6. BASELINE HUMAN HEALTH RISK ASSESSMENT

6.1 INTRODUCTION

This Baseline Human Health Risk Assessment (BHHRA) documents the potential health risks to humans resulting from exposure to contamination within LL 1. LL 1 was in operation from 1941 until 1971. During World War II and the Korean War, LL 1 was used to melt and load TNT and Composition B explosives into large-caliber shells. The load lines were rehabilitated in 1951 (USATHAMA 1978) to remove and replace soils contaminated with accumulated explosives and to remove and replace contaminated overhead storm drains. More recently, LL 1 was the site of munitions rehabilitation activities following the Vietnam War. LL 1 buildings were recently demolished and removed. Floor slabs and most below-grade infrastructure remain in place. This risk assessment is prepared as part of the Phase II RI report for LