approximately $55,000 annually for Alternative 2, Institutional Controls and Monitored Natural Atenuation.

## 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

Both USEPA and the State do not believe that Alternative 1, No Action, provides adequate protection of human health and the environment in the future. However, both agencies support Alternative 2, Institutional Controls and Monitored Natural Attenuation.

### 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 2, Institutional Controls and Monitored Natural Attenuation. Institutional Controls in the form of deed restrictions on future land use will be imposed. DOE or its successors would retain the right and responsibility to monitor, maintain, and enforce these institutional controls. The objective of these restrictions is:

- maintenance of industrial/commercial land use;
- prohibition against residential use;
- prohibition against the use of groundwater;
- site access for federal and state agencies for the purpose of sampling and monitoring; and
- prohibition against removal of Phase I soils from the DOE Mound property (as owned in 1998) boundary without approval from the Ohio Department of Health and the Ohio Environmental Protection Agency.

In addition, DOE will continue to monitor groundwater in the vicinity of Phase I for TCE to verify that the concentration of TCE is decreasing due to natural attenuation. The specifics of the monitoring will be established in a Phase I Groundwater Monitoring Plan that will require approval by USEPA and OEPA. This will become part of the O&M Plan required by the ROD. Key elements of the monitoring were outlined in Section 7. Groundwater monitoring provides assurance that the concentration of TCE observed in Phase I is decreasing and not impacting the BVA.

The soils within Phase I have not been evaluated for any use other than onsite industrial/commercial use. Any offsite disposition of Phase I soil without proper handling, sampling, and management could create an unacceptable risk to offsite receptors.

The initial costs associated with these deed restrictions are those associated with the writing and recording of the restrictions with the deed. DOE will ensure the deed restrictions are implemented prior or upon property transfer. The costs associated with monitoring and enforcing the land use and property deed restrictions are estimated to be $5,000 per year. The costs associated with groundwater monitoring are estimated to be $50,000 per year.

## 10.0 OPPORTUNITIES FOR COMMUNITY PARTICIPATION

This Proposed Plan will be available for public review and comment from March 26, 2003 through April 24, 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 (937) 865-3116 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 OEPA, respectively. Mr. Seely can be reached at (312) 886-7058; Mr. Nickel can be reached at (937) 285-6468.

## 11.0 REFERENCES


Reference 1 Work Plan for Environmental Restoration at the Mound Plant, The Mound 2000 Approach, Final, February 1999

Reference 2 The Mound 2000 Residual Risk Evaluation Methodology (RREM), Mound Plant, Final, Revision 0, January 1997

Reference 3 Remedial Investigation/Feasibility Study, Operable Unit 9, Site-Wide Work Plan, Final, May 1992

Reference 4 Operable Unit 9; Hydrogeologic Investigation: Buried Valley Aquifer Report, Technical Memorandum, Revision 1, September 1994

Reference 5 Operable Unit 9; Hydrogeologic Investigation: Bedrock Report, Technical Memorandum, Revision 0, January 1994

Reference 6 Delineation of Federal Wetlands and Other Waters of the U.S., Final, August 1999

Reference 7 Operable Unit 9 Background Soils Investigation Soil Chemistry Report, Technical Memorandum, Revision 2, September 1994

Reference 8 Operable Unit 9 Regional Soils Investigation Report, Revision 2, August 1995

Reference 9 Operable Unit 9 Hydrogeologic Investigation: Groundwater Sweeps Report, Technical Memorandum, April 1995

Reference 10 OU-3 Miscellaneous Sites Limited Field Investigation Report, Volumes 1, 2, and 3, Final, Revision 0, July 1993

Reference 11 OU-5 New Property Extended Phase I Field Investigation Report, Final, Revision 0, July 1995

Reference 12 OU-5 Remedial Investigation Report, Final, Revision 0, February 1996

Reference 13 OU-5 Operational Area Phase I Investigation Area 22, Final, Revision 1, June 1995

Reference 14 OU-5 Operational Area Phase I Investigation Area 13, Final, Revision 1, June 1995

Reference 15 OU-6 Reconnaissance Sampling Report Decontamination and Decommissioning Areas, Final, Revision 0, May 1992

Reference 16 OU-9 Site Scoping Report, Volume 3 - Radiological Site Survey, Final, June 1993

Reference 17 Residual Risk Evaluation, Release Block D, Final, December 1996

Reference 18 Phase I Residual Risk Evaluation, Final, March 2003

Reference 19 Risk-Based Guideline Values, Mound Plant, Miamisburg, Ohio, Final, Rev. 4, March 1997 (revised for April 2001 slope factors)

Reference 20 Sampling Investigation to Determine the Nature of Elevated Chromium and Nickel Levels in Two Stainless Steel Monitoring Wells at Mound, Final, August 2002

Reference 21 Summary of the Investigation and Resolution of MCL Exceedences in the Phase I Parcel, Draft, June 2002

Reference 22 Final Environmental Impact Statement, Mound Facility, US Department of Energy, June

Reference 23 Operable Unit 9, Ecological Characterization Report, Technical Memorandum, Rev 0, March 1994

Reference 24 Screening Level Ecological Risk Assessment, Parcel 4, Final, February 2001

Reference 25 Environmental Assessment for the Commercialization of the Mound Plant, DOE/EA-1001, October

Reference 26 Phase I Ecological Scoping Report, Final, March 2003

Reference 27 Memorandum, Randolph Tormey, Deputy Chief Counsel, Ohio Field Office, US DOE dated February 17, 1999 regarding Institutional Controls, Mound Facility, Miamisburg, Ohio

**Associated PRS Documents**

The following references, though relevant to evaluating Phase I, are not directly referred to in the text.

PRS 16 Package, Final, November 1996.

PRS 73 Package, Final, June 2002.

PRS 74 Package, Final, May 1997.

PRS 258-265 Package, Final, August 2002.

PRS 370 Package, Final, February 1997

PRS 371 Package, Final, May 1997.

PRS 372 Package, Final, November 1996.

PRS 383 Package, Final, September 1997.

PRS 384 Package, Final, January 1997.

PRS 306/314/406 Package, Final, November 1996.

PRS 418 Package, Final, February 2002.

PRS 419 Package, Final, April 2000.

Action Memorandum, Engineering Evaluation/Cost Analysis, Contingent Removal Action for Contaminated Soil, Final, June 2002.

PRS 304 Action Memorandum, Final, October 1998.

PRS 276 Removal Action On-Scene Coordinator (OSC) Report, Final, Spetember 2002.

PRS 304 Removal Action On-Scene Coordinator (OSC) Report, Final, December 1998.

On-Scene Coordinator (OSC) Report for Building 21 (PRS 284) & Associated Soils (PRS 407 and PRS 281) Decontamination and Decommissioning (D&D) Project, Final, Revision 0, January 2000.

PRS 421 Removal Action On-Scene Coordinator (OSC) Report, Final, September 2002.

**Associated Building Documents**

The following references, though relevant to evaluating Phase I, are not directly referred to in the text.

Building 3 Building Data Package, Final, June 2002.

Building 87 Building Data Package, Final, November 1997.

Magazines 80-84 Building Data Package, Final, June 2002.

Building 95 Building Data Package, Final, October 2002.

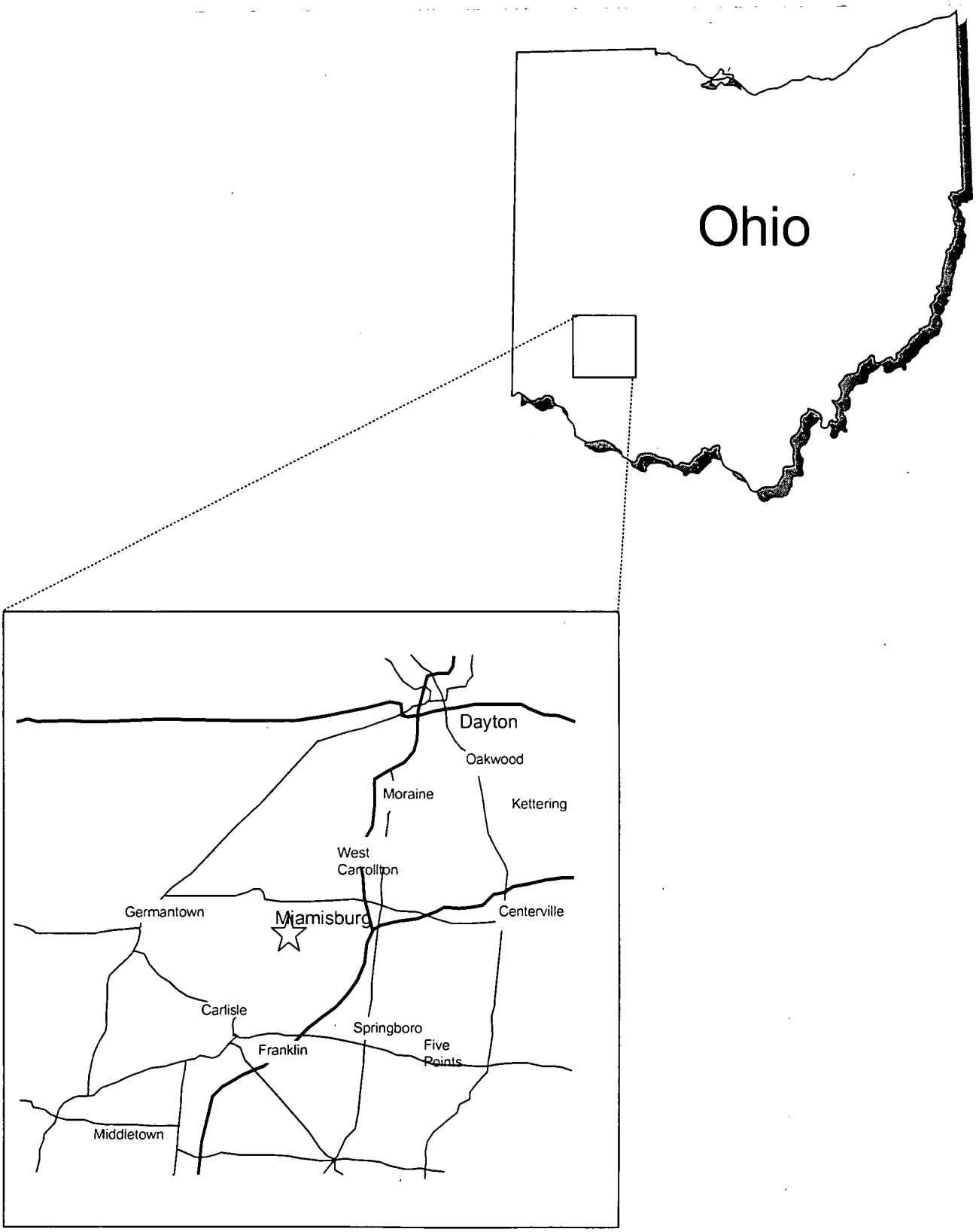
Building 102 Building Data Package, Final, August 2002.

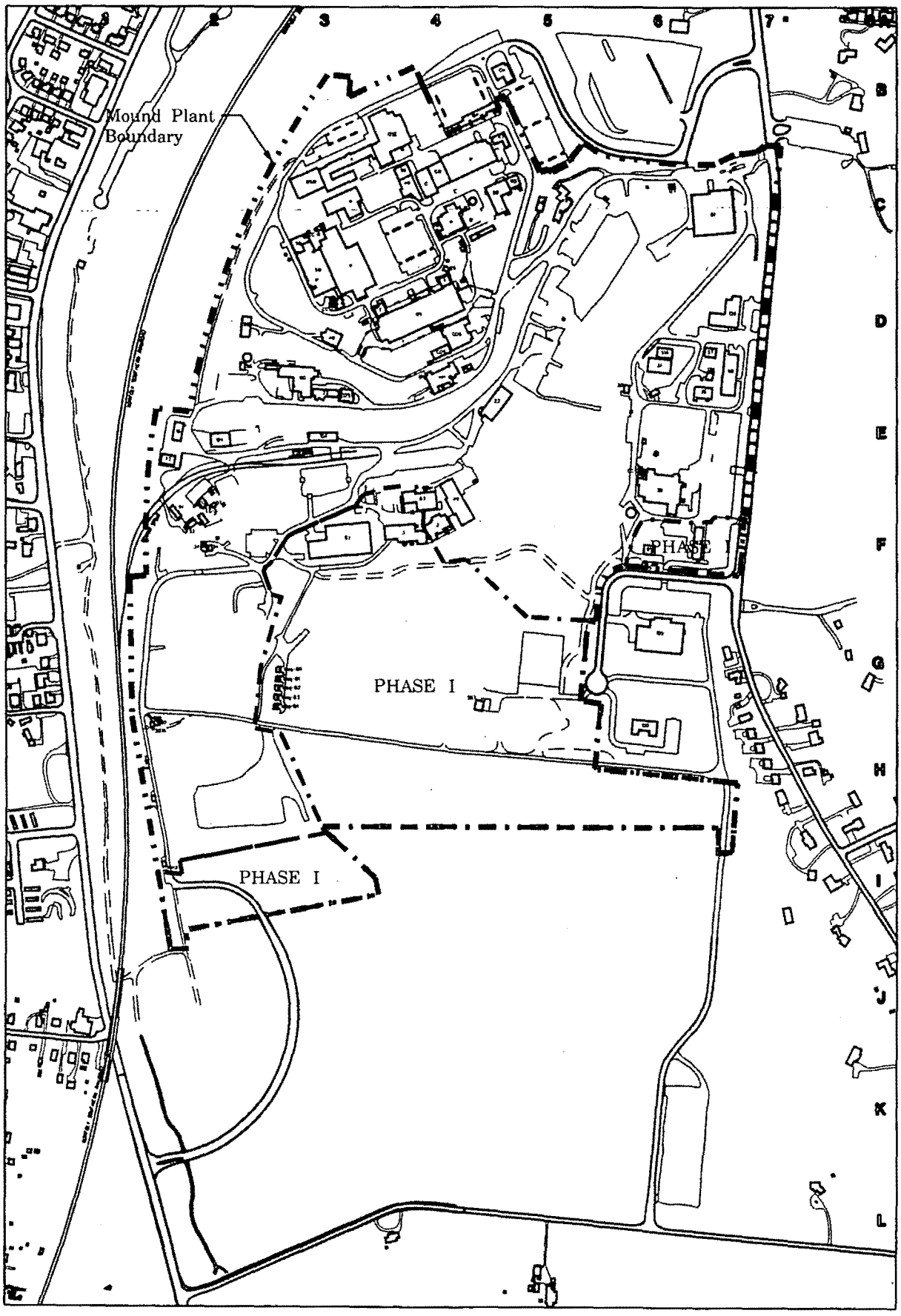
SST Building Data Package, Final, August 2002.

# APPENDIX A

## Figures

# Figure 1: Regional Context of the Mound Plant






Legend

- Structures
- Paved roadway
- Unpaved roadway
- Railroad
- Water course
- Fence
- Mound Plant boundary
- Contour line

0 100 200 400 600 800 1000
Scale In Feet

| SSS | DATE | REVISION | BY | CHKR | ENG | M |
|---|---|---|---|---|---|---|
| | 03/04/03 | ISSUE FOR GENERAL USE | SSP | | | |

MOUND
Environmental Restoration Geographic Information System

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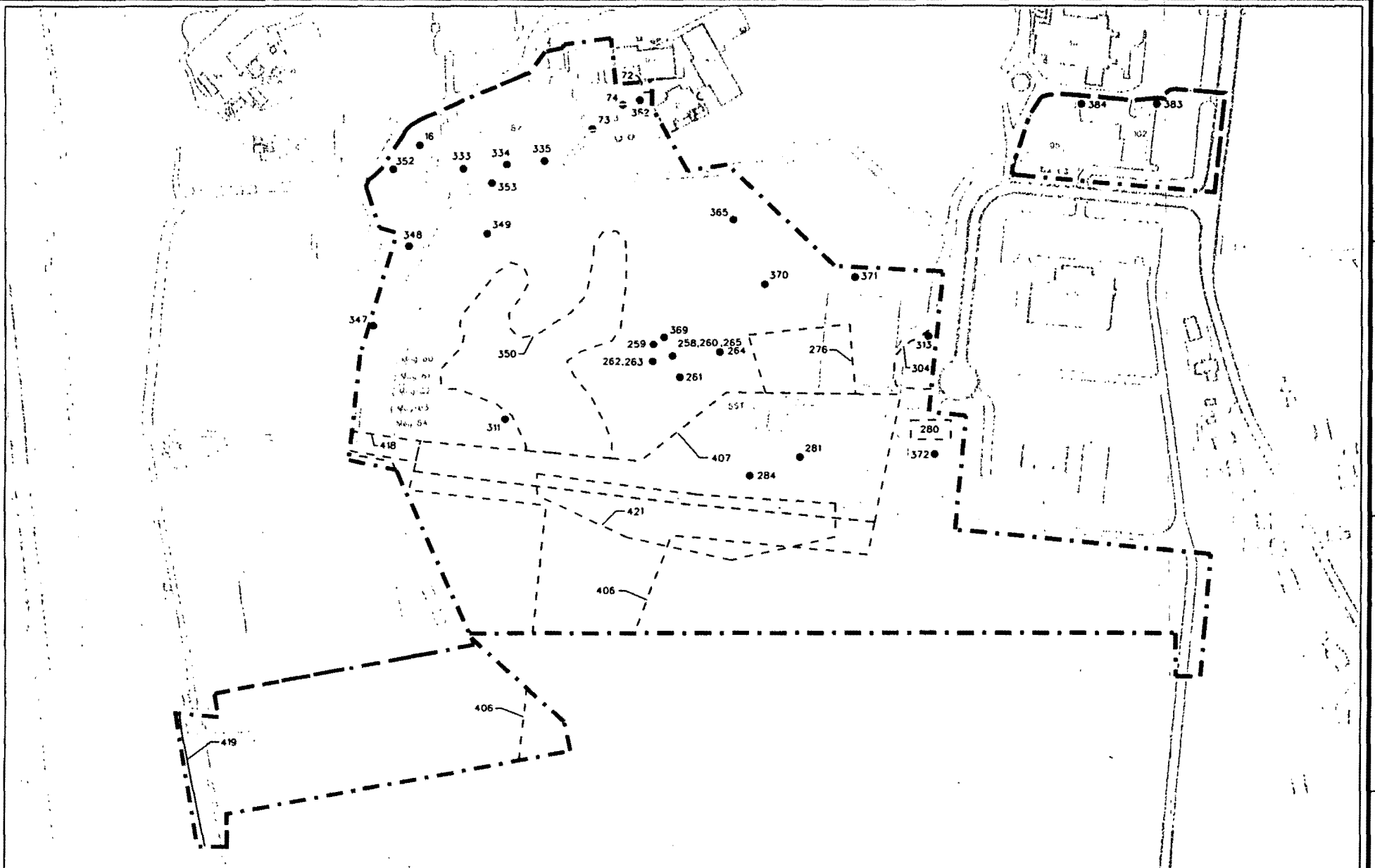
ISSUE
SHEET 1 2 3 4 5 6
ISSUE A
PART CLASSIFICATION

TITLE CLASSIFICATION

Figure 2
Location of Phase I

DRAWING CLASSIFICATION: UNCLASSIFIED
SIZE: D
DRAWING NUMBER: gen_site_plan.dgn
JOB NUMBER
DWG TYPE: SITE
PROJ
SCALE: Graphic
SHEET 1 OF
STATUS: MD-REL-09/14/99
ORIGIN: MSTATION / /

gen_site_plan.dgn




MOUND

Environmental Restoration Geographic Information System

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| SHEET | 1 | 2 | 3 | 4 | 5 | 6 |
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PART CLASSIFICATION

# Figure 3: Phase I Buildings and PRSs

DRAWING CLASSIFICATION: UNCLASSIFIED

SIZE | DRAWING NUMBER: figure3.dgn | JOB NUMBER

DGN TYPE: STE | PANG: ER-GIS | CAGEC | SCALE | SHEET 1 OF

STATUS: MD-REL-05/08/02 | ORIGIN: MSTATION / J

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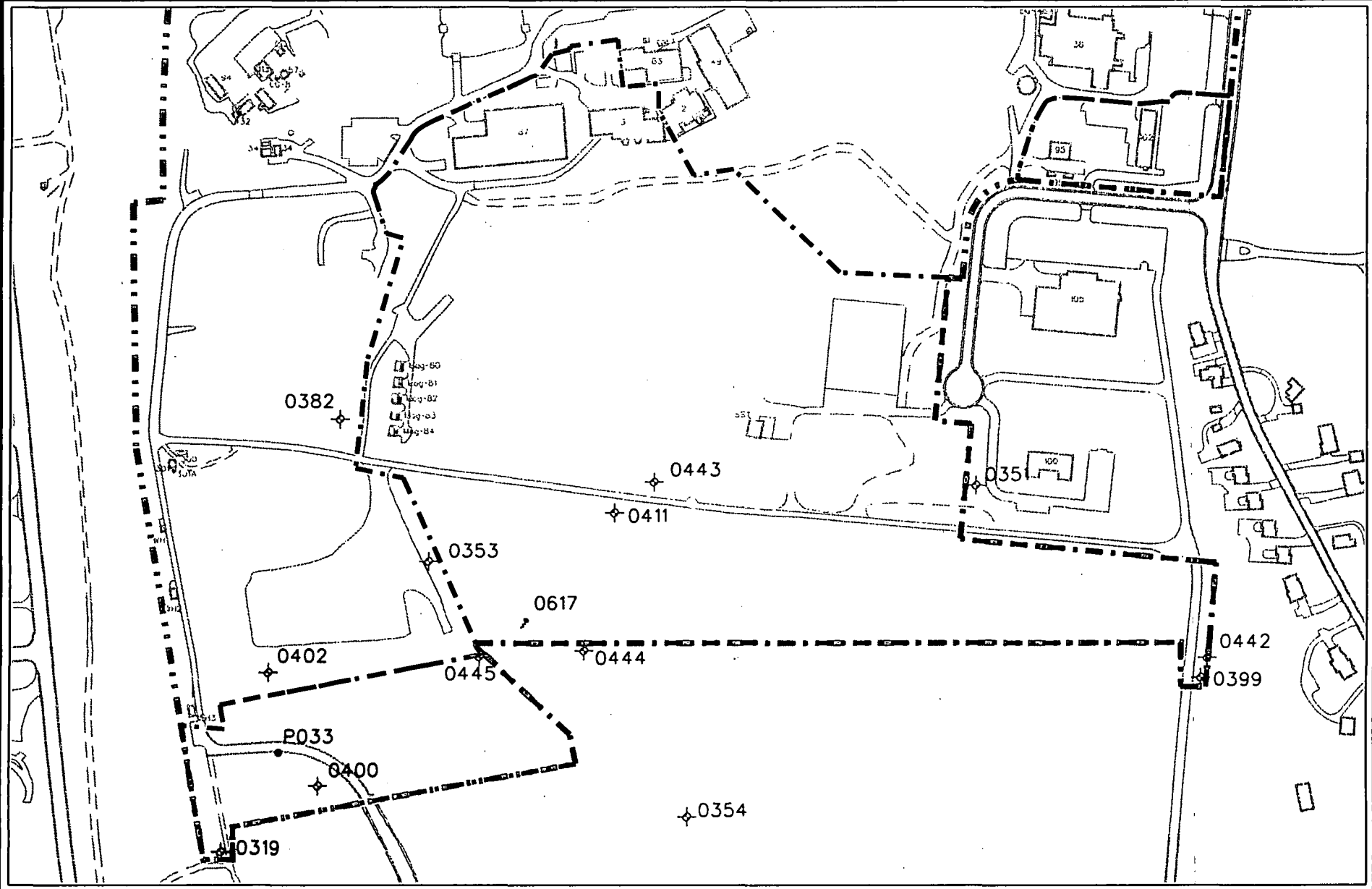


Bedrock Monitoring Well
BVA Monitoring Well
Phase 1 Boundary
Seep

0 100 200 400 600 800 1000
Scale in Feet

MOUND
Environmental Restoration Geographic Information System

Figure 4:
Selected Phase I
Wells and Seeps

| ISS | DATE | REVISION | BY | CHKR | ENG | LPMEC | APVD | # |
|---|---|---|---|---|---|---|---|---|
| | 03/04/03 | | SSF | | | | | |

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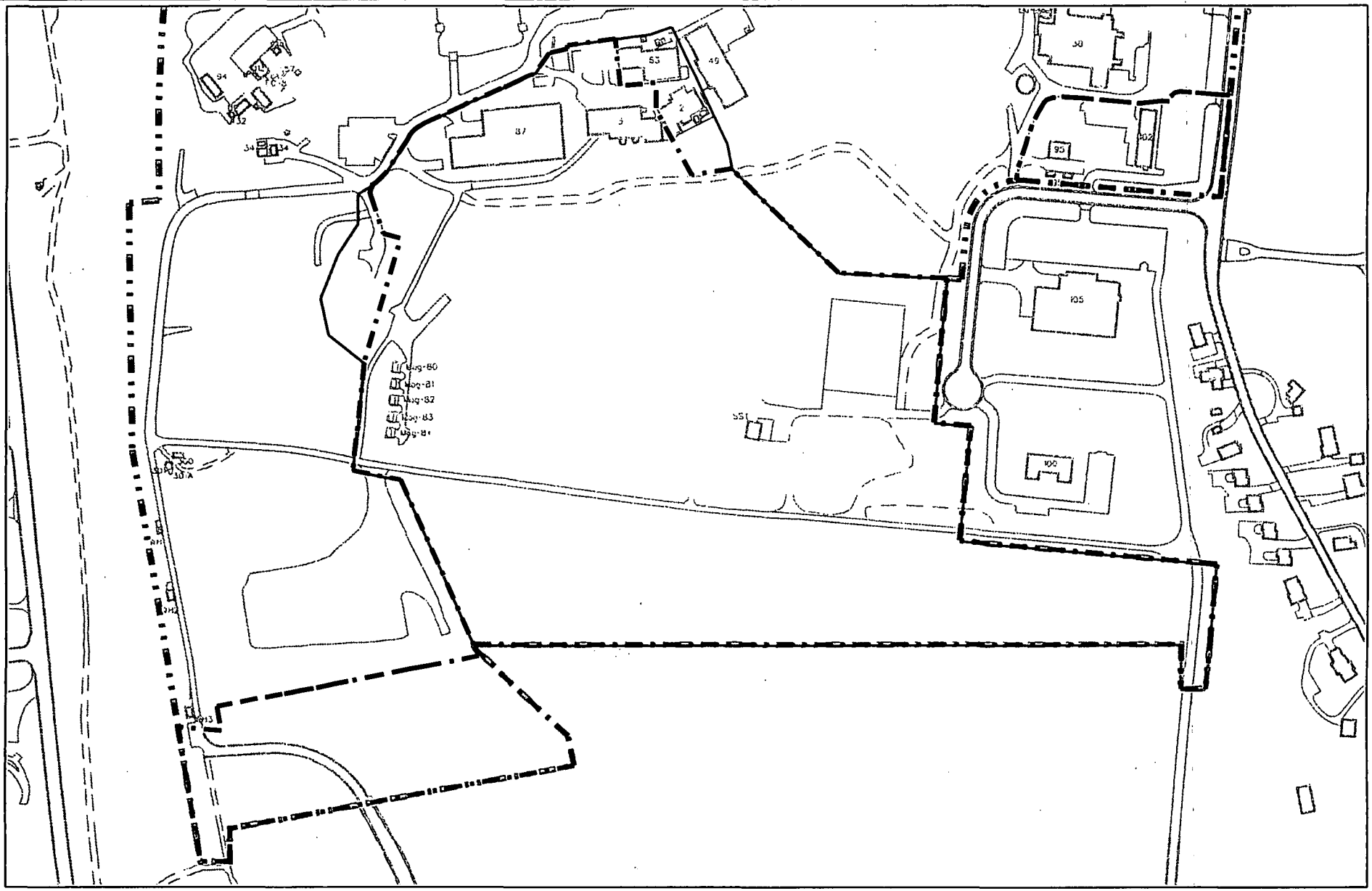
87
105
106
95
50
Aug-80
Aug-81
Aug-82
Aug-83
Old Phase 1 Boundary
New Phase 1 Boundary
0 100 200 400 600 800 1000
Scale in Feet
MOUND
Environmental Restoration Geographic Information System
Figure 5: Phase I Boundary Changes
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# APPENDIX B

## Tables

# Table 1: Phase I PRSs and Core Team Conclusions

| PRS | Description | Core Team Decision | Closeout of PRS |
|---|---|---|---|
| 16 | Area C (Old Building 72) | NFA | Recommendation signed 8 May 1996 |
| 73 | Evaporator Storage Area | NFA | Recommendation signed 17 January 2002 |
| 74 | Quonset Hut: former waste storage site | NFA | Recommendation signed 19 February 1997 |
| 258-265 | Burn Area | NFA | Recommendation signed 20 June 2001 |
| 276 | Area 22: Orphan Soil from Other Areas | RA | OSC Report signed 19 September 2002 |
| 280 | Waste Oil Drum Field | NFA | Recommendation signed 28 February 2002 |
| 281 | Area E, Waste Oil Spill | NFA | Recommendation signed 12 July 2000 |
| 284 | Building 21 Thorium Sludge Storage Facility | NFA | Recommendation signed 17 February 2001 |
| 304 | Excavated Material Disposal Area was | NFA | Recommendation signed 19 February 1997 |
| 311 | Potential Hot Spot Location S0706 | NFA | Recommendation signed 4 March 1996 |
| 313 | Potential Hot Spot Location S0982 | NFA | Recommendation signed 19 February 1997 |
| 333 | Explosive Surge Tank (Tank 263) | NFA | Recommendation signed 19 March 1997 |
| 334 | Explosive Surge Tank (Tank 264) | NFA | Recommendation signed 19 March 1997 |
| 335 | Explosive Surge Tank (Tank 265) | NFA | Recommendation signed 19 March 1997 |
| 347 | Soil Contamination | NFA | Recommendation signed 20 November 1996 |
| 348 | Soil Contamination | NFA | Recommendation signed 20 November 1996 |
| 349 | Soil Contamination | NFA | Recommendation signed 19 February 1996 |

# Table 1: Phase I PRSs and Core Team Conclusions
(continued)

| PRS | Description | Core Team Decision | Closeout of PRS |
|---|---|---|---|
| 350 | Soil Contamination, Area West of Building 21 | NFA | Recommendation signed 4 March 1996 |
| 352 | Soil Contamination | NFA | Recommendation signed 20 November 1996 |
| 353 | Soil Contamination | NFA | Recommendation signed 20 November 1996 |
| 362 | Soil Contamination | NFA | Recommendation signed 20 November 1996 |
| 365 | Soil Contamination | NFA | Recommendation signed 17 December 1996 |
| 369 | Soil Contamination | NFA | Recommendation signed 20 November 1996 |
| 370 | Soil Contamination | NFA | Recommendation signed 20 November 1996 |
| 371 | Soil Contamination | NFA | Recommendation signed 18 December 1996 |
| 372 | Soil Contamination | NFA | Recommendation signed 8 May 1996 |
| 383 | Soil Contamination | NFA | Recommendation signed 31 March 1997 |
| 384 | Soil Contamination | NFA | Recommendation signed 31 March 1997 |
| 406 | Thorium Sludge Redrumming | NFA | Recommendation signed 14 March 1996 |
| 407 | Soil Contamination West of Building 21 | NFA | Recommendation signed 17 February 2000 |
| 418 | PRS 418: Overflow Pond South Inlet | NFA | Recommendation signed 21 June 2000 |
| 419 | Drainage Outflow Reroute | NFA | Recommendation signed 17 November 1999 |
| 421 | Ridge | NFA | OSC Report signed 19 September 2002 |

NFA: No Further Assessment

# Table 2: Phase I Buildings and Core Team Conclusions

| Building | Description | Core Team Decision | Closeout Action |
|---|---|---|---|
| 3 | EM Test Facility | NFA | Recommendation signed March 2002 |
| 87 | Component Test Facility | NFA | Recommendation signed March 1997 |
| Mag 80 | Magazine | NFA | Recommendation signed March 2002 |
| Mag 81 | Magazine | NFA | Recommendation signed March 2002 |
| Mag 82 | Magazine | NFA | Recommendation signed March 2002 |
| Mag 83 | Magazine | NFA | Recommendation signed March 2002 |
| Mag 84 | Magazine | NFA | Recommendation signed March 2002 |
| 95 | SM/PP Area Chiller Plant | NFA | Recommendation signed July 2002 |
| 102 | Offices (Process Support Building) | NFA | Recommendation signed June 2002 |
| SST | Salt Storage for Water Treatment and Road Salt | NFA | Recommendation signed March 2002 |

NFA: No Further Assessment

## Table 3: Phase I Documents and Public Comment Periods

| Document | Comment Period (Begin) | Comment Period (End) |
|---|---|---|
| Phase I Proposed Plan * | 26 March 2003 | 24 April 2003 |
| Phase I Proposed Plan | 1 October 2002 | 31 October 2002 |
| Phase I RRE | 25 September 2002 | 24 October 2002 |
| PRS 16 Package | 19 June 1996 | 17 July 1996 |
| PRS 73 Package | 27 March 2002 | 25 April 2002 |
| PRS 74 Package | 3 April 1997 | 8 May 1997 |
| PRS 258-265 Package | 12 June 2002 | 12 July 2002 |
| PRS 276 CRA AM | 2 October 2001 | 1 November 2001 |
| PRS 304 AM | 21 December 1998 | 25 January 1999 |
| PRS 370 Package | 19 December 1996 | 23 January 1997 |
| PRS 371 Package | 3 April 1997 | 8 May 1997 |
| PRS 372 Package | 15 May 1996 | 17 June 1996 |
| PRS 383 Package | 17 June 1997 | 18 July 1997 |
| PRS 384 Package | 19 December 1996 | 23 January 1997 |
| PRS 406 Package | 18 March 1996 | 1 April 1996 |
| PRS 418 Package | 9 August 2000 | 14 September 2000 |
| PRS 419 Package | 19 January 2000 | 17 February 2000 |
| PRS 421 CRA AM | 2 October 2001 | 1 November 2001 |
| Building 3 BDP | 27 March 2002 | 26 April 2002 |
| Building 35 & 59 AM | 20 April 1999 | 20 May 1999 |
| Building 87 BDP | 24 July 1997 | 23 August 1997 |
| Mags 80-84 BDP | 27 March 2002 | 26 April 2002 |
| Building 95 BDP | 4 September 2002 | 4 October 2002 |
| Building 102 BDP | 3 July 2002 | 2 August 2002 |
| Building SST BDP | 27 March 2002 | 26 April 2002 |

AM: Action Memo
BDP: Building Data Package
CRA: Contingent Removal Action
PRS: Potential Release Site

Note: Some PRSs are addressed in Building Data Packages or On-Scene Coordinator Reports.

* Proposed Plan reissued to enable public comment on the Monitored Natural Attenuation component of the remedy and the impact of the boundary changes.

# Table 4: Incremental Residual Risk Summary

Table 36 of the RRE

| Scenario and Receptor | Media | Constituents | Pathway | Total Non-Cancer Hazard or HI | Total Cancer Risk |
|---|---|---|---|---|---|
| Construction Worker Scenario | Current & Future Soil (all depths) | Chemical & Radiological | Oral | 1.4E-01 | **7.4E-06** |
| | | | Dermal Contact | 1.6E-03 | 3.5E-07 |
| | | | Inhalation of Dust | NA | 2.0E-08 |
| | | | Inhalation of VOCs | NA | NA |
| | | | External | NA | **9.5E-06** |
| | | **Soil Total Risk** | | 1.4E-01 | **1.7E-05** |
| | Current Groundwater | Chemical & Radiological | Oral | 5.5E-01 | **3.5E-06** |
| | | | Dermal Contact | 3.1E-01 | **1.3E-06** |
| | | | Inhalation While Showering | 4.8E-07 | NA |
| | | **Current Groundwater Total Risk** | | **8.6E-01** | **4.8E-06** |
| | Future Groundwater | Chemical & Radiological | Oral | **4.6E+00** | **2.0E-05** |
| | | | Dermal Contact | 9.3E-01 | **2.3E-06** |
| | | | Inhalation While Showering | 1.4E-05 | 4.5E-08 |
| | | **Future Groundwater Total Risk** | | **5.5E+00** | **2.2E-05** |
| | Air* | Radiological | Inhalation | NA | 2.0E-07 |
| | | **Air Total Risk** | | NA | 2.0E-07 |
| | **Cumulative Incremental Current Risk** | | | 1.0E+00 | **2.2E-05** |
| | **Cumulative Incremental Future Risk** | | | **5.7E+00** | **4.0E-05** |
| Site Employee Scenario | Current & Future Soil (0-2 feet bls) | Chemical & Radiological | Oral | 4.6E-04 | **4.0E-06** |
| | | | Inhalation of Dust | NA | 9.7E-08 |
| | | | Inhalation of VOCs | NA | NA |
| | | | External | NA | **1.2E-05** |
| | | **Soil Total Risk** | | 4.6E-04 | **1.6E-05** |
| | Current Groundwater | Chemical & Radiological | Oral | 5.5E-01 | **2.6E-05** |
| | | **Current Groundwater Total Risk** | | 5.5E-01 | **2.6E-05** |
| | Future Groundwater | Chemical & Radiological | Oral | **4.6E+00** | **9.3E-05** |
| | | **Future Groundwater Total Risk** | | **4.6E+00** | **9.3E-05** |
| | Air* | Radiological | Inhalation | NA | 9.9E-07 |
| | | **Air Total Risk** | | NA | 9.9E-07 |
| | **Cumulative Incremental Current Risk** | | | 5.5E-01 | **4.3E-05** |
| | **Cumulative Incremental Future Risk** | | | **4.6E+00** | **1.1E-04** |

HI: Hazard Index
NA: not applicable
*RRE values for air were brought forward from the Technical Position Report for Release Blocks D and H. (DOE 1999).
**bolded** values exceed cancer risk of $10^{-6}$ or non-cancer Hazard Index greater than 1.
bls: below land surface
VOCs: volatile organic compounds
numbers written as 1.0E-3 equal 1x10-3 and 0.001

# Table 5: Background Residual Risk Summary

Table 35 of the RRE

| Scenario and Receptor | Media | Constituents | Pathway | Total Non-Cancer Hazard or HI | Total Cancer Risk |
|---|---|---|---|---|---|
| Construction Worker Scenario | Current & Future Soil (all depths) | Chemical & Radiological | Oral | 2.7E-02 | **5.7E-06** |
| | | | Dermal Contact | 6.0E-05 | NA |
| | | | Inhalation of Dust | NA | 6.9E-09 |
| | | | Inhalation of VOCs | NA | NA |
| | | | External | NA | **2.8E-05** |
| | | | **Soil Total Risk** | 2.7E-02 | **3.4E-05** |
| | Current Groundwater | Chemical & Radiological | Oral | 1.4E-02 | **1.6E-06** |
| | | | Dermal Contact | 3.1E-04 | NA |
| | | | Inhalation While Showering | NA | NA |
| | | | **Current Groundwater Total Risk** | 1.5E-02 | **1.6E-06** |
| | Future Groundwater | Chemical & Radiological | Oral | 6.1E-01 | **2.6E-06** |
| | | | Dermal Contact | 1.1E-02 | 4.6E-10 |
| | | | Inhalation While Showering | NA | 9.7E-10 |
| | | | **Future Groundwater Total Risk** | 6.2E-01 | **2.6E-06** |
| | Air* | Radiological | Inhalation | NA | 7.7E-09 |
| | | | **Air Total Risk** | NA | 7.7E-09 |
| | | | **Cumulative Background Current Risk** | 4.2E-02 | **3.6E-05** |
| | | | **Cumulative Background Future Risk** | **6.5E-01** | **3.7E-05** |
| Site Employee Scenario | Current & Future Soil (0-2 feet bls) | Chemical & Radiological | Oral | 1.4E-02 | **5.2E-06** |
| | | | Inhalation of Dust | NA | 4.1E-08 |
| | | | Inhalation of VOCs | NA | NA |
| | | | External | NA | **3.1E-05** |
| | | | **Soil Total Risk** | 1.4E-02 | **3.7E-05** |
| | Current Groundwater | Chemical & Radiological | Oral | 1.4E-02 | **1.1E-05** |
| | | | **Current Groundwater Total Risk** | 1.4E-02 | **1.1E-05** |
| | Future Groundwater | Chemical & Radiological | Oral | 6.1E-01 | **2.1E-05** |
| | | | **Future Groundwater Total Risk** | 6.1E-01 | **2.1E-05** |
| | Air* | Radiological | Inhalation | NA | 3.9E-08 |
| | | | **Air Total Risk** | NA | 3.9E-08 |
| | | | **Cumulative Background Current Risk** | 2.8E-02 | **4.8E-05** |
| | | | **Cumulative Background Future Risk** | **6.2E-01** | **5.7E-05** |

HI: Hazard Index
NA - not applicable
*RRE values for air were brought forward from the Technical Position Report for Release Blocks D and H. (DOE 1999).
**bolded** values exceed cancer risk of $10^{-6}$ or non-cancer Hazard Index greater than 1.
bls - below land surface
VOCs - volatile organic compounds
numbers written as 1.0E-3 equal 1x10-3 and 0.001

# Table 6: Total Residual Risk Summary

Table 34 of the RRE

| Scenario and Receptor | Media | Constituents | Pathway | Total Non-Cancer Hazard or HI | Total Cancer Risk |
|---|---|---|---|---|---|
| Construction Worker Scenario | Current & Future Soil (all depths) | Chemical & Radiological | Oral | 1.7E-01 | **1.3E-05** |
| | | | Dermal Contact | 1.6E-03 | 3.5E-07 |
| | | | Inhalation of Dust | NA | 2.6E-08 |
| | | | Inhalation of VOCs | NA | NA |
| | | | External | NA | **3.8E-05** |
| | | | **Soil Total Risk** | 1.7E-01 | **5.1E-05** |
| | Current Groundwater | Chemical & Radiological | Oral | 5.7E-01 | **5.1E-06** |
| | | | Dermal Contact | 3.1E-01 | **1.3E-06** |
| | | | Inhalation while Showering | 4.8E-07 | 6.7E-10 |
| | | | **Current Groundwater Total Risk** | **8.7E-01** | **6.4E-06** |
| | Future Groundwater | Chemical & Radiological | Oral | **5.2E+00** | **2.3E-05** |
| | | | Dermal Contact | 9.4E-01 | **2.3E-06** |
| | | | Inhalation while Showering | 1.4E-05 | 4.6E-08 |
| | | | **Future Groundwater Total Risk** | **6.1E+00** | **2.6E-05** |
| | Air* | Radiological | Inhalation | NA | 2.1E-07 |
| | | | **Air Total Risk** | NA | 2.1E-07 |
| | | | **Cumulative Total Current Risk** | **1.0E+00** | **5.8E-05** |
| | | | **Cumulative Total Future Risk** | **6.3E+00** | **7.7E-05** |
| Site Employee Scenario | Current & Future Soil (0-2 feet bls) | Chemical & Radiological | Oral | 1.4E-02 | **9.2E-06** |
| | | | Inhalation of Dust | NA | 1.4E-07 |
| | | | Inhalation of VOCs | NA | NA |
| | | | External | NA | **4.4E-05** |
| | | | **Soil Total Risk** | 1.4E-02 | **5.3E-05** |
| | Current Groundwater | Chemical & Radiological | Oral | 5.7E-01 | **3.1E-05** |
| | | | **Current Groundwater Total Risk** | 5.7E-01 | **3.1E-05** |
| | Future Groundwater | Chemical & Radiological | Oral | **5.2E+00** | **1.2E-04** |
| | | | **Future Groundwater Total Risk** | **5.2E+00** | **1.2E-04** |
| | Air* | Radiological | Inhalation | NA | **1.0E-06** |
| | | | **Air Total Risk** | NA | **1.0E-06** |
| | | | **Cumulative Total Current Risk** | 5.8E-01 | **8.5E-05** |
| | | | **Cumulative Total Future Risk** | **5.2E+00** | **1.7E-04** |

HI: Hazard Index
NA - not applicable
*RRE values for air were brought forward from the Technical Position Report for Release Blocks D and H. (DOE 1999).
**bolded** values exceed cancer risk of $10^{-6}$ or non-cancer Hazard Index greater than 1.
bls - below land surface
VOCs - volatile organic compounds
numbers written as 1.0E-3 equal 1x10-3 and 0.001

# Table 7: Initial Identification of Current and Future Soil COPCs for the Construction Worker Scenario

(Maximum Detected Values vs. Background and RBGVs) - Table 2 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Dist. | Detection Frequency | Screening Concentration | Background Conc. | RBGV | COPC |
|---|---|---|---|---|---|---|---|---|---|
| **Inorganics (mg/kg)** | | | | | | | | | |
| Aluminum | 7429-90-5 | 589.000 | 23000.000 | N | 145/ 146 | 23000.000 | 19000.000 | 21291.667 | YES |
| Antimony | 7440-36-0 | 0.210 | 44.500 | D | 64/ 209 | 44.500 | | 8.517 | YES |
| Arsenic | 7440-38-2 | 0.490 | 19.500 | X | 137/ 143 | 19.500 | 8.600 | 1.987 | YES |
| Barium | 7440-39-3 | 4.400 | 604.000 | X | 226/ 227 | 604.000 | 180.000 | 1490.417 | NO:2 |
| Beryllium | 7440-41-7 | 0.050 | 3.600 | X | 220/ 226 | 3.600 | 1.300 | 42.118 | NO:2 |
| Bismuth | 7440-69-9 | 0.820 | 72.700 | X | 33/ 59 | 72.700 | | | YES |
| Cadmium | 7440-43-9s | 0.250 | 11.700 | D | 69/ 227 | 11.700 | 2.100 | 21.292 | NO:2 |
| Calcium | 7440-70-2 | 1420.000 | 342000.000 | X | 145/ 146 | 342000.000 | 310000.000 | | NO:4 |
| Chromium | 7440-47-3 | 1.100 | 37.000 | X | 226/ 227 | 37.000 | 20.000 | 31937.500 | NO:2 |
| Chromium VI | 18540-29-9 | 1.100 | 37.000 | X | 226/ 227 | 37.000 | 20.000 | 63.664 | NO:2 |
| Cobalt | 7440-48-4 | 0.790 | 25.000 | X | 145/ 146 | 25.000 | 19.000 | 1277.500 | NO:2 |
| Copper | 7440-50-8 | 1.800 | 1100.000 | X | 143/ 146 | 1100.000 | 26.000 | 851.667 | YES |
| Cyanide | 57-12-5 | 0.100 | 8.900 | D | 35/ 162 | 8.900 | | 425.833 | NO:2 |
| Iron | 7439-89-6 | 23.000 | 43000.000 | N | 145/ 146 | 43000.000 | 35000.000 | | NO:4 |
| Lead | 7439-92-1 | 1.600 | 220.000 | X | 242/ 256 | 220.000 | 48.000 | | YES |
| Lithium | 7439-93-2 | 2.300 | 34.100 | N | 53/ 55 | 34.100 | 26.000 | | YES |
| Magnesium | 7439-95-4 | 12.000 | 120000.000 | X | 145/ 146 | 120000.000 | 40000.000 | | NO:4 |
| Manganese | 7439-96-5s | 65.200 | 8190.000 | X | 137/ 138 | 8190.000 | 1400.000 | 2276.586 | YES |
| Mercury | 7439-97-6 | 0.030 | 1.400 | D | 61/ 139 | 1.400 | | 6.387 | NO:2 |
| Molybdenum | 7439-98-7 | 0.220 | 9.700 | L | 49/ 54 | 9.700 | 27.000 | 106.458 | NO:2,3 |
| Nickel | 7440-02-0 | 2.300 | 247.000 | X | 224/ 227 | 247.000 | 32.000 | 425.833 | NO:2 |
| Potassium | 7440-09-7 | 305.000 | 326000.000 | X | 142/ 147 | 326000.000 | 1900.000 | | NO:4 |
| Selenium | 7782-49-2 | 0.460 | 2.300 | D | 19/ 131 | 2.300 | | 106.458 | NO:2 |
| Silver | 7440-22-4 | 0.110 | 20.800 | D | 65/ 227 | 20.800 | 1.700 | 106.458 | NO:2 |
| Sodium | 7440-23-5 | 41.700 | 3450.000 | X | 136/ 146 | 3450.000 | 240.000 | | NO:4 |
| Thallium | 7440-28-0 | 0.200 | 3.500 | D | 29/ 142 | 3.500 | 0.460 | 1.703 | YES |
| Tin | 7440-31-5 | 0.670 | 3.300 | D | 22/ 54 | 3.300 | 20.000 | 12775.000 | NO:2,3 |
| Vanadium | 7440-62-2 | 1.700 | 42.700 | X | 145/ 146 | 42.700 | 25.000 | 149.042 | NO:2 |
| Zinc | 7440-66-6 | 5.500 | 463.000 | X | 145/ 146 | 463.000 | 140.000 | 6387.500 | NO:2 |

# Table 7: Initial Identification of Current and Future Soil COPCs for the Construction Worker Scenario

(Maximum Detected Values vs. Background and RBGVs) - Table 2 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Dist. | Detection Frequency | Screening Concentration | Background Conc. | RBGV | COPC |
|---|---|---|---|---|---|---|---|---|---|
| **Pesticides (mg/kg)** | | | | | | | | | |
| 4,4'-DDE | 72-55-9 | 0.000 | 0.002 | D | 7/ 121 | 0.002 | 0.004 | 8.767 | NO:2,3 |
| Chlordane | 57-74-9 | 0.019 | 0.098 | D | 2/ 23 | 0.098 | | | YES |
| **SVOCs (mg/kg)** | | | | | | | | | |
| Anthracene | 120-12-7 | 0.022 | 2.800 | D | 13/ 174 | 2.800 | | 6387.500 | NO:2 |
| Benzo(a)anthracene | 56-55-3 | 0.023 | 4.200 | D | 31/ 174 | 4.200 | | 4.083 | YES |
| Benzo(a)pyrene | 50-32-8 | 0.023 | 3.600 | D | 29/ 174 | 3.600 | | 0.408 | YES |
| Benzo(b)fluoranthene | 205-99-2 | 0.025 | 2.800 | D | 35/ 174 | 2.800 | | 4.083 | NO:2 |
| Benzo(g,h,i)perylene | 191-24-2 | 0.027 | 2.100 | D | 16/ 174 | 2.100 | | | YES |
| Benzo(k)fluoranthene | 207-08-9 | 0.021 | 3.400 | D | 27/ 174 | 3.400 | | 40.833 | NO:2 |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | 0.019 | 6.500 | D | 59/ 159 | 6.500 | | 212.917 | NO:2 |
| Chrysene | 218-01-9 | 0.020 | 1.700 | D | 30/ 159 | 1.700 | | 408.328 | NO:2 |
| Di-n-butyl Phthalate | 84-74-2 | 0.021 | 2.000 | D | 61/ 240 | 2.000 | | 2129.167 | NO:2 |
| Fluoranthene | 206-44-0 | 0.023 | 11.000 | D | 48/ 174 | 11.000 | | 851.667 | NO:2 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | 0.025 | 1.900 | D | 18/ 174 | 1.900 | | 4.083 | NO:2 |
| N-Nitrosodiphenylamine | 86-30-6 | 0.057 | 0.210 | D | 8/ 159 | 0.210 | | 608.333 | NO:2 |
| Phenanthrene | 85-01-8 | 0.027 | 11.000 | D | 32/ 174 | 11.000 | | | YES |
| Pyrene | 129-00-0 | 0.026 | 9.700 | D | 45/ 174 | 9.700 | | 638.750 | NO:2 |
| **VOCs (mg/kg)** | | | | | | | | | |
| 2-Butanone | 78-93-3 | 0.001 | 0.031 | D | 18/ 177 | 0.031 | | 2279.081 | NO:2 |
| 4-Methyl-2-pentanone | 108-10-1 | 0.001 | 0.007 | D | 9/ 177 | 0.007 | | 1703.333 | NO:2 |
| Acetone | 67-64-1 | 0.004 | 0.170 | D | 48/ 177 | 0.170 | | 2129.167 | NO:2 |
| Dichloromethane (Methylene Chloride) | 75-09-2 | 0.003 | 0.068 | D | 96/ 200 | 0.068 | | 82.665 | NO:2 |
| Naphthalene | 91-20-3 | 0.001 | 0.006 | D | 3/ 6 | 0.006 | | 425.520 | NO:2 |
| Tetrachloroethene | 127-18-4 | 0.002 | 0.041 | D | 13/ 200 | 0.041 | | 38.005 | NO:2 |
| Toluene | 108-88-3 | 0.001 | 0.051 | D | 35/ 200 | 0.051 | | 200.348 | NO:2 |
| Xylenes, Total | 1330-20-7 | 0.001 | 0.039 | D | 16/ 177 | 0.039 | | 42583.333 | NO:2 |
| mp-Xylene | mp-Xylene | 0.005 | 0.006 | X | 23/ 23 | 0.006 | | 276.987 | NO:2 |

# Table 7: Initial Identification of Current and Future Soil COPCs for the Construction Worker Scenario

(Maximum Detected Values vs. Background and RBGVs) - Table 2 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Dist. | Detection Frequency | Screening Concentration | Background Conc. | RBGV | COPC |
|---|---|---|---|---|---|---|---|---|---|
| **Radionuclides (pCi/g)** | | | | | | | | | |
| Actinium-227 | 14952-40-0 | 0.050 | 2.110 | D | 37/ 282 | 2.110 | | 4.368 | NO:2 |
| Actinium-227 +D | 14952-40-0(+D) | 0.050 | 2.110 | D | 37/ 282 | 2.110 | | 0.453 | YES |
| Actinium-227 long lived decay | 14952-40-0L | 0.050 | 2.110 | D | 37/ 282 | 2.110 | | 0.453 | YES |
| Actinium-228 | 14331-83-0 | 0.762 | 1.380 | D | 7/ 7 | 1.380 | | 0.215 | YES |
| Bismuth-214 | 14733-03-0 | 0.699 | 0.926 | N | 10/ 10 | 0.926 | | 0.130 | YES |
| Cesium-137 | 10045-97-3 | 0.021 | 1.600 | D | 276/ 564 | 1.600 | 0.420 | 37.698 | NO:2 |
| Cesium-137 +D | 10045-97-3(+D) | 0.021 | 1.600 | D | 276/ 564 | 1.600 | 0.420 | 0.378 | YES |
| Cesium-137 long lived decay | 10045-97-3L | 0.021 | 1.600 | D | 276/ 564 | 1.600 | 0.420 | 0.378 | YES |
| Lead-210 | 14255-04-0 | 0.487 | 3.730 | X | 180/ 344 | 3.730 | | 0.905 | YES |
| Lead-210+D | 14255-04-0(+D) | 0.487 | 3.730 | X | 180/ 344 | 3.730 | | 0.625 | YES |
| Lead-210 long lived decay | 14255-04-0L | 0.487 | 3.730 | X | 180/ 344 | 3.730 | | 0.625 | YES |
| Lead-212 | 15092-94-1 | 0.843 | 1.220 | L | 10/ 10 | 1.220 | | 1.776 | NO:2 |
| Lead-214 | 15067-28-4 | 0.570 | 1.120 | N | 20/ 20 | 1.120 | | 0.991 | YES |
| Plutonium-238 | 13981-16-3 | 0.012 | 396.400 | D | 665/1545 | 396.400 | 0.130 | 6.125 | YES |
| Plutonium-239 | 15117-48-3 | 0.004 | 1.270 | X | 83/ 90 | 1.270 | 0.180 | 6.031 | NO:2 |
| Plutonium-239/240 | PU-239/240 | 0.004 | 1.010 | D | 79/ 254 | 1.010 | 0.180 | | YES |
| Potassium-40 | 13966-00-2 | 7.180 | 36.600 | X | 122/ 126 | 36.600 | 37.000 | 1.168 | NO:3 |
| Radium-224 | 13233-32-4 | 0.073 | 6.270 | X | 190/ 190 | 6.270 | | 3.238 | YES |
| Radium-226 | 13982-63-3 | 0.179 | 3.700 | X | 494/ 567 | 3.700 | 2.000 | 2.170 | YES |
| Radium-226+D | 13982-63-3(+D) | 0.179 | 3.700 | X | 494/ 567 | 3.700 | 2.000 | 0.109 | YES |
| Radium-226 long lived decay | 13982-63-3L | 0.179 | 3.700 | X | 494/ 567 | 3.700 | 2.000 | 0.093 | YES |
| Radium-228 | 15262-20-1 | 0.309 | 1.990 | N | 80/ 81 | 1.990 | | 0.731 | YES |
| Radium-228+D | 15262-20-1(+D) | 0.309 | 1.990 | N | 80/ 81 | 1.990 | | 0.166 | YES |
| Radium-228 long lived decay | 15262-20-1L | 0.309 | 1.990 | N | 80/ 81 | 1.990 | | 0.069 | YES |
| Thallium-208 | 14913-50-9 | 0.156 | 0.401 | N | 10/ 10 | 0.401 | | 0.055 | YES |
| Thorium-227 | 15623-47-9 | 0.060 | 0.440 | L | 17/ 33 | 0.440 | | 2.125 | NO:2 |
| Thorium-228 | 14274-82-9 | 0.037 | 4.520 | X | 342/ 384 | 4.520 | 1.500 | 5.582 | NO:2 |
| Thorium-228+D | 14274-82-9(+D) | 0.037 | 4.520 | X | 342/ 384 | 4.520 | 1.500 | 0.118 | YES |
| Thorium-228 long lived decay | 14274-82-9L | 0.037 | 4.520 | X | 342/ 384 | 4.520 | 1.500 | 0.118 | YES |
| Thorium-230 | 14269-63-7 | 0.100 | 7.510 | X | 340/ 595 | 7.510 | 1.900 | 8.194 | NO:2 |
| Thorium-230 long lived decay | 14269-63-7L | 0.100 | 7.510 | X | 340/ 595 | 7.510 | 1.900 | 0.092 | YES |
| Thorium-232 | 7440-29-1 | 0.045 | 80.100 | D | 789/1805 | 80.100 | 1.400 | 7.197 | YES |

## Table 7: Initial Identification of Current and Future Soil COPCs for the Construction Worker Scenario

(Maximum Detected Values vs. Background and RBGVs) - Table 2 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Dist. | Detection Frequency | Screening Concentration | Background Conc. | RBGV | COPC |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-232 long lived decay | 7440-29-1L | 0.045 | 80.100 | D | 789/1805 | 80.100 | 1.400 | 0.068 | YES |
| Uranium-234 | 13966-29-5 | 0.375 | 1.560 | N | 46/ 54 | 1.560 | 1.100 | 10.520 | NO:2 |
| Uranium-235 | 15117-96-1 | 0.027 | 0.210 | D | 28/ 77 | 0.210 | 0.110 | 1.596 | NO:2 |
| Uranium-235+D | 15117-96-1(+D) | 0.027 | 0.210 | D | 28/ 77 | 0.210 | 0.110 | 1.525 | NO:2 |
| Uranium-235 long lived decay | 15117-96-1L | 0.027 | 0.210 | D | 28/ 77 | 0.210 | 0.110 | 0.310 | NO:2 |
| Uranium-238 | 7440-61-1 | 0.408 | 1.950 | X | 72/ 119 | 1.950 | 1.200 | 11.648 | NO:2 |
| Uranium-238+D | 7440-61-1(+D) | 0.408 | 1.950 | X | 72/ 119 | 1.950 | 1.200 | 4.113 | NO:2 |
| Uranium-238 long lived decay | 7440-61-1L | 0.408 | 1.950 | X | 72/ 119 | 1.950 | 1.200 | 0.089 | YES |

"+D" : incorporates daughter products within the risk calculations
CAS: Chemical Abstract Service
RBGV: Risk-Based Guideline Value, value is the lower of $10^{-6}$ cancer risk or 0.1 hazard index
VOC: volatile organic compound
SVOC: semivolatile organic compound
Dist.: distribution where:
N = normal, L = lognormal, D = distribution not determined due to less than 20 or less than 50% detects, and
X = significantly different from lognormal or normal distribution
COPC: Constituent of Potential Concern, evaluation based on maximum detect vs. background or RBGV
COPC = YES indicates the analyte is retained as a COPC
COPC = NO indicates analyte was screened out based on: 2 = comparison to background, 3 = comparison to RBGV, and/or 4 = analyte is an essential human nutrient

# Table 8: Final Identification of Current and Future Soil COPCs for the Construction Worker Scenario

(EPC vs. Background) - Table 3 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Dist. | Detection Frequency | 95% UCL of Mean | EPC | Background Concentration | COPC |
|---|---|---|---|---|---|---|---|---|---|
| **Inorganics (mg/kg)** | | | | | | | | | |
| Aluminum | 7429-90-5 | 589.000 | 23000.000 | N | 145/ 146 | 15400.000 | 15400.000 | 19000.000 | NO |
| Antimony | 7440-36-0 | 0.210 | 44.500 | D | 64/ 209 | 8.460 | 8.460 | | YES |
| Arsenic | 7440-38-2 | 0.490 | 19.500 | X | 137/ 143 | 8.220 | 8.220 | 8.600 | NO |
| Bismuth | 7440-69-9 | 0.820 | 72.700 | X | 33/ 59 | 133.000 | 72.700 | | YES |
| Copper | 7440-50-8 | 1.800 | 1100.000 | X | 143/ 146 | 22.100 | 22.100 | 26.000 | NO |
| Lead | 7439-92-1 | 1.600 | 220.000 | X | 242/ 256 | 15.400 | 15.400 | 48.000 | NO |
| Lithium | 7439-93-2 | 2.300 | 34.100 | N | 53/ 55 | 18.300 | 18.300 | 26.000 | NO |
| Manganese | 7439-96-5s | 65.200 | 8190.000 | X | 137/ 138 | 679.000 | 679.000 | 1400.000 | NO |
| Thallium | 7440-28-0 | 0.200 | 3.500 | D | 29/ 142 | 1.140 | 1.140 | 0.460 | YES |
| **Pesticides (mg/kg)** | | | | | | | | | |
| Chlordane | 57-74-9 | 0.019 | 0.098 | D | 2/ 23 | 0.016 | 0.016 | | YES |
| **SVOCs (mg/kg)** | | | | | | | | | |
| Benzo(a)anthracene | 56-55-3 | 0.023 | 4.200 | D | 31/ 174 | 0.321 | 0.321 | | YES |
| Benzo(a)pyrene | 50-32-8 | 0.023 | 3.600 | D | 29/ 174 | 0.316 | 0.316 | | YES |
| Benzo(g,h,i)perylene | 191-24-2 | 0.027 | 2.100 | D | 16/ 174 | 0.304 | 0.304 | | YES |
| Phenanthrene | 85-01-8 | 0.027 | 11.000 | D | 32/ 174 | 0.348 | 0.348 | | YES |
| **Radionuclides (pCi/g)** | | | | | | | | | |
| Actinium-227 +D | 14952-40-0(+D) | 0.050 | 2.110 | D | 37/ 282 | 0.304 | 0.304 | | YES:1 |
| Actinium-227 long lived decay | 14952-40-0L | 0.050 | 2.110 | D | 37/ 282 | 0.304 | 0.304 | | YES |
| Actinium-228 | 14331-83-0 | 0.762 | 1.380 | D | 7/ 7 | 1.230 | 1.380 | | YES:3 |
| Bismuth-214 | 14733-03-0 | 0.699 | 0.926 | N | 10/ 10 | 0.858 | 0.926 | | YES:2 |
| Cesium-137 +D | 10045-97-3(+D) | 0.021 | 1.600 | D | 276/ 564 | 0.159 | 0.159 | 0.420 | NO |
| Cesium-137 long lived decay | 10045-97-3L | 0.021 | 1.600 | D | 276/ 564 | 0.159 | 0.159 | 0.420 | NO |
| Lead-210 | 14255-04-0 | 0.487 | 3.730 | X | 180/ 344 | 1.150 | 1.150 | | YES:2 |
| Lead-210+D | 14255-04-0(+D) | 0.487 | 3.730 | X | 180/ 344 | 1.150 | 1.150 | | YES:2 |
| Lead-210 long lived decay | 14255-04-0L | 0.487 | 3.730 | X | 180/ 344 | 1.150 | 1.150 | | YES:2 |
| Lead-214 | 15067-28-4 | 0.570 | 1.120 | N | 20/ 20 | 0.921 | 0.921 | | YES:2 |
| Plutonium-238 | 13981-16-3 | 0.012 | 396.400 | D | 665/1545 | 25.900 | 25.900 | 0.130 | YES |
| Plutonium-239/240 | PU-239/240 | 0.004 | 1.010 | D | 79/ 254 | 0.044 | 0.044 | 0.180 | NO |
| Radium-224 | 13233-32-4 | 0.073 | 6.270 | X | 190/ 190 | 1.250 | 1.250 | | YES:3 |
| Radium-226 | 13982-63-3 | 0.179 | 3.700 | X | 494/ 567 | 1.240 | 1.240 | 2.000 | NO |
| Radium-226+D | 13982-63-3(+D) | 0.179 | 3.700 | X | 494/ 567 | 1.240 | 1.240 | 2.000 | NO |

## Table 8: Final Identification of Current and Future Soil COPCs for the Construction Worker Scenario

(EPC vs. Background) - Table 3 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Dist. | Detection Frequency | 95% UCL of Mean | EPC | Background Concentration | COPC |
|---|---|---|---|---|---|---|---|---|---|
| Radium-226 long lived decay | 13982-63-3L | 0.179 | 3.700 | X | 494/ 567 | 1.240 | 1.240 | 2.000 | NO |
| Radium-228 | 15262-20-1 | 0.309 | 1.990 | N | 80/ 81 | 1.220 | 1.220 | | YES:3 |
| Radium-228+D | 15262-20-1(+D) | 0.309 | 1.990 | N | 80/ 81 | 1.220 | 1.220 | | YES:3 |
| Radium-228 long lived decay | 15262-20-1L | 0.309 | 1.990 | N | 80/ 81 | 1.220 | 1.220 | | YES:3 |
| Thallium-208 | 14913-50-9 | 0.156 | 0.401 | N | 10/ 10 | 0.377 | 0.401 | | YES:3 |
| Thorium-228+D | 14274-82-9(+D) | 0.037 | 4.520 | X | 342/ 384 | 1.640 | 1.640 | 1.500 | YES:3 |
| Thorium-228 long lived decay | 14274-82-9L | 0.037 | 4.520 | X | 342/ 384 | 1.640 | 1.640 | 1.500 | YES:3 |
| Thorium-230 long lived decay | 14269-63-7L | 0.100 | 7.510 | X | 340/ 595 | 2.830 | 2.830 | 1.900 | YES:2 |
| Thorium-232 | 7440-29-1 | 0.045 | 80.100 | D | 789/1805 | 0.832 | 0.832 | 1.400 | NO |
| Thorium-232 long lived decay | 7440-29-1L | 0.045 | 80.100 | D | 789/1805 | 0.832 | 0.832 | 1.400 | YES:4 |
| Uranium-238 long lived decay | 7440-61-1L | 0.408 | 1.950 | X | 72/ 119 | 1.880 | 1.880 | 1.200 | YES |

"+D" : incorporates daughter products within the risk calculations
CAS: Chemical Abstract Service
UCL: upper confidence limit
EPC: Exposure Point Concentration
SVOCs: semivolatile organic compounds
Dist.: distribution where:
N = normal, L = lognormal, D = distribution not determined due to less than 20 or less than 50% detects, and
X = significantly different from lognormal or normal distribution
COPC: Constituent of Potential Concern, evaluation based on EPC vs. background
COPC = YES indicates the analyte is retained as a COPC; however, will not be evaluated individually because it is included in the risk assessment as part of the long lived decay chain of Ac-227 (reference 1), U-238 (reference 2), or Th-232 (reference 3). See Appendix H for details. For reference 4, Th-232 screens out but the Th-232 long lived decay chain was retained for risk evaluation.
COPC = NO indicates analyte was screened out based on: 2 = comparison to background, 3 = comparison to RBGV, and/or 4 = analyte is an essential human nutrient

# Table 9: Initial Identification of Current and Future Soil COPCs for the Site Employee Scenario

(Maximum Detected Values vs. Background and RBGVs) - Table 4 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Dist. | Detection Frequency | Screening Concentration | Background Conc. | RBGV | COPC |
|---|---|---|---|---|---|---|---|---|---|
| **Explosives (mg/kg)** | | | | | | | | | |
| Nitrobenzene | 98-95-3 | 0.3800 | 0.380 | D | 1/ 12 | 0.380 | | 102.200 | NO:2 |
| **Inorganics (mg/kg)** | | | | | | | | | |
| Aluminum | 7429-90-5 | 589.0000 | 23000.000 | N | 105/ 105 | 23000.000 | 19000.000 | 204400.000 | NO:2 |
| Antimony | 7440-36-0 | 0.2100 | 44.500 | D | 42/ 146 | 44.500 | | 81.760 | NO:2 |
| Arsenic | 7440-38-2 | 0.4900 | 19.500 | X | 104/ 105 | 19.500 | 8.600 | 3.804 | YES |
| Barium | 7440-39-3 | 4.4000 | 453.000 | X | 158/ 158 | 453.000 | 180.000 | 14308.000 | NO:2 |
| Beryllium | 7440-41-7 | 0.1200 | 3.600 | X | 155/ 158 | 3.600 | 1.300 | 369.600 | NO:2 |
| Bismuth | 7440-69-9 | 12.6000 | 72.700 | X | 26/ 36 | 72.700 | | | YES |
| Cadmium | 7440-43-9s | 0.2500 | 11.700 | D | 43/ 158 | 11.700 | 2.100 | 204.400 | NO:2 |
| Calcium | 7440-70-2 | 1420.0000 | 312000.000 | X | 105/ 105 | 312000.000 | 310000.000 | | NO:4 |
| Chromium | 7440-47-3 | 1.1000 | 37.000 | X | 158/ 158 | 37.000 | 20.000 | 306600.000 | NO:2 |
| Chromium VI | 18540-29-9 | 1.1000 | 37.000 | X | 158/ 158 | 37.000 | 20.000 | 449.680 | NO:2 |
| Cobalt | 7440-48-4 | 0.7900 | 25.000 | X | 105/ 105 | 25.000 | 19.000 | 12264.000 | NO:2 |
| Copper | 7440-50-8 | 2.6000 | 1100.000 | X | 103/ 105 | 1100.000 | 26.000 | 8176.000 | NO:2 |
| Cyanide | 57-12-5 | 0.1000 | 8.900 | D | 31/ 126 | 8.900 | | 4088.000 | NO:2 |
| Iron | 7439-89-6 | 23.0000 | 43000.000 | N | 105/ 105 | 43000.000 | 35000.000 | | NO:4 |
| Lead | 7439-92-1 | 1.6000 | 220.000 | X | 179/ 186 | 220.000 | 48.000 | | YES |
| Lithium | 7439-93-2 | 2.3000 | 26.900 | N | 31/ 31 | 26.900 | 26.000 | | YES |
| Magnesium | 7439-95-4 | 12.0000 | 116000.000 | X | 105/ 105 | 116000.000 | 40000.000 | | NO:4 |
| Manganese | 7439-96-5s | 65.2000 | 1280.000 | X | 104/ 104 | 1280.000 | 1400.000 | 7208.611 | NO:2,3 |
| Mercury | 7439-97-6 | 0.0300 | 0.650 | D | 43/ 97 | 0.650 | | 61.255 | NO:2 |
| Molybdenum | 7439-98-7 | 0.4700 | 9.700 | L | 29/ 31 | 9.700 | 27.000 | 1022.000 | NO:2,3 |
| Nickel | 7440-02-0 | 2.3000 | 247.000 | X | 157/ 158 | 247.000 | 32.000 | 4088.000 | NO:2 |
| Potassium | 7440-09-7 | 305.0000 | 5230.000 | X | 103/ 105 | 5230.000 | 1900.000 | | NO:4 |
| Selenium | 7782-49-2 | 0.4900 | 2.300 | D | 18/ 96 | 2.300 | | 1022.000 | NO:2 |
| Silver | 7440-22-4 | 0.1100 | 20.800 | D | 47/ 158 | 20.800 | 1.700 | 1022.000 | NO:2 |
| Sodium | 7440-23-5 | 41.7000 | 3450.000 | X | 100/ 105 | 3450.000 | 240.000 | | NO:4 |
| Thallium | 7440-28-0 | 0.2200 | 3.500 | D | 27/ 100 | 3.500 | 0.460 | 16.352 | NO:2 |
| Tin | 7440-31-5 | 1.1000 | 2.200 | D | 7/ 31 | 2.200 | 20.000 | 122640.000 | NO:2,3 |
| Vanadium | 7440-62-2 | 1.7000 | 40.000 | X | 105/ 105 | 40.000 | 25.000 | 1430.800 | NO:2 |
| Zinc | 7440-66-6 | 5.5000 | 463.000 | X | 105/ 105 | 463.000 | 140.000 | 61320.000 | NO:2 |
| **Pesticides (mg/kg)** | | | | | | | | | |

# Table 9: Initial Identification of Current and Future Soil COPCs for the Site Employee Scenario

(Maximum Detected Values vs. Background and RBGVs) - Table 4 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Dist. | Detection Frequency | Screening Concentration | Background Conc. | RBGV | COPC |
|---|---|---|---|---|---|---|---|---|---|
| 4,4'-DDE | 72-55-9 | 0.0003 | 0.002 | D | 7/ 85 | 0.002 | | 16.833 | NO:2 |
| Chlordane | 57-74-9 | 0.0190 | 0.098 | D | 2/ 23 | 0.098 | | | YES |
| **SVOCs (mg/kg)** | | | | | | | | | |
| Anthracene | 120-12-7 | 0.0220 | 2.800 | D | 11/ 134 | 2.800 | | 61320.000 | NO:2 |
| Benzo(a)anthracene | 56-55-3 | 0.0280 | 4.200 | D | 24/ 134 | 4.200 | | 7.839 | NO:2 |
| Benzo(a)pyrene | 50-32-8 | 0.0240 | 3.600 | D | 22/ 134 | 3.600 | | 0.784 | YES |
| Benzo(b)fluoranthene | 205-99-2 | 0.0250 | 2.800 | D | 28/ 134 | 2.800 | | 7.839 | NO:2 |
| Benzo(g,h,i)perylene | 191-24-2 | 0.0270 | 2.100 | D | 12/ 134 | 2.100 | | | YES |
| Benzo(k)fluoranthene | 207-08-9 | 0.0250 | 3.400 | D | 24/ 134 | 3.400 | | 78.390 | NO:2 |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | 0.0200 | 6.500 | D | 44/ 119 | 6.500 | | 408.800 | NO:2 |
| Chrysene | 218-01-9 | 0.0200 | 1.700 | D | 23/ 119 | 1.700 | | 783.900 | NO:2 |
| Di-n-butyl Phthalate | 84-74-2 | 0.0210 | 2.000 | D | 48/ 172 | 2.000 | | 20440.000 | NO:2 |
| Dibenzofuran | 132-64-9 | 0.0320 | 0.580 | D | 6/ 119 | 0.580 | | 817.600 | NO:2 |
| Diethyl Phthalate | 84-66-2 | 0.0390 | 0.110 | D | 6/ 119 | 0.110 | | 163520.000 | NO:2 |
| Fluoranthene | 206-44-0 | 0.0230 | 11.000 | D | 40/ 134 | 11.000 | | 8176.000 | NO:2 |
| Fluorene | 86-73-7 | 0.0380 | 1.100 | D | 7/ 134 | 1.100 | | 8176.000 | NO:2 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | 0.0250 | 1.900 | D | 14/ 134 | 1.900 | | 7.839 | NO:2 |
| Phenanthrene | 85-01-8 | 0.0270 | 11.000 | D | 25/ 134 | 11.000 | | | YES |
| Pyrene | 129-00-0 | 0.0280 | 9.700 | D | 37/ 134 | 9.700 | | 6132.000 | NO:2 |
| **VOCs (mg/kg)** | | | | | | | | | |
| 2-Butanone | 78-93-3 | 0.0010 | 0.017 | D | 7/ 86 | 0.017 | | 2712.604 | NO:2 |
| 4-Methyl-2-pentanone | 108-10-1 | 0.0010 | 0.006 | D | 5/ 86 | 0.006 | | 16352.000 | NO:2 |
| Acetone | 67-64-1 | 0.0040 | 0.150 | D | 14/ 86 | 0.150 | | 20440.000 | NO:2 |
| Dichloromethane (Methylene Chloride) | 75-09-2 | 0.0030 | 0.068 | D | 49/ 109 | 0.068 | | 20.319 | NO:2 |
| Naphthalene | 91-20-3 | 0.0010 | 0.006 | D | 3/ 6 | 0.006 | | 18.747 | NO:2 |
| Tetrachloroethene | 127-18-4 | 0.0020 | 0.028 | D | 7/ 109 | 0.028 | | 18.719 | NO:2 |
| Toluene | 108-88-3 | 0.0010 | 0.051 | D | 18/ 109 | 0.051 | | 209.164 | NO:2 |
| Xylenes, Total | 1330-20-7 | 0.0010 | 0.039 | D | 7/ 86 | 0.039 | | 408800.000 | NO:2 |
| mp-Xylene | mp-Xylene | 0.0050 | 0.006 | X | 23/ 23 | 0.006 | | 278.611 | NO:2 |
| **Radionuclides (pCi/g)** | | | | | | | | | |
| Actinium-227 | 14952-40-0 | 0.0500 | 2.110 | D | 36/ 219 | 2.110 | | 7.487 | NO:2 |
| Actinium-227 +D | 14952-40-0(+D) | 0.0500 | 2.110 | D | 36/ 219 | 2.110 | | 0.485 | YES |
| Actinium-227 long lived decay | 14952-40-0L | 0.0500 | 2.110 | D | 36/ 219 | 2.110 | | 0.485 | YES |
| Actinium-228 | 14331-83-0 | 0.7620 | 1.380 | D | 7/ 7 | 1.380 | | 0.193 | YES |

# Table 9: Initial Identification of Current and Future Soil COPCs for the Site Employee Scenario

(Maximum Detected Values vs. Background and RBGVs) - Table 4 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Dist. | Detection Frequency | Screening Concentration | Background Conc. | RBGV | COPC |
|---|---|---|---|---|---|---|---|---|---|
| Bismuth-214 | 14733-03-0 | 0.6990 | 0.926 | N | 10/ 10 | 0.926 | | 0.117 | YES |
| Cesium-137 | 10045-97-3 | 0.0211 | 1.600 | X | 258/ 461 | 1.600 | 0.420 | 70.723 | NO:2 |
| Cesium-137 +D | 10045-97-3(+D) | 0.0211 | 1.600 | X | 258/ 461 | 1.600 | 0.420 | 0.342 | YES |
| Cesium-137 long lived decay | 10045-97-3L | 0.0211 | 1.600 | X | 258/ 461 | 1.600 | 0.420 | 0.342 | YES |
| Lead-210 | 14255-04-0 | 0.6300 | 3.730 | X | 146/ 262 | 3.730 | | 1.733 | YES |
| Lead-210+D | 14255-04-0(+D) | 0.6300 | 3.730 | X | 146/ 262 | 3.730 | | 1.194 | YES |
| Lead-210 long lived decay | 14255-04-0L | 0.6300 | 3.730 | X | 146/ 262 | 3.730 | | 1.194 | YES |
| Lead-212 | 15092-94-1 | 0.8430 | 1.220 | L | 10/ 10 | 1.220 | | 1.661 | NO:2 |
| Lead-214 | 15067-28-4 | 0.8270 | 1.120 | N | 10/ 10 | 1.120 | | 0.892 | YES |
| Plutonium-238 | 13981-16-3 | 0.0122 | 396.400 | D | 592/1308 | 396.400 | 0.130 | 11.330 | YES |
| Plutonium-239 | 15117-48-3 | 0.0035 | 1.270 | X | 83/ 90 | 1.270 | 0.180 | 11.157 | NO:2 |
| Plutonium-239/240 | PU-239/240 | 0.0039 | 1.010 | D | 64/ 230 | 1.010 | 0.180 | | YES |
| Potassium-40 | 13966-00-2 | 7.4500 | 36.000 | X | 96/ 96 | 36.000 | 37.000 | 1.076 | NO:3 |
| Radium-224 | 13233-32-4 | 0.0730 | 6.270 | X | 186/ 186 | 6.270 | | 5.424 | YES |
| Radium-226 | 13982-63-3 | 0.1790 | 3.700 | X | 411/ 466 | 3.700 | 2.000 | 3.921 | NO:2 |
| Radium-226+D | 13982-63-3(+D) | 0.1790 | 3.700 | X | 411/ 466 | 3.700 | 2.000 | 0.101 | YES |
| Radium-226 long lived decay | 13982-63-3L | 0.1790 | 3.700 | X | 411/ 466 | 3.700 | 2.000 | 0.093 | YES |
| Radium-228 | 15262-20-1 | 0.5450 | 1.990 | N | 74/ 75 | 1.990 | | 1.403 | YES |
| Radium-228+D | 15262-20-1(+D) | 0.5450 | 1.990 | N | 74/ 75 | 1.990 | | 0.170 | YES |
| Radium-228 long lived decay | 15262-20-1L | 0.5450 | 1.990 | N | 74/ 75 | 1.990 | | 0.067 | YES |
| Thallium-208 | 14913-50-9 | 0.1560 | 0.401 | N | 10/ 10 | 0.401 | | 0.050 | YES |
| Thorium-227 | 15623-47-9 | 0.0600 | 0.440 | L | 17/ 33 | 0.440 | | 2.093 | NO:2 |
| Thorium-228 | 14274-82-9 | 0.0370 | 4.520 | X | 319/ 356 | 4.520 | 1.500 | 9.158 | NO:2 |
| Thorium-228+D | 14274-82-9(+D) | 0.0370 | 4.520 | X | 319/ 356 | 4.520 | 1.500 | 0.110 | YES |
| Thorium-228 long lived decay | 14274-82-9L | 0.0370 | 4.520 | X | 319/ 356 | 4.520 | 1.500 | 0.110 | YES |
| Thorium-230 | 14269-63-7 | 0.1000 | 7.510 | X | 317/ 499 | 7.510 | 1.900 | 14.979 | NO:2 |
| Thorium-230 long lived decay | 14269-63-7L | 0.1000 | 7.510 | X | 317/ 499 | 7.510 | 1.900 | 0.092 | YES |
| Thorium-232 | 7440-29-1 | 0.0450 | 80.100 | D | 675/1518 | 80.100 | 1.400 | 13.041 | YES |
| Thorium-232 long lived decay | 7440-29-1L | 0.0450 | 80.100 | D | 675/1518 | 80.100 | 1.400 | 0.066 | YES |
| Tritium | 10028-17-8p | 1.3500 | 1.350 | D | 1/ 16 | 1.350 | | 14541.469 | NO:2 |
| Uranium-234 | 13966-29-5 | 0.3890 | 1.560 | N | 25/ 29 | 1.560 | 1.100 | 19.707 | NO:2 |
| Uranium-235 | 15117-96-1 | 0.0326 | 0.210 | D | 13/ 55 | 0.210 | 0.110 | 1.559 | NO:2 |
| Uranium-235+D | 15117-96-1(+D) | 0.0326 | 0.210 | D | 13/ 55 | 0.210 | 0.110 | 1.488 | NO:2 |
| Uranium-235 long lived decay | 15117-96-1L | 0.0326 | 0.210 | D | 13/ 55 | 0.210 | 0.110 | 0.332 | NO:2 |

## Table 9: Initial Identification of Current and Future Soil COPCs for the Site Employee Scenario

(Maximum Detected Values vs. Background and RBGVs) - Table 4 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Dist. | Detection Frequency | Screening Concentration | Background Conc. | RBGV | COPC |
|---|---|---|---|---|---|---|---|---|---|
| Uranium-238 | 7440-61-1 | 0.4760 | 1.950 | X | 50/ 91 | 1.950 | 1.200 | 21.917 | NO:2 |
| Uranium-238+D | 7440-61-1(+D) | 0.4760 | 1.950 | X | 50/ 91 | 1.950 | 1.200 | 5.085 | NO:2 |
| Uranium-238 long lived decay | 7440-61-1L | 0.4760 | 1.950 | X | 50/ 91 | 1.950 | 1.200 | 0.090 | YES |

"+D" : incorporates daughter products within the risk calculations
CAS: Chemical Abstract Service
RBGV: Risk-Based Guideline Value, value is the lower of $10^{-6}$ cancer risk or 0.1 hazard index
VOC: volatile organic compound
SVOC: semivolatile organic compound
Dist.: distribution where:
N = normal, L = lognormal, D = distribution not determined due to less than 20 or less than 50% detects, and
X = significantly different from lognormal or normal distribution
COPC: Constituent of Potential Concern, evaluation based on maximum detect vs. background or RBGV
COPC = YES indicates the analyte is retained as a COPC
COPC = NO indicates analyte was screened out based on: 2 = comparison to background, 3 = comparison to RBGV, and/or 4 = analyte is an essential human nutrient

# Table 10: Final Identification of Current and Future Soil COPCs for the Site Employee Scenario

(EPC vs. Background) - Table 5 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Dist. | Detection Frequency | 95% UCL of Mean | EPC | Background Concentration | COPC |
|---|---|---|---|---|---|---|---|---|---|
| **Inorganics (mg/kg)** | | | | | | | | | |
| Arsenic | 7440-38-2 | 0.4900 | 19.500 | X | 9.9E-01 | 8.880 | 8.880 | 8.600 | YES |
| Bismuth | 7440-69-9 | 12.6000 | 72.700 | X | 26/ 36 | 104.000 | 72.700 | | YES |
| Lead | 7439-92-1 | 1.6000 | 220.000 | X | 179/ 186 | 16.700 | 16.700 | 48.000 | NO |
| Lithium | 7439-93-2 | 2.3000 | 26.900 | N | 31/ 31 | 16.600 | 16.600 | 26.000 | NO |
| **Pesticides (mg/kg)** | | | | | | | | | |
| Chlordane | 57-74-9 | 0.0190 | 0.098 | D | 2/ 23 | 0.016 | 0.016 | | YES |
| **SVOCs (mg/kg)** | | | | | | | | | |
| Benzo(a)pyrene | 50-32-8 | 0.0240 | 3.600 | D | 22/ 134 | 0.350 | 0.350 | | YES |
| Benzo(g,h,i)perylene | 191-24-2 | 0.0270 | 2.100 | D | 12/ 134 | 0.333 | 0.333 | | YES |
| Phenanthrene | 85-01-8 | 0.0270 | 11.000 | D | 25/ 134 | 0.398 | 0.398 | | YES |
| **Radionuclides (pCi/g)** | | | | | | | | | |
| Actinium-227 +D | 14952-40-0(+D) | 0.0500 | 2.110 | D | 36/ 219 | 0.354 | 0.354 | | YES |
| Actinium-227 long lived decay | 14952-40-0L | 0.0500 | 2.110 | D | 36/ 219 | 0.354 | 0.354 | | YES |
| Actinium-228 | 14331-83-0 | 0.7620 | 1.380 | D | 7/ 7 | 1.230 | 1.380 | | YES:3 |
| Bismuth-214 | 14733-03-0 | 0.6990 | 0.926 | N | 10/ 10 | 0.858 | 0.926 | | YES:2 |
| Cesium-137 +D | 10045-97-3(+D) | 0.0211 | 1.600 | X | 258/ 461 | 0.179 | 0.179 | 0.420 | NO |
| Cesium-137 long lived decay | 10045-97-3L | 0.0211 | 1.600 | X | 258/ 461 | 0.179 | 0.179 | 0.420 | NO |
| Lead-210 | 14255-04-0 | 0.6300 | 3.730 | X | 146/ 262 | 1.290 | 1.290 | | YES:2 |
| Lead-210+D | 14255-04-0(+D) | 0.6300 | 3.730 | X | 146/ 262 | 1.290 | 1.290 | | YES:2 |
| Lead-210 long lived decay | 14255-04-0L | 0.6300 | 3.730 | X | 146/ 262 | 1.290 | 1.290 | | YES:2 |
| Lead-214 | 15067-28-4 | 0.8270 | 1.120 | N | 10/ 10 | 1.030 | 1.120 | | YES:2 |
| Plutonium-238 | 13981-16-3 | 0.0122 | 396.400 | D | 592/1308 | 24.900 | 24.900 | 0.130 | YES |
| Plutonium-239/240 | PU-239/240 | 0.0039 | 1.010 | D | 64/ 230 | 0.044 | 0.044 | 0.180 | NO |
| Radium-224 | 13233-32-4 | 0.0730 | 6.270 | X | 186/ 186 | 1.260 | 1.260 | | YES:3 |
| Radium-226+D | 13982-63-3(+D) | 0.1790 | 3.700 | X | 411/ 466 | 1.250 | 1.250 | 2.000 | NO |
| Radium-226 long lived decay | 13982-63-3L | 0.1790 | 3.700 | X | 411/ 466 | 1.250 | 1.250 | 2.000 | NO |
| Radium-228 | 15262-20-1 | 0.5450 | 1.990 | N | 74/ 75 | 1.260 | 1.260 | | YES:3 |
| Radium-228+D | 15262-20-1(+D) | 0.5450 | 1.990 | N | 74/ 75 | 1.260 | 1.260 | | YES:3 |
| Radium-228 long lived decay | 15262-20-1L | 0.5450 | 1.990 | N | 74/ 75 | 1.260 | 1.260 | | YES:3 |
| Thallium-208 | 14913-50-9 | 0.1560 | 0.401 | N | 10/ 10 | 0.377 | 0.401 | | YES:3 |
| Thorium-228+D | 14274-82-9(+D) | 0.0370 | 4.520 | X | 319/ 356 | 1.700 | 1.700 | 1.500 | YES:3 |
| Thorium-228 long lived decay | 14274-82-9L | 0.0370 | 4.520 | X | 319/ 356 | 1.700 | 1.700 | 1.500 | YES:3 |
| Thorium-230 long lived decay | 14269-63-7L | 0.1000 | 7.510 | X | 317/ 499 | 2.700 | 2.700 | 1.900 | YES:2 |

## Table 10: Final Identification of Current and Future Soil COPCs for the Site Employee Scenario

(EPC vs. Background) - Table 5 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Dist. | Detection Frequency | 95% UCL of Mean | EPC | Background Concentration | COPC |
|---|---|---|---|---|---|---|---|---|---|
| Thorium-232 | 7440-29-1 | 0.0450 | 80.100 | D | 675/1518 | 0.873 | 0.873 | 1.400 | NO |
| Thorium-232 long lived decay | 7440-29-1L | 0.0450 | 80.100 | D | 675/1518 | 0.868 | 0.868 | 1.400 | YES:4 |
| Uranium-238 long lived decay | 7440-61-1L | 0.4760 | 1.950 | X | 50/ 91 | 2.030 | 1.950 | 1.200 | YES |

"+D" : incorporates daughter products within the risk calculations
CAS: Chemical Abstract Service
UCL: upper confidence limit
EPC: Exposure Point Concentration
SVOCs: semivolatile organic compounds
Dist.: distribution where:
N = normal, L = lognormal, D = distribution not determined due to less than 20 or less than 50% detects, and
X = significantly different from lognormal or normal distribution
COPC: Constituent of Potential Concern, evaluation based on EPC vs. background
COPC = YES indicates the analyte is retained as a COPC; however, will not be evaluated individually because it is included in the risk assessment as part of the long lived decay chain of Ac-227 (reference 1), U-238 (reference 2), or Th-232 (reference 3). See Appendix H for details. For reference 4, Th-232 screens out but the Th-232 long lived decay chain was retained for risk evaluation.

COPC = NO indicates analyte was screened out based on: 2 = comparison to background, 3 = comparison to RBGV, and/or 4 = analyte is an essential human nutrient

# Table 11: Initial Identification of Current Groundwater COPCs for the Construction Worker Scenario

(Maximum Detected Values vs. Background and RBGVs) - Table 6 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Detection Frequency | Screening Concentration | Background Concentration | RBGV | | COPC |
|---|---|---|---|---|---|---|---|---|---|
| **Inorganics (mg/L)** | | | | | | | | | |
| Nitrate (Mound CAS 7697-37-2) | 14797-55-8 | 0.7380 | 2.550 | 2/ 2 | 2.550 | 5.349 | 10.000 | c | NO:2,3 |
| Nitrate/Nitrite (Mound CAS 1497-55-8) | 14797-65-0 | 0.6800 | 4.900 | 11/ 11 | 4.900 | 5.349 | 1.000 | c | NO:2 |
| Aluminum | 7429-90-5 | 0.0688 | 0.148 | 6/ 22 | 0.148 | 0.038 | 10.187 | b | NO:3 |
| Antimony | 7440-36-0 | 0.0028 | 0.014 | 3/ 20 | 0.014 | 0.001 | 0.004 | b | YES |
| Barium | 7440-39-3 | 0.0750 | 0.115 | 20/ 22 | 0.115 | 0.310 | 0.713 | b | NO:2,3 |
| Cadmium | 7440-43-9w | 0.0046 | 0.008 | 5/ 25 | 0.008 | | 0.005 | c | YES |
| Calcium | 7440-70-2 | 94.3000 | 126.000 | 24/ 24 | 126.000 | 111.111 | | | NO:4 |
| Chromium | 7440-47-3 | 0.0183 | 0.024 | 5/ 25 | 0.024 | 0.006 | 0.100 | c | NO:3 |
| Chromium VI | 18540-29-9 | 0.0183 | 0.024 | 5/ 25 | 0.024 | 0.006 | 0.031 | b | NO:3 |
| Copper | 7440-50-8 | 0.0016 | 0.593 | 15/ 25 | 0.593 | 0.001 | 0.407 | b | YES |
| Iron | 7439-89-6 | 0.0190 | 1.890 | 13/ 24 | 1.890 | 4.065 | | | NO:4 |
| Lead | 7439-92-1 | 0.0034 | 0.040 | 5/ 25 | 0.040 | | | | YES |
| Lithium | 7439-93-2 | 0.0029 | 0.003 | 2/ 4 | 0.003 | 0.056 | | | NO:2 |
| Magnesium | 7439-95-4 | 29.1000 | 39.600 | 24/ 24 | 39.600 | 40.428 | | | NO:4 |
| Manganese | 7439-96-5w | 0.0028 | 0.224 | 22/ 24 | 0.224 | 0.230 | 0.479 | b | NO:2,3 |
| Molybdenum | 7439-98-7 | 0.0020 | 0.003 | 2/ 4 | 0.003 | 0.006 | 0.051 | b | NO:2,3 |
| Nickel | 7440-02-0 | 0.0021 | 0.027 | 5/ 25 | 0.027 | 0.035 | 0.204 | b | NO:2,3 |
| Potassium | 7440-09-7 | 2.3900 | 3.650 | 20/ 26 | 3.650 | 4.461 | | | NO:4 |
| Silver | 7440-22-4 | 0.0169 | 0.024 | 5/ 22 | 0.024 | | 0.051 | b | NO:3 |
| Sodium | 7440-23-5 | 46.6000 | 84.200 | 24/ 24 | 84.200 | 62.426 | | | NO:4 |
| Tin | 7440-31-5 | 0.0087 | 0.009 | 1/ 4 | 0.009 | 0.034 | 6.112 | b | NO:2,3 |
| Vanadium | 7440-62-2 | 0.0078 | 0.015 | 7/ 22 | 0.015 | 0.017 | 0.071 | b | NO:2,3 |
| Zinc | 7440-66-6 | 0.0045 | 0.058 | 9/ 25 | 0.058 | 0.120 | 3.056 | b | NO:2,3 |
| **Volatile Organic Compounds (mg/L)** | | | | | | | | | |
| 1,1,1-Trichloroethane | 71-55-6 | 0.0003 | 0.003 | 91/ 215 | 0.003 | | 0.200 | c | NO:3 |
| 1,2-Dichloroethene * | 540-59-0 | 0.0013 | 0.007 | 10/ 13 | 0.007 | | 0.070 | c | NO:3 |
| 1,2-cis-Dichloroethene | 156-59-2 | 0.0005 | 0.004 | 102/ 182 | 0.004 | | 0.070 | c | NO:3 |
| 2-Butanone | 78-93-3 | 0.0070 | 0.041 | 3/ 13 | 0.041 | | 5.111 | b | NO:3 |
| Acetone | 67-64-1 | 0.0020 | 0.012 | 6/ 11 | 0.012 | | 1.022 | b | NO:3 |
| Chloroform (Trichloromethane) | 67-66-3 | 0.0005 | 0.007 | 13/ 219 | 0.007 | | 0.035 | b | NO:3 |
| FREON-113 | 76-13-1 | 0.0020 | 0.034 | 12/ 19 | 0.034 | | 246.554 | b | NO:3 |
| Tert-butyl methyl ether | 1634-04-4 | 0.0012 | 0.002 | 4/ 24 | 0.002 | | | | YES |
| Tetrachloroethene | 127-18-4 | 0.0003 | 0.002 | 114/ 218 | 0.002 | | 0.003 | a | NO:3 |

## Table 11: Initial Identification of Current Groundwater COPCs for the Construction Worker Scenario

(Maximum Detected Values vs. Background and RBGVs) - Table 6 of the RRE

| Analyte | CAS Number | Minimum Detect | Maximum Detect | Detection Frequency | Screening Concentration | Background Concentration | RBGV | COPC |
|---|---|---|---|---|---|---|---|---|
| Trichloroethylene (TCE) | 79-01-6 | 0.0005 | 0.006 | 189/ 219 | 0.006 | | 0.001 b | YES |
| **Radionuclides (pCi/L)** | | | | | | | | |
| Bismuth-210 | 14331-79-4 | 0.1100 | 0.390 | 2/ 18 | 0.390 | | 89.686 | NO:3 |
| Plutonium-238 | 13981-16-3 | 0.0060 | 0.250 | 8/ 57 | 0.250 | 0.087 | 6.107 | NO:3 |
| Plutonium-238/239 | PU-238/239 | 0.0100 | 0.010 | 1/ 6 | 0.010 | | 5.926 | NO:3 |
| Plutonium-239/240 | PU-239/240 | 0.0018 | 2.000 | 5/ 19 | 2.000 | 0.125 | 5.926 | NO:3 |
| Radium-226 | 13982-63-3 | 0.1000 | 0.520 | 6/ 18 | 0.520 | 0.996 | 2.078 | NO:2,3 |
| Radium-226+D | 13982-63-3(+D) | 0.1000 | 0.520 | 6/ 18 | 0.520 | 0.996 | 2.073 | NO:2,3 |
| Radium-226 long lived decay | 13982-63-3L | 0.1000 | 0.520 | 6/ 18 | 0.520 | 0.996 | 0.483 | NO:2 |
| Strontium-85 | 13967-73-2 | 25.0000 | 25.000 | 1/ 2 | 25.000 | | 353.982 | NO:3 |
| Strontium-90 | 10098-97-2 | 0.5000 | 0.500 | 3/ 18 | 0.500 | | 14.311 | NO:3 |
| Thorium-227 | 15623-47-9 | 0.0110 | 0.230 | 16/ 22 | 0.230 | | 16.878 | NO:3 |
| Thorium-228 | 14274-82-9 | 0.0085 | 2.170 | 17/ 46 | 2.170 | 0.779 | 7.477 | NO:3 |
| Thorium-228+D | 14274-82-9(+D) | 0.0085 | 2.170 | 17/ 46 | 2.170 | 0.779 | 2.667 | NO:3 |
| Thorium-228 long lived decay | 14274-82-9L | 0.0085 | 2.170 | 17/ 46 | 2.170 | 0.779 | 2.667 | NO:3 |
| Thorium-230 | 14269-63-7 | 0.0075 | 1.990 | 19/ 43 | 1.990 | | 8.791 | NO:3 |
| Thorium-230 long lived decay | 14269-63-7L | 0.0075 | 1.990 | 19/ 43 | 1.990 | | 0.458 | YES |
| Thorium-232 | 7440-29-1 | 0.0025 | 0.100 | 8/ 44 | 0.100 | 0.314 | 7.921 | NO:2,3 |
| Thorium-232 long lived decay | 7440-29-1L | 0.0025 | 0.100 | 8/ 44 | 0.100 | 0.314 | 0.555 | NO:2,3 |
| Tritium | 10028-17-8w | 30.0000 | 7200.000 | 123/ 139 | 7200.000 | 1485.470 | 15544.541 | NO:3 |
| Uranium-233/234 | U-233/234 | 0.1670 | 0.361 | 36/ 36 | 0.361 | | 1.334 | NO:3 |
| Uranium-234 | 13966-29-5 | 0.2000 | 8.140 | 19/ 24 | 8.140 | 0.792 | 11.315 | NO:3 |
| Uranium-235 | 15117-96-1 | 0.0063 | 2.300 | 30/ 53 | 2.300 | 0.814 | 11.494 | NO:3 |
| Uranium-235+D | 15117-96-1(+D) | 0.0063 | 2.300 | 30/ 53 | 2.300 | 0.814 | 11.142 | NO:3 |
| Uranium-235 long lived decay | 15117-96-1L | 0.0063 | 2.300 | 30/ 53 | 2.300 | 0.814 | 1.095 | YES |
| Uranium-238 | 7440-61-1 | 0.1300 | 8.250 | 52/ 59 | 8.250 | 0.688 | 12.500 | NO:3 |
| Uranium-238+D | 7440-61-1(+D) | 0.1300 | 8.250 | 52/ 59 | 8.250 | 0.688 | 9.185 | NO:3 |
| Uranium-238 long lived decay | 7440-61-1L | 0.1300 | 8.250 | 52/ 59 | 8.250 | 0.688 | 0.420 | YES |

footnotes on next page

# Table 11: Initial Identification of Current Groundwater COPCs for the Construction Worker Scenario
footnotes

RBGV: Risk-Based Guideline Value, value is the lower of $10^{-6}$ cancer risk or 0.1 hazard index
a - carcinogen value, b - noncarcinogen value, c - maximum contaminant level (MCL)
CAS: Chemical Abstract Service
VOCs: volatile organic compounds
"+D": incorporates daughter products within the risk calculations
* 1,2-cis-dichloroethene isomer RBGV used for screening due to lack of criteria for 1,2-dichloroethene

COPC: Constituent of Potential Concern

COPC = YES indicates the analyte is retained as a COPC

COPC = NO indicates analyte was screened out based on: 2 = comparison to background, 3 = comparison to the lower of RBGV or MCL, and/or 4 = analyte is an essential human nutrient

# Table 12: Final Identification of Current Groundwater COPCs for the Construction Worker Scenario

(EPC vs. Background) - Table 7 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Detection Frequency | 95% UCL | EPC | Background Concentration | COPC |
|---|---|---|---|---|---|---|---|---|
| **Inorganics (mg/L)** | | | | | | | | |
| Antimony | 7440-36-0 | 0.0028 | 0.014 | 3/ 20 | 0.044 | 0.014 | 0.001 | YES |
| Cadmium | 7440-43-9w | 0.0046 | 0.008 | 5/ 25 | 0.007 | 0.007 | | YES |
| Copper | 7440-50-8 | 0.0016 | 0.593 | 15/ 25 | 0.042 | 0.042 | 0.001 | YES |
| Lead | 7439-92-1 | 0.0034 | 0.040 | 5/ 25 | 0.013 | 0.013 | | YES |
| **Volatile Organic Compounds (mg/L)** | | | | | | | | |
| Tert-butyl methyl ether | 1634-04-4 | 0.0012 | 0.002 | 4/ 24 | 0.001 | 0.001 | | YES |
| Trichloroethylene (TCE) | 79-01-6 | 0.0005 | 0.006 | 189/ 219 | 0.002 | 0.002 | | YES |
| **Radionuclides (pCi/L)** | | | | | | | | |
| Thorium-230 long lived decay | 14269-63-7L | 0.0075 | 1.990 | 19/ 43 | 0.476 | 0.476 | | YES:2 |
| Uranium-235 long lived decay | 15117-96-1L | 0.0063 | 2.300 | 30/ 53 | 0.466 | 0.466 | 0.814 | NO |
| Uranium-238 long lived decay | 7440-61-1L | 0.1300 | 8.250 | 52/ 59 | 0.409 | 0.409 | 0.688 | YES:5 |

EPC: exposure point concentration
UCL: upper confidence limit
CAS: Chemical Abstract Service

COPC: Constituent of Potential Concern

COPC = YES indicates the analyte is retained as a COPC; however, will not be evaluated individually because it is included in the risk assessment as part of the long lived decay chain of Ac-227 (reference 1), U-238 (reference 2), or Th-232 (reference 3). For reference 4, Th-232 screens out but the Th-232 long lived decay chain was retained for risk evaluation. For reference 5, U-238 screens out but the U-238 long lived decay chain was retained for risk evaluation.

COPC = NO indicates analyte was screened out based on: 2 = comparison to background, 3 = comparison to the lower of RBGV or MCL, and/or 4 = analyte is an essential human nutrient

# Table 13: Initial Identification of Current Groundwater COPCs for the Site Employee Scenario

(Maximum Detected Values vs. Background and RBGVs) - Table 8 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Detection Frequency | Screening Concentration | Background Concentration | RBGV | COPC |
|---|---|---|---|---|---|---|---|---|
| **Inorganics (mg/L)** | | | | | | | | |
| Nitrate (Mound CAS 7697-37-2) | 14797-55-8 | 0.7380 | 2.550 | 2/ 2 | 2.550 | 5.349 | 10.000 c | NO:2,3 |
| Nitrate/Nitrite (Mound CAS 1497-55-8) | 14797-65-0 | 0.6800 | 4.900 | 11/ 11 | 4.900 | 5.349 | 1.000 c | NO:2 |
| Aluminum | 7429-90-5 | 0.0688 | 0.148 | 6/ 22 | 0.148 | 0.038 | 10.220 b | NO:3 |
| Antimony | 7440-36-0 | 0.0028 | 0.014 | 3/ 20 | 0.014 | 0.001 | 0.004 b | YES |
| Barium | 7440-39-3 | 0.0750 | 0.115 | 20/ 22 | 0.115 | 0.310 | 0.715 b | NO:2,3 |
| Cadmium | 7440-43-9w | 0.0046 | 0.008 | 5/ 25 | 0.008 | | 0.005 c | YES |
| Calcium | 7440-70-2 | 94.3000 | 126.000 | 24/ 24 | 126.000 | 111.111 | | NO:4 |
| Chromium | 7440-47-3 | 0.0183 | 0.024 | 5/ 25 | 0.024 | 0.006 | 0.100 c | NO:3 |
| Chromium VI | 18540-29-9 | 0.0183 | 0.024 | 5/ 25 | 0.024 | 0.006 | 0.031 b | NO:3 |
| Copper | 7440-50-8 | 0.0016 | 0.593 | 15/ 25 | 0.593 | 0.001 | 0.409 b | YES |
| Iron | 7439-89-6 | 0.0190 | 1.890 | 13/ 24 | 1.890 | 4.065 | | NO:4 |
| Lead | 7439-92-1 | 0.0034 | 0.040 | 5/ 25 | 0.040 | | | YES |
| Lithium | 7439-93-2 | 0.0029 | 0.003 | 2/ 4 | 0.003 | 0.056 | | NO:2 |
| Magnesium | 7439-95-4 | 29.1000 | 39.600 | 24/ 24 | 39.600 | 40.428 | | NO:4 |
| Manganese | 7439-96-5w | 0.0028 | 0.224 | 22/ 24 | 0.224 | 0.230 | 0.480 b | NO:2,3 |
| Molybdenum | 7439-98-7 | 0.0020 | 0.003 | 2/ 4 | 0.003 | 0.006 | 0.051 b | NO:2,3 |
| Nickel | 7440-02-0 | 0.0021 | 0.027 | 5/ 25 | 0.027 | 0.035 | 0.204 b | NO:2,3 |
| Potassium | 7440-09-7 | 2.3900 | 3.650 | 20/ 26 | 3.650 | 4.461 | | NO:4 |
| Silver | 7440-22-4 | 0.0169 | 0.024 | 5/ 22 | 0.024 | | 0.051 b | NO:3 |
| Sodium | 7440-23-5 | 46.6000 | 84.200 | 24/ 24 | 84.200 | 62.426 | | NO:4 |
| Tin | 7440-31-5 | 0.0087 | 0.009 | 1/ 4 | 0.009 | 0.034 | 6.132 b | NO:2,3 |
| Vanadium | 7440-62-2 | 0.0078 | 0.015 | 7/ 22 | 0.015 | 0.017 | 0.072 b | NO:2,3 |
| Zinc | 7440-66-6 | 0.0045 | 0.058 | 9/ 25 | 0.058 | 0.120 | 3.066 b | NO:2,3 |
| **Volatile Organic Compounds (mg/L)** | | | | | | | | |
| 1,1,1-Trichloroethane | 71-55-6 | 0.0003 | 0.003 | 91/ 215 | 0.003 | | 0.200 c | NO:3 |
| 1,2-Dichloroethene * | 540-59-0 | 0.0013 | 0.007 | 10/ 13 | 0.007 | | 0.070 c | NO:3 |
| 1,2-cis-Dichloroethene | 156-59-2 | 0.0005 | 0.004 | 102/ 182 | 0.004 | | 0.070 c | NO:3 |
| 2-Butanone | 78-93-3 | 0.0070 | 0.041 | 3/ 13 | 0.041 | | 6.132 b | NO:3 |
| Acetone | 67-64-1 | 0.0020 | 0.012 | 6/ 11 | 0.012 | | 1.022 b | NO:3 |
| Chloroform (Trichloromethane) | 67-66-3 | 0.0005 | 0.007 | 13/ 219 | 0.007 | | 0.102 b | NO:3 |
| FREON-113 | 76-13-1 | 0.0020 | 0.034 | 12/ 19 | 0.034 | | 306.600 b | NO:3 |
| Tert-butyl methyl ether | 1634-04-4 | 0.0012 | 0.002 | 4/ 24 | 0.002 | | | YES |
| Tetrachloroethene | 127-18-4 | 0.0003 | 0.002 | 114/ 218 | 0.002 | | 0.005 c | NO:3 |
| Trichloroethylene (TCE) | 79-01-6 | 0.0005 | 0.006 | 189/ 219 | 0.006 | | 0.001 a | YES |
| **Radionuclides (pCi/L)** | | | | | | | | |
| Bismuth-210 | 14331-79-4 | 0.1100 | 0.390 | 2/ 18 | 0.390 | | 17.937 | NO:3 |

# Table 13: Initial Identification of Current Groundwater COPCs for the Site Employee Scenario

(Maximum Detected Values vs. Background and RBGVs) - Table 8 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Detection Frequency | Screening Concentration | Background Concentration | RBGV | COPC |
|---|---|---|---|---|---|---|---|---|
| Plutonium-238 | 13981-16-3 | 0.0060 | 0.250 | 8/ 57 | 0.250 | 0.087 | 1.221 | NO:3 |
| Plutonium-238/239 | PU-238/239 | 0.0100 | 0.010 | 1/ 6 | 0.010 | | 1.185 | NO:3 |
| Plutonium-239/240 | PU-239/240 | 0.0018 | 2.000 | 5/ 19 | 2.000 | 0.125 | 1.185 | YES |
| Radium-226 | 13982-63-3 | 0.1000 | 0.520 | 6/ 18 | 0.520 | 0.996 | 0.416 | NO:2 |
| Radium-226+D | 13982-63-3(+D) | 0.1000 | 0.520 | 6/ 18 | 0.520 | 0.996 | 0.415 | NO:2 |
| Radium-226 long lived decay | 13982-63-3L | 0.1000 | 0.520 | 6/ 18 | 0.520 | 0.996 | 0.097 | NO:2 |
| Strontium-85 | 13967-73-2 | 25.0000 | 25.000 | 1/ 2 | 25.000 | | 70.796 | NO:3 |
| Strontium-90 | 10098-97-2 | 0.5000 | 0.500 | 3/ 18 | 0.500 | | 2.862 | NO:3 |
| Thorium-227 | 15623-47-9 | 0.0110 | 0.230 | 16/ 22 | 0.230 | | 3.376 | NO:3 |
| Thorium-228 | 14274-82-9 | 0.0085 | 2.170 | 17/ 46 | 2.170 | 0.779 | 1.495 | YES |
| Thorium-228+D | 14274-82-9(+D) | 0.0085 | 2.170 | 17/ 46 | 2.170 | 0.779 | 0.533 | YES |
| Thorium-228 long lived decay | 14274-82-9L | 0.0085 | 2.170 | 17/ 46 | 2.170 | 0.779 | 0.533 | YES |
| Thorium-230 | 14269-63-7 | 0.0075 | 1.990 | 19/ 43 | 1.990 | | 1.758 | YES |
| Thorium-230 long lived decay | 14269-63-7L | 0.0075 | 1.990 | 19/ 43 | 1.990 | | 0.092 | YES |
| Thorium-232 | 7440-29-1 | 0.0025 | 0.100 | 8/ 44 | 0.100 | 0.314 | 1.584 | NO:2,3 |
| Thorium-232 long lived decay | 7440-29-1L | 0.0025 | 0.100 | 8/ 44 | 0.100 | 0.314 | 0.111 | NO:2,3 |
| Tritium | 10028-17-8w | 30.0000 | 7200.000 | 123/ 139 | 7200.000 | 1485.470 | 3155.819 | YES |
| Uranium-233/234 | U-233/234 | 0.1670 | 0.361 | 36/ 36 | 0.361 | | 0.267 | YES |
| Uranium-234 | 13966-29-5 | 0.2000 | 8.140 | 19/ 24 | 8.140 | 0.792 | 2.263 | YES |
| Uranium-235 | 15117-96-1 | 0.0063 | 2.300 | 30/ 53 | 2.300 | 0.814 | 2.299 | YES |
| Uranium-235+D | 15117-96-1(+D) | 0.0063 | 2.300 | 30/ 53 | 2.300 | 0.814 | 2.228 | YES |
| Uranium-235 long lived decay | 15117-96-1L | 0.0063 | 2.300 | 30/ 53 | 2.300 | 0.814 | 0.219 | YES |
| Uranium-238 | 7440-61-1 | 0.1300 | 8.250 | 52/ 59 | 8.250 | 0.688 | 1.100 | YES |
| Uranium-238+D | 7440-61-1(+D) | 0.1300 | 8.250 | 52/ 59 | 8.250 | 0.688 | 1.837 | YES |
| Uranium-238 long lived decay | 7440-61-1L | 0.1300 | 8.250 | 52/ 59 | 8.250 | 0.688 | 0.084 | YES |

RBGV: Risk-Based Guideline Value, value is the lower of $10^{-6}$ cancer risk or 0.1 hazard index

a - carcinogen value, b - noncarcinogen value, c - maximum contaminant level (MCL)

CAS: Chemical Abstract Service

"+D": incorporates daughter products within the risk calculations

* 1,2-cis-dichloroethene isomer RBGV used for screening due to lack of criteria for 1,2-dichloroethene

COPC: Constituent of Potential Concern

COPC = YES indicates the analyte is retained as a COPC

COPC = NO indicates analyte was screened out based on: 2 = comparison to background, 3 = comparison to the lower of RBGV or MCL, and/or 4 = analyte is an essential human nutrient

# Table 14: Final Identification of Current Groundwater COPCs for the Site Employee Scenario

(EPC vs. Background) - Table 9 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Detection Frequency | 95% UCL | EPC | Background Concentration | COPC |
|---|---|---|---|---|---|---|---|---|
| **Inorganics (mg/L)** | | | | | | | | |
| Antimony | 7440-36-0 | 0.0028 | 0.014 | 3/ 20 | 0.0436 | 0.0144 | 0.0006 | YES |
| Cadmium | 7440-43-9w | 0.0046 | 0.008 | 5/ 25 | 0.0066 | 0.0066 | | YES |
| Copper | 7440-50-8 | 0.0016 | 0.593 | 15/ 25 | 0.0416 | 0.0416 | 0.0012 | YES |
| Lead | 7439-92-1 | 0.0034 | 0.040 | 5/ 25 | 0.0130 | 0.0130 | | YES |
| **Volatile Organic Compounds (mg/L)** | | | | | | | | |
| Tert-butyl methyl ether | 1634-04-4 | 0.0012 | 0.002 | 4/ 24 | 0.0006 | 0.0006 | | YES |
| Trichloroethylene (TCE) | 79-01-6 | 0.0005 | 0.006 | 189/ 219 | 0.0023 | 0.0023 | | YES |
| **Radionuclides (pCi/L)** | | | | | | | | |
| Plutonium-239/240 | PU-239/240 | 0.0018 | 2.000 | 5/ 19 | 9.6400 | 2.0000 | 0.1250 | YES |
| Thorium-228 | 14274-82-9 | 0.0085 | 2.170 | 17/ 46 | 25.6000 | 2.1700 | 0.7790 | YES:3 |
| Thorium-228+D | 14274-82-9(+D) | 0.0085 | 2.170 | 17/ 46 | 25.6000 | 2.1700 | 0.7790 | YES:3 |
| Thorium-228 long lived decay | 14274-82-9L | 0.0085 | 2.170 | 17/ 46 | 25.6000 | 2.1700 | 0.7790 | YES:3 |
| Thorium-230 | 14269-63-7 | 0.0075 | 1.990 | 19/ 43 | 0.4760 | 0.4760 | | YES:2 |
| Thorium-230 long lived decay | 14269-63-7L | 0.0075 | 1.990 | 19/ 43 | 0.4760 | 0.4760 | | YES:2 |
| Thorium-232 long lived decay | 7440-29-1L | 0.0025 | 0.100 | 8/ 44 | 0.3380 | 0.1000 | 0.3140 | YES:4 |
| Tritium | 10028-17-8w | 30.0000 | 7200.000 | 123/ 139 | 799.0000 | 799.0000 | 1485.4700 | NO |
| Uranium-233/234 | U-233/234 | 0.1670 | 0.361 | 36/ 36 | 0.2460 | 0.2460 | | YES |
| Uranium-234 | 13966-29-5 | 0.2000 | 8.140 | 19/ 24 | 2.0200 | 2.0200 | 0.7920 | YES:2 |
| Uranium-235 | 15117-96-1 | 0.0063 | 2.300 | 30/ 53 | 0.4660 | 0.4660 | 0.8140 | NO |
| Uranium-235+D | 15117-96-1(+D) | 0.0063 | 2.300 | 30/ 53 | 0.4660 | 0.4660 | 0.8140 | NO |
| Uranium-235 long lived decay | 15117-96-1L | 0.0063 | 2.300 | 30/ 53 | 0.4660 | 0.4660 | 0.8140 | NO |
| Uranium-238 | 7440-61-1 | 0.1300 | 8.250 | 52/ 59 | 0.4090 | 0.4090 | 0.6880 | NO |
| Uranium-238+D | 7440-61-1(+D) | 0.1300 | 8.250 | 52/ 59 | 0.4090 | 0.4090 | 0.6880 | NO |
| Uranium-238 long lived decay | 7440-61-1L | 0.1300 | 8.250 | 52/ 59 | 0.4090 | 0.4090 | 0.6880 | YES:5 |

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# Table 14: Final Identification of Current Groundwater COPCs for the Site Employee Scenario

footnotes

"+D" - incorporates daughter products within the risk calculations
EPC: exposure point concentration
UCL: upper confidence limit
CAS: Chemical Abstract Service
COPC: Constituent of Potential Concern
COPC = YES indicates the analyte is retained as a COPC; however, will not be evaluated individually because it is included in the risk assessment as part of the long lived decay chain of Ac-227 (reference 1), U-238 (reference 2), or Th-232 (reference 3). See Appendix H for details. For reference 4, Th-232 screens out but the Th-232 long lived decay chain was retained for risk evaluation. For reference 5, U-238 screens out but the U-238 long lived decay chain was retained for risk evaluation.
COPC = NO indicates analyte was screened out based on: 2 = comparison to background, 3 = comparison to the lower of RBGV or MCL, and/or 4 = analyte is an essential human nutrient

# Table 15: Initial Identification of Future Groundwater COPCs for the Construction Worker Scenario

(Maximum Detected Values in Bedrock vs. Background and RBGV) - Table 10 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Detection Frequency | Screening Concentration | Background Concentration | RBGV | | COPC |
|---|---|---|---|---|---|---|---|---|---|
| **Inorganics (mg/L)** | | | | | | | | | |
| Aluminum | 7429-90-5 | 0.0121 | 31.5000 | 141/ 151 | 31.500 | 0.038 | 10.187 | b | YES |
| Antimony | 7440-36-0 | 0.0004 | 0.0416 | 47/ 158 | 0.042 | 0.001 | 0.004 | b | YES |
| Arsenic | 7440-38-2 | 0.0003 | 0.9330 | 35/ 150 | 0.933 | 0.033 | 0.001 | a | YES |
| Barium | 7440-39-3 | 0.0176 | 3.1200 | 148/ 150 | 3.120 | 0.310 | 0.713 | b | YES |
| Beryllium | 7440-41-7 | 0.0000 | 0.0023 | 56/ 151 | 0.002 | | 0.004 | c | NO:3 |
| Bismuth | 7440-69-9 | 0.0008 | 0.2640 | 29/ 139 | 0.264 | | | | YES |
| Boron | 7440-42-8 | 0.0570 | 0.1290 | 7/ 8 | 0.129 | | 0.917 | b | NO:3 |
| Cadmium | 7440-43-9w | 0.0001 | 0.0131 | 17/ 161 | 0.013 | | 0.005 | c | YES |
| Calcium | 7440-70-2 | 0.1160 | 1510.0000 | 198/ 198 | 1510.000 | 111.111 | | | NO:4 |
| Chromium | 7440-47-3 | 0.0002 | 44.8000 | 106/ 155 | 44.800 | 0.006 | 0.100 | c | YES |
| Cobalt | 7440-48-4 | 0.0003 | 0.2950 | 63/ 151 | 0.295 | | 0.611 | b | NO:3 |
| Copper | 7440-50-8 | 0.0004 | 0.5140 | 118/ 153 | 0.514 | 0.001 | 0.407 | b | YES |
| Cyanide | 57-12-5 | 0.0055 | 0.0142 | 3/ 46 | 0.014 | | 0.200 | b | NO:3 |
| Iron | 7439-89-6 | 0.0002 | 192.0000 | 186/ 199 | 192.000 | 4.065 | | | NO:4 |
| Lead | 7439-92-1 | 0.0004 | 0.0404 | 62/ 162 | 0.040 | | | | YES |
| Lithium | 7439-93-2 | 0.0117 | 4.5900 | 123/ 138 | 4.590 | 0.056 | | | YES |
| Magnesium | 7439-95-4 | 0.0269 | 719.0000 | 199/ 199 | 719.000 | 40.428 | | | NO:4 |
| Manganese | 7439-96-5w | 0.0000 | 3.0300 | 190/ 199 | 3.030 | 0.230 | 0.479 | b | YES |
| Molybdenum | 7439-98-7 | 0.0004 | 0.4740 | 82/ 134 | 0.474 | 0.006 | 0.051 | b | YES |
| Nickel | 7440-02-0 | 0.0004 | 11.6000 | 114/ 154 | 11.600 | 0.035 | 0.204 | b | YES |
| Nitrate | 14797-55-8 | 0.1700 | 9.4000 | 5/ 10 | 9.400 | 5.349 | 10.000 | c | NO:3 |
| Nitrate/Nitrite | 14797-65-0nn | 0.0063 | 20.0000 | 76/ 113 | 20.000 | 5.349 | 1.000 | c | YES |
| Nitrite | 14797-65-0 | 0.0100 | 0.0700 | 2/ 21 | 0.070 | | 1.000 | c | NO:3 |
| Potassium | 7440-09-7 | 0.0021 | 214.0000 | 186/ 200 | 214.000 | 4.461 | | | NO:4 |
| Selenium | 7782-49-2 | 0.0013 | 0.0091 | 11/ 149 | 0.009 | | 0.050 | c | NO:3 |
| Silver | 7440-22-4 | 0.0002 | 0.0294 | 13/ 153 | 0.029 | | 0.051 | b | NO:3 |
| Sodium | 7440-23-5 | 0.0682 | 7270.0000 | 197/ 197 | 7270.000 | 62.426 | | | NO:4 |
| Thallium | 7440-28-0 | 0.0011 | 0.0069 | 10/ 147 | 0.007 | | 0.001 | b | YES |
| Tin | 7440-31-5 | 0.0014 | 0.3572 | 29/ 136 | 0.357 | 0.034 | 6.112 | b | NO:3 |
| Vanadium | 7440-62-2 | 0.0002 | 0.2770 | 72/ 151 | 0.277 | 0.017 | 0.071 | b | YES |
| Zinc | 7440-66-6 | 0.0006 | 0.3990 | 114/ 153 | 0.399 | 0.120 | 3.056 | b | NO:3 |
| **SVOCs (mg/L)** | | | | | | | | | |

# Table 15: Initial Identification of Future Groundwater COPCs for the Construction Worker Scenario

(Maximum Detected Values in Bedrock vs. Background and RBGV) - Table 10 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Detection Frequency | Screening Concentration | Background Concentration | RBGV | | COPC |
|---|---|---|---|---|---|---|---|---|---|
| Bis(2-ethylhexyl)phthalate | 117-81-7 | 0.0010 | 0.9500 | 12/ 66 | 0.950 | | 0.006 | c | YES |
| Di-n-butyl Phthalate | 84-74-2 | 0.0006 | 0.0030 | 5/ 65 | 0.003 | | 0.409 | b | NO:3 |
| **VOCs (mg/L)** | | | | | | | | | |
| 1,1,1-Trichloroethane | 71-55-6 | 0.0004 | 0.0070 | 20/ 264 | 0.007 | | 0.200 | c | NO:3 |
| 1,2-Dichloroethene * | 540-59-0 | 0.0018 | 0.0350 | 10/ 33 | 0.035 | | 0.070 | c | NO:3 |
| 1,2-cis-Dichloroethene | 156-59-2 | 0.0009 | 0.0170 | 46/ 166 | 0.017 | | 0.070 | c | NO:3 |
| 2-Butanone | 78-93-3 | 0.0060 | 0.0650 | 12/ 130 | 0.065 | | 5.111 | b | NO:3 |
| Acetone | 67-64-1 | 0.0010 | 0.0170 | 23/ 75 | 0.017 | | 1.022 | b | NO:3 |
| Bromochloromethane | 74-97-5 | 0.0260 | 0.0260 | 1/ 1 | 0.026 | | | | YES |
| Dichloromethane (Methylene Chloride) | 75-09-2 | 0.0010 | 0.6100 | 46/ 264 | 0.610 | | 0.005 | c | YES |
| Fluorobenzene | 462-06-6 | 0.0390 | 0.0390 | 1/ 1 | 0.039 | | | | YES |
| O-Chloroflurobenzene | 348-51-6 | 0.0320 | 0.0320 | 1/ 1 | 0.032 | | | | YES |
| Tetrachloroethene | 127-18-4 | 0.0003 | 0.0250 | 50/ 264 | 0.025 | | 0.003 | a | YES |
| Trichloroethylene (TCE) | 79-01-6 | 0.0006 | 0.0460 | 139/ 273 | 0.046 | | 0.005 | c | YES |
| **Radionuclides (pCi/L)** | | | | | | | | | |
| Americium-241 | 14596-10-2 | 0.0675 | 0.1650 | 6/ 43 | 0.165 | 0.139 | 7.692 | | NO:3 |
| Plutonium-238 | 13981-16-3 | 0.0090 | 1.8700 | 8/ 62 | 1.870 | 0.087 | 6.107 | | NO:3 |
| Plutonium-239/240 | PU-239/240 | 0.0030 | 0.1820 | 12/ 52 | 0.182 | 0.125 | 5.926 | | NO:3 |
| Plutonium-242 | 13982-10-0 | 0.1110 | 0.1110 | 1/ 2 | 0.111 | | 6.250 | | NO:3 |
| Potassium-40 | 13966-00-2 | 129.0000 | 258.0000 | 5/ 54 | 258.000 | | 32.389 | | YES |
| Radium-226 | 13982-63-3 | 0.1260 | 39.4700 | 50/ 66 | 39.470 | 0.996 | 2.078 | | YES |
| Radium-226 +D | 13982-63-3(+D) | 0.1260 | 39.4700 | 50/ 66 | 39.470 | 0.996 | 2.073 | | YES |
| Radium-226 long lived decay | 13982-63-3L | 0.1260 | 39.4700 | 50/ 66 | 39.470 | 0.996 | 0.483 | | YES |
| Radium-228 | 15262-20-1 | 0.5710 | 16.8000 | 8/ 8 | 16.800 | | 0.769 | | YES |
| Radium-228 +D | 15262-20-1(+D) | 0.5710 | 16.8000 | 8/ 8 | 16.800 | | 0.769 | | YES |
| Radium-228 long lived decay | 15262-20-1L | 0.5710 | 16.8000 | 8/ 8 | 16.800 | | 0.597 | | YES |
| Strontium-90 | 10098-97-2 | 0.7480 | 42.4000 | 8/ 57 | 42.400 | 0.975 | 14.311 | | YES |
| Thorium-227 | 15623-47-9 | 0.0580 | 0.0580 | 1/ 5 | 0.058 | | 16.878 | | NO:3 |
| Thorium-228 | 14274-82-9 | 0.0200 | 8.5000 | 42/ 57 | 8.500 | 0.779 | 7.477 | | YES |
| Thorium-228+D | 14274-82-9(+D) | 0.0200 | 8.5000 | 42/ 57 | 8.500 | 0.779 | 2.667 | | YES |
| Thorium-228 long lived decay | 14274-82-9L | 0.0200 | 8.5000 | 42/ 57 | 8.500 | 0.779 | 2.667 | | YES |
| Thorium-230 | 14269-63-7 | 0.0044 | 4.0700 | 45/ 59 | 4.070 | | 8.791 | | NO:3 |
| Thorium-230 long lived decay | 14269-63-7L | 0.0044 | 4.0700 | 45/ 59 | 4.070 | | 0.458 | | YES |
| Thorium-232 | 7440-29-1 | 0.0005 | 2.1100 | 33/ 66 | 2.110 | 0.314 | 7.921 | | NO:3 |
| Thorium-232 long lived decay | 7440-29-1L | 0.0011 | 2.1100 | 32/ 66 | 2.110 | 0.314 | 0.555 | | YES |

# Table 15: Initial Identification of Future Groundwater COPCs for the Construction Worker Scenario

(Maximum Detected Values in Bedrock vs. Background and RBGV) - Table 10 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Detection Frequency | Screening Concentration | Background Concentration | RBGV | COPC |
|---|---|---|---|---|---|---|---|---|
| Tritium | 10028-17-8w | 2.9500 | 2816310.0000 | 4473/4488 | 2816310.000 | 1485.470 | 15544.541 | YES |
| Uranium-233 | 13968-55-3 | 0.0272 | 16.1200 | 3/ 3 | 16.120 | | 11.142 | YES |
| Uranium-233 long lived decay | 13968-55-3L | 0.0272 | 16.1200 | 3/ 3 | 16.120 | | 1.334 | YES |
| Uranium-233/234 | U-233/234 | 0.1540 | 0.9280 | 5/ 5 | 0.928 | | 1.334 | NO:3 |
| Uranium-234 | 13966-29-5 | 0.0330 | 66.9000 | 61/ 70 | 66.900 | 0.792 | 11.315 | YES |
| Uranium-235 | 15117-96-1 | 0.0078 | 8.2500 | 20/ 43 | 8.250 | 0.814 | 11.494 | NO:3 |
| Uranium-235+D | 15117-96-1(+D) | 0.0078 | 8.2500 | 20/ 43 | 8.250 | 0.814 | 11.142 | NO:3 |
| Uranium-235 long lived decay | 15117-96-1L | 0.0078 | 8.2500 | 20/ 43 | 8.250 | 0.814 | 1.095 | YES |
| Uranium-235/236 | U-235/236 | 0.0373 | 0.0471 | 2/ 26 | 0.047 | | 1.095 | NO:3 |
| Uranium-238 | 7440-61-1 | 0.0290 | 6.5800 | 59/ 77 | 6.580 | 0.688 | 12.500 | NO:3 |
| Uranium-238+D | 7440-61-1(+D) | 0.0290 | 6.5800 | 59/ 77 | 6.580 | 0.688 | 9.185 | NO:3 |
| Uranium-238 long lived decay | 7440-61-1L | 0.0290 | 6.5800 | 59/ 77 | 6.580 | 0.688 | 0.420 | YES |

* used cis-1,2-dichloroethene values for screening due to lack of toxicity criteria
'+D' incorporates daughter products
CAS: Chemical Abstract Service
SVOCs: semivolatile organic compounds
VOCs: volatile organic compounds

RBGV: Risk-Based Guideline Value, value is the lower of $10^{-6}$ cancer risk or 0.1 hazard index
a - carcinogen value
b - noncarcinogen value
c - maximum contaminant level (MCL)

COPC: Constituent of Potential Concern, evaluation based on maximum detect vs. background or RBGV
COPC = YES indicates the analyte is retained as a COPC
COPC = NO indicates analyte was screened out based on: 2 = comparison to background, 3 = comparison to RBGV, and/or 4 = analyte is an essential human nutrient

# Table 16: Final Identification of Future Groundwater COPCs for the Construction Worker Scenario

(Modeled Concentration vs. Background) - Table 11 of the RRE

| Analyte (unit) | CAS Number | Future Modeled Screening Concentration | Background Concentration | COPC |
|---|---|---|---|---|
| **Metals (mg/L)** | | | | |
| Aluminum | 7429-90-5 | 2.0238 | 0.038 | YES |
| Antimony | 7440-36-0 | 0.0184 | 0.001 | YES |
| Arsenic | 7440-38-2 | 0.0184 | 0.033 | NO |
| Barium | 7440-39-3 | 0.1829 | 0.310 | NO |
| Bismuth | 7440-69-9 | 0.0241 | | YES |
| Cadmium | 7440-43-9w | 0.0080 | | YES |
| Chromium | 7440-47-3 | 0.9642 | 0.006 | YES |
| Copper | 7440-50-8 | 0.0557 | 0.001 | YES |
| Lead | 7439-92-1 | 0.0194 | | YES |
| Lithium | 7439-93-2 | 0.1510 | 0.056 | YES |
| Manganese | 7439-96-5w | 0.2154 | 0.230 | NO |
| Molybdenum | 7439-98-7 | 0.0149 | 0.006 | YES |
| Nickel | 7440-02-0 | 0.2779 | 0.035 | YES |
| Nitrate/Nitrite | 14797-65-0nn | 6.5098 | 5.3490 | YES |
| Thallium | 7440-28-0 | 0.0036 | | YES |
| Vanadium | 7440-62-2 | 0.0257 | 0.017 | YES |
| **SVOCs (mg/L)** | | | | |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | 0.0176 | | YES |
| **VOCs (mg/L)** | | | | |
| Bromochloromethane | 74-97-5 | 0.0058 | | YES |
| Dichloromethane (Methylene Chloride) | 75-09-2 | 0.0154 | | YES |
| Fluorobenzene | 462-06-6 | 0.0087 | | YES |
| O-Chloroflurobenzene | 348-51-6 | 0.0072 | | YES |
| Tetrachloroethene | 127-18-4 | 0.0015 | | YES |
| Tert-butyl methyl ether | 1634-04-4 | 0.0006 | | YES |
| Trichloroethylene (TCE) | 79-01-6 | 0.0039 | | YES |
| **Radionuclides (pCi/L)** | | | | |
| Plutonium-238 | 13981-16-3 | 0.2587 | 0.087 | YES |
| Potassium-40 | 13966-00-2 | 48.3052 | | YES |
| Radium-226 | 13982-63-3 | 1.6849 | 0.996 | YES:2 |
| Radium-226 +D | 13982-63-3(+D) | 1.6849 | 0.996 | YES:2 |
| Radium-226 long lived decay | 13982-63-3L | 1.6849 | 0.996 | YES:2 |
| Radium-228 | 15262-20-1 | 0.4179 | | YES:3 |
| Radium-228 +D | 15262-20-1(+D) | 0.4179 | | YES:3 |
| Radium-228 long lived decay | 15262-20-1L | 0.4179 | | YES:3 |
| Strontium-90 | 10098-97-2 | 1.4173 | 0.975 | YES |
| Thorium-228 | 14274-82-9 | 77.5034 | 0.779 | YES:3 |
| Thorium-228+D | 14274-82-9(+D) | 77.5034 | 0.779 | YES:3 |
| Thorium-228 long lived decay | 14274-82-9L | 77.5034 | 0.779 | YES:3 |
| Thorium-230 | 14269-63-7 | 0.6202 | | YES:2 |
| Thorium-230 long lived decay | 14269-63-7L | 0.6202 | | YES:2 |
| Thorium-232 | 7440-29-1 | 0.1803 | 0.314 | NO |
| Thorium-232 long lived decay | 7440-29-1L | 0.1803 | 0.314 | YES:4 |

## Table 16: Final Identification of Future Groundwater COPCs for the Construction Worker Scenario

(Modeled Concentration vs. Background) - Table 11 of the RRE

| Analyte (unit) | CAS Number | Future Modeled Screening Concentration | Background Concentration | COPC |
|---|---|---|---|---|
| Tritium | 10028-17-8w | 66797.9574 | 1485.470 | YES |
| Uranium-233 | 13968-55-3 | 1.3619 | | YES:6 |
| Uranium-233 long lived decay | 13968-55-3L | 1.3619 | | YES |
| Uranium-234 | 13966-29-5 | 2.6013 | 0.792 | YES:2 |
| Uranium-235 | 15117-96-1 | 2.1485 | 0.814 | YES:7 |
| Uranium-235+D | 15117-96-1(+D) | 2.1485 | 0.814 | YES:7 |
| Uranium-235 long lived decay | 15117-96-1L | 2.1485 | 0.814 | YES |
| Uranium-235/236 | U-235/236 | 0.0184 | | YES:7 |
| Uranium-238 | 7440-61-1 | 0.5524 | 0.688 | NO |
| Uranium-238+D | 7440-61-1(+D) | 0.5524 | 0.688 | NO |
| Uranium-238 long lived decay | 7440-61-1L | 0.5524 | 0.688 | YES:5 |

'+D' incorporates daughter products
CAS: Chemical Abstract Service
VOCs: volatile organic compounds
SVOCs: semivolatile organic compounds

COPC = YES indicates the analyte is retained as a COPC; however, will not be evaluated individually because it i included in the risk assessment as part of the long lived decay chain of Ac-227 (reference 1), U-238 (reference 2) or Th-232 (reference 3). For reference 4, Th-232 screens out but the Th-232 long lived decay chain was retained for risk evaluation. For reference 5, U-238 screens out but the U-238 long lived decay chain was retained for risk evaluation. Analyte is retained as a COPC; however, will not be evaluated individually because it is included in the risk assessment as part of the long lived decay chain of U-233 (reference 6) and U-235 (reference 7).

COPC = NO indicates analyte was screened out based on: 2 = comparison to background, 3 = comparison to the lower of RBGV or MCL, and/or 4 = analyte is an essential human nutrient

# Table 17: Initial Identification of Future Groundwater COPCs for the Site Employee Scenario

(Maximum Detected Values in Bedrock vs. Background and RBGVs) - Table 12 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Detection Frequency | Screening Concentration | Background Concentration | RBGV | | COPC |
|---|---|---|---|---|---|---|---|---|---|
| **Inorganics (mg/L)** | | | | | | | | | |
| Aluminum | 7429-90-5 | 0.0121 | 31.500 | 141/ 151 | 31.500 | 0.0375 | 10.2200 | b | YES |
| Antimony | 7440-36-0 | 0.0004 | 0.042 | 47/ 158 | 0.042 | 0.0006 | 0.0041 | b | YES |
| Arsenic | 7440-38-2 | 0.0003 | 0.933 | 35/ 150 | 0.933 | 0.0330 | 0.0002 | a | YES |
| Barium | 7440-39-3 | 0.0176 | 3.120 | 148/ 150 | 3.120 | 0.3102 | 0.7154 | b | YES |
| Beryllium | 7440-41-7 | 0.0000 | 0.002 | 56/ 151 | 0.002 | | 0.0040 | c | NO:3 |
| Bismuth | 7440-69-9 | 0.0008 | 0.264 | 29/ 139 | 0.264 | | | | YES |
| Boron | 7440-42-8 | 0.0570 | 0.129 | 7/ 8 | 0.129 | | 0.9198 | b | NO:3 |
| Cadmium | 7440-43-9w | 0.0001 | 0.013 | 17/ 161 | 0.013 | | 0.0050 | c | YES |
| Calcium | 7440-70-2 | 0.1160 | 1510.000 | 198/ 198 | 1510.000 | 111.1107 | | | NO:4 |
| Chromium | 7440-47-3 | 0.0002 | 44.800 | 106/ 155 | 44.800 | 0.0061 | 0.1000 | c | YES |
| Cobalt | 7440-48-4 | 0.0003 | 0.295 | 63/ 151 | 0.295 | | 0.6132 | b | NO:3 |
| Copper | 7440-50-8 | 0.0004 | 0.514 | 118/ 153 | 0.514 | 0.0012 | 0.4088 | b | YES |
| Cyanide | 57-12-5 | 0.0055 | 0.014 | 3/ 46 | 0.014 | | 0.2044 | b | NO:3 |
| Iron | 7439-89-6 | 0.0002 | 192.000 | 186/ 199 | 192.000 | 4.0649 | | | NO:4 |
| Lead | 7439-92-1 | 0.0004 | 0.040 | 62/ 162 | 0.040 | | | | YES |
| Lithium | 7439-93-2 | 0.0117 | 4.590 | 123/ 138 | 4.590 | 0.0557 | | | YES |
| Magnesium | 7439-95-4 | 0.0269 | 719.000 | 199/ 199 | 719.000 | 40.4281 | | | NO:4 |
| Manganese | 7439-96-5w | 0.0000 | 3.030 | 190/ 199 | 3.030 | 0.2296 | 0.4803 | b | YES |
| Molybdenum | 7439-98-7 | 0.0004 | 0.474 | 82/ 134 | 0.474 | 0.0056 | 0.0511 | b | YES |
| Nickel | 7440-02-0 | 0.0004 | 11.600 | 114/ 154 | 11.600 | 0.0350 | 0.2044 | b | YES |
| Nitrate | 14797-55-8 | 0.1700 | 9.400 | 5/ 10 | 9.400 | 5.3490 | 10.0000 | c | NO:3 |
| Nitrate/Nitrite | 14797-65-0nn | 0.0063 | 20.000 | 76/ 113 | 20.000 | 5.3490 | 1.0000 | c | YES |
| Nitrite | 14797-65-0 | 0.0100 | 0.070 | 2/ 21 | 0.070 | | 1.0000 | c | NO:3 |
| Potassium | 7440-09-7 | 0.0021 | 214.000 | 186/ 200 | 214.000 | 4.4611 | | | NO:4 |
| Selenium | 7782-49-2 | 0.0013 | 0.009 | 11/ 149 | 0.009 | | 0.0500 | c | NO:3 |
| Silver | 7440-22-4 | 0.0002 | 0.029 | 13/ 153 | 0.029 | | 0.0511 | b | NO:3 |
| Sodium | 7440-23-5 | 0.0682 | 7270.000 | 197/ 197 | 7270.000 | 62.4256 | | | NO:4 |
| Thallium | 7440-28-0 | 0.0011 | 0.007 | 10/ 147 | 0.007 | | 0.0008 | b | YES |
| Tin | 7440-31-5 | 0.0014 | 0.357 | 29/ 136 | 0.357 | 0.0344 | 6.1320 | b | NO:3 |
| Vanadium | 7440-62-2 | 0.0002 | 0.277 | 72/ 151 | 0.277 | 0.0171 | 0.0715 | b | YES |
| Zinc | 7440-66-6 | 0.0006 | 0.399 | 114/ 153 | 0.399 | 0.1196 | 3.0660 | b | NO:3 |
| **SVOCs (mg/L)** | | | | | | | | | |

# Table 17: Initial Identification of Future Groundwater COPCs for the Site Employee Scenario

(Maximum Detected Values in Bedrock vs. Background and RBGVs) - Table 12 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Detection Frequency | Screening Concentration | Background Concentration | RBGV | | COPC |
|---|---|---|---|---|---|---|---|---|---|
| Bis(2-ethylhexyl)phthalate | 117-81-7 | 0.0010 | 0.950 | 12/ 66 | 0.950 | | 0.0060 | c | YES |
| Di-n-butyl Phthalate | 84-74-2 | 0.0006 | 0.003 | 5/ 65 | 0.003 | | 1.0220 | b | NO:3 |
| **VOCs (mg/L)** | | | | | | | | | |
| 1,1,1-Trichloroethane | 71-55-6 | 0.0004 | 0.007 | 20/ 264 | 0.007 | | 0.2000 | c | NO:3 |
| 1,2-Dichloroethene * | 540-59-0 | 0.0018 | 0.035 | 10/ 33 | 0.035 | | 0.0700 | c | NO:3 |
| 1,2-cis-Dichloroethene | 156-59-2 | 0.0009 | 0.017 | 46/ 166 | 0.017 | | 0.0700 | c | NO:3 |
| 2-Butanone | 78-93-3 | 0.0060 | 0.065 | 12/ 130 | 0.065 | | 6.1320 | b | NO:3 |
| Acetone | 67-64-1 | 0.0010 | 0.017 | 23/ 75 | 0.017 | | 1.0220 | b | NO:3 |
| Bromochloromethane | 74-97-5 | 0.0260 | 0.026 | 1/ 1 | 0.026 | | | | YES |
| Dichloromethane (Methylene Chloride) | 75-09-2 | 0.0010 | 0.610 | 46/ 264 | 0.610 | | 0.0050 | c | YES |
| Fluorobenzene | 462-06-6 | 0.0390 | 0.039 | 1/ 1 | 0.039 | | | | YES |
| O-Chloroflurobenzene | 348-51-6 | 0.0320 | 0.032 | 1/ 1 | 0.032 | | | | YES |
| Tetrachloroethene | 127-18-4 | 0.0003 | 0.025 | 50/ 264 | 0.025 | | 0.0050 | c | YES |
| Trichloroethylene (TCE) | 79-01-6 | 0.0006 | 0.046 | 139/ 273 | 0.046 | | 0.0050 | c | YES |
| **Radionuclides (pCi/L)** | | | | | | | | | |
| Americium-241 | 14596-10-2 | 0.0675 | 0.165 | 6/ 43 | 0.165 | 0.1390 | 1.5385 | | NO:3 |
| Plutonium-238 | 13981-16-3 | 0.0090 | 1.870 | 8/ 62 | 1.870 | 0.0870 | 1.2214 | | YES |
| Plutonium-239/240 | PU-239/240 | 0.0030 | 0.182 | 12/ 52 | 0.182 | 0.1250 | 1.1852 | | NO:3 |
| Potassium-40 | 13966-00-2 | 129.0000 | 258.000 | 5/ 54 | 258.000 | | 6.4777 | | YES |
| Radium-226 | 13982-63-3 | 0.1260 | 39.470 | 50/ 66 | 39.470 | 0.9960 | 0.4156 | | YES |
| Radium-226 +D | 13982-63-3(+D) | 0.1260 | 39.470 | 50/ 66 | 39.470 | 0.9960 | 0.4145 | | YES |
| Radium-226 long lived decay | 13982-63-3L | 0.1260 | 39.470 | 50/ 66 | 39.470 | 0.9960 | 0.0966 | | YES |
| Radium-228 | 15262-20-1 | 0.5710 | 16.800 | 8/ 8 | 16.800 | | 0.1538 | | YES |
| Radium-228 +D | 15262-20-1(+D) | 0.5710 | 16.800 | 8/ 8 | 16.800 | | 0.1538 | | YES |
| Radium-228 long lived decay | 15262-20-1L | 0.5710 | 16.800 | 8/ 8 | 16.800 | | 0.1194 | | YES |
| Strontium-90 | 10098-97-2 | 0.7480 | 42.400 | 8/ 57 | 42.400 | 0.9750 | 2.8623 | | YES |
| Thorium-227 | 15623-47-9 | 0.0580 | 0.058 | 1/ 5 | 0.058 | | 3.3755 | | NO:3 |
| Thorium-228 | 14274-82-9 | 0.0200 | 8.500 | 42/ 57 | 8.500 | 0.7790 | 1.4953 | | YES |
| Thorium-228+D | 14274-82-9(+D) | 0.0200 | 8.500 | 42/ 57 | 8.500 | 0.7790 | 0.5333 | | YES |
| Thorium-228 long lived decay | 14274-82-9L | 0.0200 | 8.500 | 42/ 57 | 8.500 | 0.7790 | 0.5333 | | YES |
| Thorium-230 | 14269-63-7 | 0.0044 | 4.070 | 45/ 59 | 4.070 | | 1.7582 | | YES |
| Thorium-230 long lived decay | 14269-63-7L | 0.0044 | 4.070 | 45/ 59 | 4.070 | | 0.0916 | | YES |
| Thorium-232 | 7440-29-1 | 0.0005 | 2.110 | 33/ 66 | 2.110 | 0.3140 | 1.5842 | | YES |

## Table 17: Initial Identification of Future Groundwater COPCs for the Site Employee Scenario

(Maximum Detected Values in Bedrock vs. Background and RBGVs) - Table 12 of the RRE

| Analyte (unit) | CAS Number | Minimum Detect | Maximum Detect | Detection Frequency | Screening Concentration | Background Concentration | RBGV | COPC |
|---|---|---|---|---|---|---|---|---|
| Thorium-232 long lived decay | 7440-29-1L | 0.0011 | 2.110 | 32/ 66 | 2.110 | 0.3140 | 0.1110 | YES |
| Tritium | 10028-17-8w | 2.9500 | 2816310.000 | 4473/4488 | 2816310.000 | 1485.4700 | 3155.8185 | YES |
| Uranium-233 | 13968-55-3 | 0.0272 | 16.120 | 3/ 3 | 16.120 | | 2.2284 | YES |
| Uranium-233 long lived decay | 13968-55-3L | 0.0272 | 16.120 | 3/ 3 | 16.120 | | 0.2668 | YES |
| Uranium-233/234 | U-233/234 | 0.1540 | 0.928 | 5/ 5 | 0.928 | | 0.2668 | YES |
| Uranium-234 | 13966-29-5 | 0.0330 | 66.900 | 61/ 70 | 66.900 | 0.7920 | 2.2631 | YES |
| Uranium-235 | 15117-96-1 | 0.0078 | 8.250 | 20/ 43 | 8.250 | 0.8140 | 2.2989 | YES |
| Uranium-235+D | 15117-96-1(+D) | 0.0078 | 8.250 | 20/ 43 | 8.250 | 0.8140 | 2.2284 | YES |
| Uranium-235 long lived decay | 15117-96-1L | 0.0078 | 8.250 | 20/ 43 | 8.250 | 0.8140 | 0.2189 | YES |
| Uranium-235/236 | U-235/236 | 0.0373 | 0.047 | 2/ 26 | 0.047 | | 0.2189 | NO:3 |
| Uranium-238 | 7440-61-1 | 0.0290 | 6.580 | 59/ 77 | 6.580 | 0.6880 | 2.5000 | YES |
| Uranium-238+D | 7440-61-1(+D) | 0.0290 | 6.580 | 59/ 77 | 6.580 | 0.6880 | 1.8370 | YES |
| Uranium-238 long lived decay | 7440-61-1L | 0.0290 | 6.580 | 59/ 77 | 6.580 | 0.6880 | 0.0840 | YES |

* used cis-1,2-dichloroethene values for screening due to lack of toxicity criteria

'+D' incorporates daughter products

CAS: Chemical Abstract Service

VOCs: volatile organic compounds

SVOCs: semivolatile organic compounds

RBGV: Risk-Based Guideline Value, value is the lower of $10^{-6}$ cancer risk or 0.1 hazard index

a - carcinogen value, b - noncarcinogen value, c - maximum contaminant level (MCL)

COPC: Constituent of Potential Concern

COPC = YES indicates the analyte is retained as a COPC

COPC = NO indicates analyte was screened out based on: 2 = comparison to background, 3 = comparison to the lower of RBGV or MCL, and/or 4 = analyte is an essential human nutrient

# Table 18: Final Identification of Future Groundwater COPCs for the Site Employee Scenario

(Future Modeled Concentration vs. Background) - Table 13 of the RRE

| Analyte (unit) | CAS Number | Future Modeled Screening Concentration | Background Concentration | COPC |
|---|---|---|---|---|
| **Inorganics (mg/L)** | | | | |
| Aluminum | 7429-90-5 | 2.0238 | 0.0375 | YES |
| Antimony | 7440-36-0 | 0.0184 | 0.0006 | YES |
| Arsenic | 7440-38-2 | 0.0184 | 0.0330 | NO |
| Barium | 7440-39-3 | 0.1829 | 0.3102 | NO |
| Bismuth | 7440-69-9 | 0.0241 | | YES |
| Cadmium | 7440-43-9w | 0.0080 | | YES |
| Chromium | 7440-47-3 | 0.9642 | 0.0061 | YES |
| Copper | 7440-50-8 | 0.0557 | 0.0012 | YES |
| Lead | 7439-92-1 | 0.0194 | | YES |
| Lithium | 7439-93-2 | 0.1510 | 0.0557 | YES |
| Manganese | 7439-96-5w | 0.2154 | 0.2296 | NO |
| Molybdenum | 7439-98-7 | 0.0149 | 0.0056 | YES |
| Nickel | 7440-02-0 | 0.2779 | 0.0350 | YES |
| Nitrate/Nitrite | 14797-65-0nn | 6.510 | 5.3490 | YES |
| Thallium | 7440-28-0 | 0.0036 | | YES |
| Vanadium | 7440-62-2 | 0.0257 | 0.0171 | YES |
| **SVOCs (mg/L)** | | | | |
| Bis(2-ethylhexyl)phthalate | 117-81-7 | 0.0176 | | YES |
| **VOCs (mg/L)** | | | | |
| Bromochloromethane | 74-97-5 | 0.0058 | | YES |
| Dichloromethane (Methylene Chloride) | 75-09-2 | 0.0154 | | YES |
| Fluorobenzene | 462-06-6 | 0.0087 | | YES |
| O-Chloroflurobenzene | 348-51-6 | 0.0072 | | YES |
| Tert-butyl methyl ether | 1634-04-4 | 0.0006 | | YES |
| Tetrachloroethene | 127-18-4 | 0.0015 | | YES |
| Trichloroethylene (TCE) | 79-01-6 | 0.0039 | | YES |
| **Radionuclides (pCi/L)** | | | | |
| Plutonium-238 | 13981-16-3 | 0.2587 | 0.0870 | YES |
| Potassium-40 | 13966-00-2 | 48.3052 | | YES |
| Radium-226 | 13982-63-3 | 1.6849 | 0.9960 | YES:2 |
| Radium-226 +D | 13982-63-3(+D) | 1.6849 | 0.9960 | YES:2 |
| Radium-226 long lived decay | 13982-63-3L | 1.6849 | 0.9960 | YES:2 |
| Radium-228 | 15262-20-1 | 0.4179 | | YES:3 |
| Radium-228 +D | 15262-20-1(+D) | 0.4179 | | YES:3 |
| Radium-228 long lived decay | 15262-20-1L | 0.4179 | | YES:3 |
| Strontium-90 | 10098-97-2 | 1.4173 | 0.9750 | YES |
| Thorium-228 | 14274-82-9 | 77.5034 | 0.7790 | YES:3 |
| Thorium-228+D | 14274-82-9(+D) | 77.5034 | 0.7790 | YES:3 |
| Thorium-228 long lived decay | 14274-82-9L | 77.5034 | 0.7790 | YES:3 |
| Thorium-230 | 14269-63-7 | 0.6202 | | YES:2 |
| Thorium-230 long lived decay | 14269-63-7L | 0.6202 | | YES:2 |
| Thorium-232 | 7440-29-1 | 0.1803 | 0.3140 | NO |
| Thorium-232 long lived decay | 7440-29-1L | 0.1803 | 0.3140 | YES:4 |
| Tritium | 10028-17-8w | 66797.9574 | 1485.4700 | YES |

## Table 18: Final Identification of Future Groundwater COPCs for the Site Employee Scenario

(Future Modeled Concentration vs. Background) - Table 13 of the RRE

| Analyte (unit) | CAS Number | Future Modeled Screening Concentration | Background Concentration | COPC |
|---|---|---|---|---|
| Uranium-233 | 13968-55-3 | 1.3619 | | YES:6 |
| Uranium-233 long lived decay | 13968-55-3L | 1.3619 | | YES |
| Uranium-234 | 13966-29-5 | 2.6013 | 0.7920 | YES:2 |
| Uranium-235 | 15117-96-1 | 2.1485 | 0.8140 | YES:7 |
| Uranium-235+D | 15117-96-1(+D) | 2.1485 | 0.8140 | YES:7 |
| Uranium-235 long lived decay | 15117-96-1L | 2.1485 | 0.8140 | YES |
| Uranium-238 | 7440-61-1 | 0.5524 | 0.6880 | NO |
| Uranium-238+D | 7440-61-1(+D) | 0.5524 | 0.6880 | NO |
| Uranium-238 long lived decay | 7440-61-1L | 0.5524 | 0.6880 | YES:5 |

'+D' incorporates daughter products
CAS: Chemical Abstract Service
VOCs: volatile organic compounds
SVOCs: semivolatile organic compounds
RBGV: Risk-Based Guideline Value, value is the lower of $10^{-6}$ cancer risk or 0.1 hazard index
a - carcinogen value, b - noncarcinogen value, c - maximum contaminant level (MCL)
COPC: Constituent of Potential Concern

COPC = YES indicates the analyte is retained as a COPC; however, will not be evaluated individually because it is included in the risk assessment as part of the long lived decay chain of Ac-227 (reference 1), U-238 (reference 2), or Th-232 (reference 3). For reference 4, Th-232 screens out but the Th-232 long lived decay chain was retained for risk evaluation. For reference 5, U-238 screens out but the U-238 long lived decay chain was retained for risk evaluation. Analyte is retained as a COPC; however, will not be evaluated individually because it is included in the risk assessment as part of the long lived decay chain of U-233 (reference 6) and U-235 (reference 7).

COPC = NO indicates analyte was screened out based on: 2 = comparison to background, 3 = comparison to the lower of RBGV or MCL, and/or 4 = analyte is an essential human nutrient

## Table 19: Impact of Boundary Changes on Incremental Residual Soil Risk

| Scenario and Receptor | Media | Constituents | Pathway | Total Non-Cancer Hazard or HI | Total Non-Cancer Hazard or HI | Total Cancer Risk | Total Cancer Risk |
|---|---|---|---|---|---|---|---|
| | | | | Boundary in October 2002 | Current Boundary | Boundary in October 2002 | Current Boundary |
| Construction Worker Scenario | Current & Future Soil (all depths) | Chemical & Radiological | Oral | 1.4E-01 | 1.4E-01 | **7.4E-06** | **7.4E-06** |
| | | | Dermal Contact | 1.6E-03 | 2.2E-02 | 3.5E-07 | 3.5E-07 |
| | | | Inhalation of Dust | NA | NA | 2.0E-08 | 1.9E-08 |
| | | | Inhalation of VOCs | NA | NA | NA | NA |
| | | | External | NA | NA | **9.5E-06** | **9.6E-06** |
| | | | **Soil Total Risk** | 1.4E-01 | 1.6E-01 | **1.7E-05** | **1.7E-05** |
| Site Employee Scenario | Current & Future Soil (0-2 feet bls) | Chemical & Radiological | Oral | 4.6E-04 | 4.6E-04 | **4.0E-06** | **4.0E-06** |
| | | | Inhalation of Dust | NA | NA | 9.7E-08 | 9.7E-08 |
| | | | Inhalation of VOCs | NA | NA | NA | NA |
| | | | External | NA | NA | **1.2E-05** | **1.2E-05** |
| | | | **Soil Total Risk** | 4.6E-04 | 4.6E-04 | **1.6E-05** | **1.6E-05** |

HI: Hazard Index
NA: not applicable
**bolded** values exceed cancer risk of $10^{-6}$ or non-cancer Hazard Index greater than 1.
bls: below land surface
VOCs: volatile organic compounds
numbers written as 1.0E-3 equal 1x10-3 and 0.001

# APPENDIX C

## Listing of ARARs

# Appendix C

# ARARs for Phase I

## Chemical Specific ARARs

| | |
|---|---|
| OAC 3745-81-11, | Maximum Contaminant Levels for Inorganic Chemicals |
| OAC 3745-81-12, | Maximum Contaminant Levels for Organic Chemicals |
| OAC 3745-81-13, | Maximum Contaminant Levels for Turbidity |
| OAC 3745-81-15, | Maximum Contaminant Levels for Radium 226, 228, Gross Alpha |
| OAC 3745-81-16, | Maximum Contaminant Levels for Beta Particle & Photon Radioactivity |

## Location Specific ARARs

| | |
|---|---|
| ORC 6111.03, | Protection of Waters of the State |
| ORC 3734.20, | Description of OEPA Director's power for Protection of Public Health and the Environment |
| OAC 3745-66-15 | Certification of Closure |

## Action Specific ARARs

| | |
|---|---|
| ORC 317.08, | Criteria for County Recording of Deeds |
| ORC 5301.25(A), | Proper Recording of Land Encumbrances |

# APPENDIX D

## PRS Information

PRS 16. Area C (Old Building 72) was a former Hazardous Waste Storage Area dismantled in accordance with an Ohio Environmental Protection Agency approved RCRA closure plan. Core Team decided that PRS 16 requires No Further Assessment.

PRS 73. PRS 73, the Evaporator Storage Area, was an equipment storage area located in the Test Fire Valley. Further Assessment sampling in July 2001 identified no levels of concern. Core Team decided that PRS 73 requires No Further Assessment.

PRS 74. Quonset Hut (former), placed on a potentially contaminated concrete floor shows no indication that its shell was ever contaminated. The concrete floor was removed in 1963. Core Team decided that PRS 74 requires No Further Assessment.

PRS 258-265. PRSs 258-265 refer to the waste storage and treatment facilities formerly located in the "Burn Area" where a variety of wastes such as explosive powders, pyrotechnic materials, solid wastes contaminated with energetic materials, and non-radiological weapons components were thermally treated. Beryllium was the only COC identified as exceeding its Guideline Value during sampling events. There are no reported recent historical events to indicate other reasons for concern. Core Team decided that PRSs 258-265 require No Further Assessment.

PRS 276. Area 22, Orphan Soil from Other Areas, was a potentially contaminated site due to its use as a temporary storage area for contaminated soils. The soils were removed in accordance with the Core Team recommendation. Core Team decided that PRS 276 requires No Further Assessment.

PRS 280. Further Assessment sampling in the Waste Oil Drum Field yielded only low-level and isolated exceedances were noted above $10^{-6}$ RBGVs/screening levels; however, none were above cleanup objectives ($10^{-5}$ RBGV + background). Core Team decided that PRS 280 requires No Further Assessment.

PRS 281. Area E, identified as a historical, isolated waste oil spill, produced levels of radiological contamination over Mound soils guidelines for radium-226. The area was subject to the removal action associated with the Building 21 demolition. Core Team decided that PRS 281 requires No Further Assessment.

PRS 284. The Building 21 Thorium Sludge Storage Facility held 4,914 drums of thorium oxalate from 1966-1975 and 1,258 drums of Cotter Concentrate (high-level nuclear waste) until 1987. Cleanup and removal of Building 21 was completed 31 March 1997. Core Team decided that PRS 284 requires No Further Assessment.

PRS 304. This Excavated Material Disposal Area was created due to the dumping of low-level thorium soils. Sampling in 1984 found plutonium and thorium levels below the risk-based guideline values. Core Team decided that PRS 304 requires No Further Assessment.

PRS 311. Potential Hot Spot Location S0706 was identified during a 1983 site survey project, which discovered an isolated plutonium-238 reading of 29 pCi/g. This level is below all associated cleanup levels and guideline values. Core Team decided that PRS 311 requires No Further Assessment.

PRS 313. Potential Hot Spot Location S0982 was identified as a thorium hot spot during

the Radiological Site Survey Project. Results from sampling in 1995 indicated no radioactive contamination in excess of guideline criteria. Core Team decided that PRS 313 requires No Further Assessment.

PRS 333. PRS 333 is an explosive surge tank (Tank 263) located along the southern border of Building 87,a previous explosives testing area that has since undergone Safe Shutdown. Core Team decided that PRS 333 requires No Further Assessment.

PRS 334. PRS 334 is an explosive surge tank (Tank 264) located along the southern border of Building 87,a previous explosives testing area that has since undergone Safe Shutdown. Core Team decided that PRS 334 requires No Further Assessment.

PRS 335. PRS 335 is an explosive surge tank (Tank 265) located along the southern border of Building 87,a previous explosives testing area that has since undergone Safe Shutdown. Core Team decided that PRS 335 requires No Further Assessment.

PRS 347. PRS 347 was identified according to qualitative hydrocarbon detections found during the PETREX soil gas portion of OU5, Non Area of Concern investigation. The 1996 Soil Gas confirmation sampling effort discovered no contamination above the $10^{-6}$ risk range. Core Team decided that PRS 347 requires No Further Assessment.

PRS 348. PRS 348 was identified according to qualitative hydrocarbon detections found during the PETREX soil gas portion of OU5, Non Area of Concern investigation. The 1996 Soil Gas confirmation sampling effort discovered no contamination above the $10^{-6}$ risk range. Core Team decided that PRS 348 requires No Further Assessment.

PRS 349. PRS 349 was identified due to plutonium detections found during the Mound Soil Screening Analysis performed as part of the June 1994 OU5, Operational Area Phase I Investigation. All concentrations are below the $10^{-5}$ Risk Based Guideline Value. Core Team decided that PRS 349 requires No Further Assessment.

PRS 350. Soil Contamination, Area West of Building 21, consists of detectable plutonium concentrations; however, concentrations were below all associated cleanup levels and guideline values. Core Team decided that PRS 350 requires No Further Assessment.

PRS 352. PRS 352 was identified as an elevated soil gas location due to an elevated PETREX passive soil gas portion of the OU5, Non Area of Concern investigation. Soil gas confirmation sampling indicated that all concentrations of volatile, semivolatile, PCBs, pesticides, metals, radionuclides, and explosives within the soil were below applicable guideline criteria. Core Team decided that PRS 352 requires No Further Assessment.

PRS 353. PRS 353 was identified as an elevated soil gas location due to an elevated PETREX passive soil gas portion of the OU5, Non Area of Concern investigation. Soil gas confirmation sampling indicated that all concentrations of volatile, semivolatile, PCBs, pesticides, metals, radionuclides, and explosives within the soil were below applicable guideline criteria. Core Team decided that PRS 353 requires No Further Assessment.

PRS 362. PRS 362 was identified as an elevated soil gas location due to an elevated

PETREX passive soil gas portion of the OU5, Non Area of Concern investigation. Soil gas confirmation sampling indicated that all concentrations of volatile, semivolatile, PCBs, pesticides, metals, radionuclides, and explosives within the soil were below applicable guideline criteria. Core Team decided that PRS 362 requires No Further Assessment.

PRS 365. PRS 365 was identified as an elevated soil gas location due to an elevated PETREX passive soil gas survey result in 1994. A soil gas confirmation sample collected within 50 feet of this PRS indicated that all concentrations of volatile, semivolatile, PCBs, pesticides, metals, radionuclides, and explosives within the soil were below applicable guideline criteria. Core Team decided that PRS 365 requires No Further Assessment.

PRS 369. PRS 369 was identified as an elevated soil gas location due to elevation qualitative PETREX hydrocarbon levels. During the 1996 soil gas confirmation sampling, all concentrations of volatile, semivolatile, PCBs, pesticides, metals, radionuclides, and explosives within the soil were below applicable guideline criteria. Core Team decided that PRS 369 requires No Further Assessment.

PRS 370. PRS 370 was identified according to qualitative hydrocarbon detections found during the PETREX soil gas portion of OU5, Non Area of Concern investigation. The 1996 Soil Gas confirmation sampling effort discovered no contamination above the $10^{-6}$ risk range. Core Team decided that PRS 370 requires No Further Assessment.

PRS 371. PRS 371 was identified due to a single, elevated plutonium-238 detection during the OU5, Operational Area Phase I Investigation in 1994. In 1996, a sample was collected within approximately 25 feet of PRS 371 during the Soil Gas Confirmation Investigation. All concentrations of volatile, semivolatile, PCBs, pesticides, metals, radionuclides, and explosives within the soil were below applicable guideline criteria. Core Team decided that PRS 371 requires No Further Assessment.

PRS 372. PRS 372 was identified due to elevated soil gas measurements. Subsequent quantitative sampling showed that all soil samples taken in the area were at or below their respective $10^{-6}$ Risk Based Guideline Value. Core Team decided that PRS 372 requires No Further Assessment.

PRS 383. PRS 383 was identified as an area of possible organic contamination during the 1992 PETREX Survey. However, additional sampling in 1995 quantitatively determined that no volatile, semivolatile, PCBs, pesticides, metals, radionuclides, or explosives exceeded applicable guideline values. Core Team decided that PRS 383 requires No Further Assessment.

PRS 384. PRS 384 was identified due to elevated qualitative PETREX hydrocarbon levels. However, the soil gas confirmation investigation in 1996 determined that no volatile, semivolatile, PCBs, pesticides, metals, radionuclides, or explosives exceeded applicable guideline values. Core Team decided that PRS 384 requires No Further Assessment.

PRS 406. The southern portion of PRS 283 became a PRS due to potential thorium dust from the thorium sludge redrumming. However, radionuclides in the soils were

scattered and infrequent, and all occurrences were below the $10^{-5}$ risk-based guideline values. Core Team decided that PRS 406 requires No Further Assessment.

PRS 407. Soil Contamination West of Building 21 resulted in a removal action in which one to two feet of soil was excavated and disposed of via railcar shipments to Envirocare. PRS 407 was later binned No Further Action in 2000. Core Team decided that PRS 407 requires No Further Assessment.

PRS 418. PRS 418, the Overflow Pond South Inlet, was created to address potential plutonium-238, thorium-228, thorium-232, and Radium-226 contamination from PRS 407. Since the PRS 407 removal action, there are no known PRSs draining into the inlet. Although sample results for benzo(a)pyrene exceed the $10^{-6}$ guideline value, they are below the $10^{-5}$ risk-based guideline value. All other constituents are below guideline criteria. Core Team decided that PRS 418 requires No Further Assessment.

PRS 419. The Mound Plant Drainage Outflow Reroute, constructed during the Miami-Erie Canal Remediation Project, is monitored for radiological parameters under DOE Order 5400.1 and the DOE Regulatory Guide. It is also monitored for non-radiological parameters in accordance with the site's NPDES permit. To address potential radiological releases, the Outflow Reroute is also monitored daily for gross alpha and tritium, and bi-weekly from flow-proportional 24-hour composite samples for multiple radionuclides. Core Team decided that PRS 419 requires No Further Assessment.

PRS 421. PRS 421 is "The Ridge" across the road south of the location of the former Building 21. It was identified as a PRS when historical sampling data indicated the presence of contaminated soil. Contamination was confirmed during the verification sampling for PRS 407. The source of the contamination was surface runoff from the PRS 407 cleanup that followed preferential and intermediate drainage pathways south to the PRS 421 area. The removal action resulted in the excavation and containerization for disposal of approximately 105,133 cubic feet of soil, concrete, and asphalt. The cleanup objectives were 55 pCi/g for plutonium-238, 2.1 pCi/g for thorium-232, and 2.6 pCi/g for thorium-228. The OSC report documented that all verification sample results were below cleanup objectives.

# APPENDIX E

## Building Information

Phase I includes 51.6 acres of land located in three distinct sections or parcels of the site property (Figure 2). The first parcel, the largest block of property in Phase I includes lands located on the south central part of the original 182 acres of the site that was purchased in 1947. This piece of property also contains a portion of the South Property (purchased in 1982). The second parcel of property included in Phase I is situated to the south of the Spoils Area and the site well pump houses, in the area designated as the South Property. The third parcel of property in Phase I lies to the south-southwest of Building 38.

Phase I includes 10 existing buildings and explosives magazines and 25 former production-era building sites including buildings, explosives storage magazines, and an electrical generator. Since the plant became operational, the properties in Phase I, with the exception of the South Property, have supported a number of plant related operations. Included in the activities that once took place in Phase I is explosives testing and production-related activities, administrative activities (i.e., offices and site security operations), utilities operations, waste processing operations (the Burn Area), and cleanup waste storage operations.

In addition to the production-era buildings noted above, Phase I also includes building sites dating from the construction era (a storage warehouse, a quonset-type hut building, and some temporary buildings).

Phase I lands have also been used for various waste and non-waste storage activities including waste container management, equipment management, and for other general plant uses.

## BUILDINGS CURRENTLY LOCATED IN PHASE I

There are 10 existing buildings located within Phase I (as shown in Figure 3), including two buildings located in the Test Fire Area that have supported detonator and explosives testing operations (Buildings 3 and 87). In addition to the two Test Fire Area buildings, there are five explosives magazines located to the southwest of the Test Fire Area (Magazines 80, 81, 82, 83, and 84). Both of the buildings in the Test Fire Area and the explosives magazines are currently operated under users agreements that are being administered by MMCIC.

The remaining three buildings located in Phase I include Building 95, which is a chiller and steam plant that is located on the SM/PP Hill; Building 102, an office building located on the SM/PP Hill; and the Salt Storage (SST) Building.

Buildings currently located in Phase I are described below.

Building 3. Building 3 was constructed in 1963 and is an explosives material destructive test firing and environmental testing laboratory. With four additions to the building, including two attached corrugated fiberglass faced metal framed storage sheds, the square footage of Building 3 is currently 12,400 square feet.

When operated by DOE and the contractor, Building 3 included 17 environmental chambers for thermal testing, six systems for mechanical testing operations, two vibration testing systems, one centrifuge testing system, and three shock testing systems.

Building 3 was used as a facility for the destructive and environmental testing of explosives materials from the time of construction in 1963 until the building was turned over to EG&G Star City (now Perkin-Elmer) in 1994 under a lease agreement with the DOE. Building 3 has operated under that agreement since that time.

Building 87. Building 87 (or CTF-the Component Test Facility) is a two-story, 38,882 square foot, concrete structure, built slab-on-grade. The CTF offices and support facilities and other operational control/testing facilities that supported the testing cells were located on the first floor. The mechanical penthouse, on the second floor, contains HVAC heating and air conditioning, air handling units for the test cell areas, and a heat exchanger for hot water. The mechanical area occupies approximately 600 square feet. Building 87 was constructed in the 1980s and underwent shut down in about 1995.

Building 87 is currently being renovated by MMCIC for use by private industry.

Building 95. Building 95, the "SM/PP Chiller" consists of one larger building (Building 95) with 2,000 square feet of floor space, and two smaller ancillary buildings (Buildings 95-A and 95-B, each having 450 square feet of floor space. Buildings 95 (collectively) was constructed in the mid-1980s, in order to supplement P Building (Power Plant) operations, and in order to satisfy the demand for a chiller on the SM/PP Hill.

Building 102. Building 102 is a 10,982 square-foot two-story office building that was constructed in 1987 to support Mound's Decontamination and Decommissioning Program (D&D Program), and to provide an administrative area to house cleanup related staff. Through time, Building 102 has continued in its mission as an office, however, the building tenants have differed, including staff members from the PST Program, Soil Project team staff, as well as D&D Program staff members.

SST Building. SST Building was constructed in the early 1970s and is located in the vicinity of the former Burn Area, just to the southwest of where that area was located, and just to the east of the former Building 21 location. SST has been used for salt storage for snow control on site.

SST Building is a one-story, 590 square-foot, slab-on grade structure with wood framing for the walls and roof. The front of SST Building is open from wall to wall and from the ground to the roof. A 3-foot high concrete wall separates the wood structure from the slab and divides the area into two sections. Wood siding and the roof are covered with tar paper. SST Building was renovated in 2000.

Magazines 80, 81, 82, 83, and 84. Magazines 80, 81, 82, 83, and 84, are smaller explosives storage bunkers (explosives magazines) that were constructed in 1985.

Magazines 80, 81, 82, 83, and 84 each contain two-units or compartments. Each of the magazines is constructed of reinforced concrete as a box-shaped structure and considered non-standard earthen-covered magazines. The configuration of Magazines 80, 81, 82, 83, and 84 appears to be one unit. These magazines were used for the storage of energetic materials, and were used for that purpose, until they were transferred to EG&G Star City (now Perkin-Elmer) under a user agreement initiated with DOE.

The transition of Magazines 80, 81, 82, 83, and 84 to private industry took place in the mid-1990s, and these magazines have continued to operate under a user lease agreement since that time.

**FORMER PRODUCTION ERA BUILDING SITES**

There are numerous sites where production era buildings were once located within Phase I. Included in the former buildings that were located in Phase I are 4 buildings (Buildings 13, 14, 35, and 59) in the Test Fire Area that supported detonator and explosives testing operations. In addition to the Test Fire buildings, there were six explosives storage magazines to the southwest of the Test Fire Area (Magazines 4, 5, 8, 9, 10, and 20) that supported explosive operations.

Buildings 12 and 18 were located near the current Building 87 location into the 1980s. These buildings were apparently storage warehouses that were used to support explosives operations.

An additional four buildings or facilities were located in an area designated as the "Burn Area." This area was located to the northwest of SST Building, and included the Pyroshed Energetic Materials Waste Storage Unit, the Open Burn Energetic Materials Treatment Unit, Building 90 and the retort unit (an explosives treatment unit), and Magazine 53 (an explosives storage area).

Other building sites in Phase I also include the location for Building 39, a maintenance building, the location for an emergency electrical generator (Electric Generator Number 7), a process material storage building (Building 21), and four modular office buildings (Buildings 77, 78, 97, and 101).

The buildings once located on the former building sites within Phase I are described below.

Buildings 12 and 18. Building 12, titled the "Detonator Storage Building" was constructed in 1960, as a 57' x 32' long "Armco" steel building. Building 18, constructed in 1963, was similar in size and construction to Building 12. Both buildings were used to support explosives operations and were located about where Building 87 is currently located. Buildings 12 and Building 18 were demolished in the 1980s.

Building 13. Building 13 was a one-story, 44 square-foot wood-framed asbestos-coated steel structure on a concrete slab. Building 13 was located to the west of Building 21, and was used to support a program for remote monitoring of energetic materials

destructed in the Burn Area, located to the east. Building 13 contained a video monitor and electrical initiation equipment for firing explosive materials treatment devices. The building use, as described in 1990, was a "firing shed." Building 13 was demolished in 1997.

Building 14. Building 14 was a 42 square-foot, one-story, structure. This building was constructed with a wood and metal-frame and asbestos-coated sidewalls, with concrete deck roof on concrete footings. This building was used as an observation post in association with the former Burn Area to the east. The facility had no heating, cooling, or electrical services. The building use, as described in 1990, was metal melting. Building 14 was demolished in 1997.

Building 21. Building 21 was used for the storage of materials associated with two of Mound's processing missions, including thorium ores and protactinium ores (Cotter Concentrates). This structure was located along the south central border of the improved plant property; adjacent to the area designated as the Burn Area.

Building 21 was a 4,032 square-foot concrete structure with 10-inch thick floors and 14- to 16-inch thick walls. The roof was constructed of iron and steel. The facility was designed to ensure liquid tightness and was divided into two separate isolated bay areas. Building 21 became operational in 1964. Storage operations ended in 1987. Beginning in 1964, 1,338 drums of thorium oxalate were dumped in bulk form into the small bay area, while 3,576 drums of thorium hydroxide sludge were dumped in bulk form into the larger bay. The thorium sludge was ultimately sold to General Atomic Company for reclamation and was removed from Building 21 in 1975. Following removal of the thorium sludge, the building was cleaned and used as a staging area for Cotter Concentrates (high-level waste resulting from uranium milling). Approximately 1,258 drums of Cotter Concentrate were stored in Building 21. These drums were eventually shipped to the Nevada Test Site (NTS) in 1987 and use of Building 21 ceased. Since 1987, the building and surrounding area were maintained in a safe mode until the building was demolished in 1997.

Building 35. Building 35 was a 2,500 square-foot single-story structure built of concrete block. Building 35 was designed to provide x-ray and eddy current non-destructive testing of explosives. Building 35 was also used as the control room for the californium-252 multiplier (CFX) neutron radiography facility that was located in adjacent Building 59. Building 35 was demolished in the spring of 1998.

Building 39. Building 39, constructed in 1969, was a one-story structure constructed of prefabricated metal with a metal roof.

Initially, the eastern end of Building 39 was used by the Decontamination and Decommissioning project, which worked to produce fiberglass wooden boxes that were used for radioactive trash. The turntable used for this operation is still in place. Indications are that the facility was also used to perform gamma spectroscopy on these boxes.

From 1984 to 1988, the building was either inactive or used for storage.

In 1988, Building 39 was converted to a maintenance shop, and was divided into three sections: the east end was a machine shop; the middle was a break room; and the west end was used primarily for storage of building materials, parts, paints, and some solvents.

Building 39 was demolished in 1998.

Building 59. Building 59, the neutron radiography facility, was a 700 square-foot, two-story reinforced concrete structure with a rolled roof. Building 59 was constructed in 1970 to provide neutron radiography capability to the site.

Building 59 housed a neutron-radiation source (californium-252) that was used to supply neutrons to an assembly of uranium plates. The californium-252 source was stored remotely from the core when not in use; when radiography operations were to be conducted, the source would be transported via a hand-cranked source transfer system into its proper location within the core assembly. The californium-252 source was removed from the facility and transported to Oak Ridge National Lab in 1995. Building 59 was demolished in the spring of 1998.

Building 77 and 78. Building 77 and 78, both located to the north of Building 39 were modular office structures that were used in the early 1980s. Both Building 77 and Building 78 contained 12 rooms, each with overall dimensions of 23.5 feet by 60 feet, and a combined square footage of 2,995. Both of these buildings were removed from service or were dismantled by the 1990s.

Building 97. Building 97 was a 12-room, 7,410 square-foot, 23.5 foot by 60 foot modular office structure, located to the south of Building 39. Building 97 was constructed in the early to late 1980s and was removed from service and dismantled in the 1990s.

Building 101. Building 101 was a single-story modular building with wooden exterior and Hypalon roof. The square footage of Building 101 was 1,815. Building 101 was brought on site in 1986, and was used as offices for the area maintenance foreman and planner. It was sold and removed from the site in 1999.

Building 120. Building 120 was a 350 square-foot, one-story, wood-sided building with a metal roof. Building 120 was located just to the south of Building 102 and was used as an administrative office for the Decontamination and Decommissioning (D&D) Group. It was dismantled in 1998.

Burn Area Buildings. The Burn Area, excluding Magazine 53, described below, included three buildings and/or areas, as follows:

1. Pyroshed Energetic Materials Waste Storage Unit. This structure, known as the "Pyroshed" was used for the storage of pyrotechnic wastes and other energetic materials prior to their treatment at the Burn Area. The Pyroshed was located inside the fenced Burn Area and was constructed on a concrete pad measuring approximately 9 feet by 15 feet. The shed was approximately 7 feet high, with

chain-link fence walls. A locked entry gate was located in the front side of the structure.

2. Open Burn Energetic Materials Treatment Unit. The open burn unit was used for op en burning of non-liquid explosive waste, pyrotechnic waste, and thermal treatment of explosive-contaminated material.

   The open burn unit consisted of a 12.3-foot by 18-foot base encircled by a 10-foot high composite metal wall with a sand core. The treatment zone measured approximately 12 feet by 12 feet, and the remainder of the floor space was occupied by an access-way. The entrance consisted of a 4-foot wide aisle that turned at a right angle to enter the treatment zone. The unit was developed on an 18-inch wide by 30-inch deep continuous, concrete footing developed on native soil. The enclosure's sides consisted of 0.25-inch thick milled steel plates.

3. Building 90. Building 90, constructed in 1984 and demolished in 1997, was a pre-engineered sheet metal building constructed on a reinforced concrete slab. The retort unit part of this building was located within a rectangular enclosure attached to the east side of Building 90 that was approximately 30 feet long and 15 feet wide with 9-foot high walls. Building 90 was designed to house the unit controls and waste feed operations for the Retort Unit (rotary-kiln-thermal-treatment-unit). Operations in Building 90 were suspended in January 1996, and the building was demolished in 1996-1997.

The buildings and facilities within the Burn Area were used for the destruction of pyrotechnics and energetic materials, including regulated hazardous waste explosives. Consequently, these operations underwent a RCRA closure, and as a part of that process were demolished in 1997 and 1998.

Electrical Generator 7. EG-7 (emergency generator) was constructed in 1972 to provide emergency electrical power to the Test Fire Area. The generator was an internal combustion key-starting engine generator housed in an 80-foot square metal structure, which was located just to the north of Building 63. EG-7 remained available as an emergency generator until the 1990s, when it was taken out of use. EG-7 was sold in 1998.

Magazines 5, 8, 10, and 20. Magazines 5, 8, 10, and 20 were smaller explosive storage magazines or bunkers that were constructed in the mid-1950s and into the early 1960's. These magazines were located in the Test Fire Area, in a fenced area behind the former Building 85 site and behind Building 87. The purpose of these structures was for the storage of Mounds energetic materials. These buildings were demolished.

Magazine 53. Magazine 53 was a one-story, 239 square-foot reinforced concrete structure. The roof was made of reinforced steel, and the structure was covered with earth. Magazine 53 was constructed in 1970 and was used for the storage of pyrotechnics and energetic materials that were destroyed in the Burn Area. Magazine 53 was also used as a storage area for hazardous waste regulated explosives, and

consequently underwent a RCRA closure. Magazine 53, as part of this closure, was demolished in January 1998.

Magazines 4 and 9. Magazine 4, the bulk storage magazine, was constructed in 1962 as an earthen covered magazine. Magazine 53 was constructed in an area adjacent to Magazine 9. Magazine 4 contained 4 units, with the front of the structure measuring 53 feet across. Magazine 9 was constructed in 1956, also as an earthen covered magazine. Magazine 9 contained a single cell that measured 17-feet by 14-feet. Both magazines were in the vicinity of Building 87. Magazines 4 and 9 were demolished by the 1980s.

**FORMER CONSTRUCTION-ERA BUILDING SITES LOCATED IN PHASE I**

There are three locations within Phase I that were used during the time that the original 1948-era buildings were constructed on the Mound site. These locations are summarized below:

Warehouse 12. Warehouse 12 was located in the approximate vicinity of the Building 39 site and was constructed by Maxon Construction Company to provide an administrative area (i.e., storage warehouse) in 1947 during the construction era for Mound's original buildings. Later plant records do not indicate any mission-related uses for Warehouse 12. Based upon comparisons of site photographs and available information, Warehouse 12 was likely demolished in the late 1940s or the early 1950s.

Tropical Huts and other Temporary Buildings. A number of shacks and tents (tropical huts) were used in conjunction with the construction of the original plant buildings in the very early 1950s for the storage of debris and other polonium contaminated materials. Little information is available on these buildings. However, based upon early photographs, there were three of these structures located near the current location of Building 2.

Building 19 Quonset Hut. The Quonset Hut is a 40-foot by 60-foot Stransteel brand structure that was originally located at Dayton Unit III and was relocated to the Mound site. When Unit III was being cleaned up, this building was disassembled and was moved from Unit III. In 1949, it was relocated to the lower valley of the Mound Laboratory site where the existing Building 3 is now located.

The Quonset Hut was used for shipping, receiving, and storing of radioactive field materials in the 1950s.

The Quonset Hut was also used for storage of bismuth-chloride sludges from the polonium separations. At that time, 500 to 600 drums of sludge generated by the hydrolysis process were stored in the Quonset Hut awaiting a determination on potential reuse or shipment to the Oak Ridge site for burial.

The Quonset Hut was also used for the storage of thorium in 1952 and for the storage of Purex residues from 1949 to 1954.

In 1963, the Quonset Hut was again relocated when it was moved to its current location near the western property boundary.

**OTHER LAND USE AREAS IN PHASE I**

In addition to uses of the Test Fire Area (i.e., around Building 2) for the management of materials during the construction era and use of those same areas for early production era uses, the lands in Phase I have also been used for the following purposes:

SM/PP Pad. The SM/PP Pad is a concrete pad that was used by waste management for the management of low-level waste boxes containing soil and debris, as well as being used as a staging site for unused or empty low-level waste boxes. This pad is located to the east of the former Building 21 site and north of the SST Building.

Fenced Location for Storage of Equipment and Drums near Building 21. A fenced area to the east-southeast of Building 21 was used for the management of low-level waste drums and potentially contaminated equipment. This area was addressed as part of the Building 21 cleanup activities.

Building 21 soils management area, east of SST Building. This area was used for the management of soils excavated after the Building 21 operations ceased and was addressed as part of the Building 21 cleanup activities.

South Property Portions of Phase I. The portions of the south property included in Phase I are part of two property parcels containing 124 acres of rolling hills to the south of the main processing related areas. DOE had purchased the South Property (also called the "New Property") in 1981 in part as a buffer and in part for possible future expansions. Despite its purchase for possible future expansion, it has for the most part remained unused since the date of purchase. The only plant uses that have taken place in the areas to be transferred in Phase I are the installation of boundary fences, the grading of the surface and the associated filling in of low-lying areas, and road installation and mobile laboratory operations in support of the Canal Removal Action.

An older unimproved road. The road running from the vicinity of Building 105 to the area behind Buildings 2, 3, and 87 was improved and the curves banked to utilize the area as a haul road in support of clean up activities in the Building 21 area and in the Burn Area.

Unidentified trailers near Building 21 and the SST Building. A grouping of office-type trailers existed in the vicinity of Building 21 and the SST Building were removed from this location by the 1990s.

Concrete Pad West of Building 35. The Building 35 concrete pad area was used by waste management for the management of low-level waste boxes of soil and debris.

P Building Soils Management Area-"Petro Piles". In the early 1990s, soil that was removed in conjunction with the removal of the P Building fuel oil tank removal were staged in the vicinity of Building 87 and Building 85 for treatment in a biodegradation facility for petroleum contaminated soils.

Management Area for Equipment. In 1996 and 1997, along the current property line for (previously transferred) Release Block D and Phase I (west of Building 100), an area was used to store portable office trailers, modular guard shacks, portable utility buildings, and various types of equipment that had been removed from an equipment management area in the Spoils Area.

Storage of Bird-Cage Drums. In the mid-1990s, empty blue transport drums that had been used for the transportation of fissile (product) material were located along the current property line for Release Block D and Phase I (west of Building 100). These drums were constructed with an internal framework that suspended the material contained in the drum in the drums' center, allowing the placement of the drums in a manner that was consistent with the criticality requirements for the contained material.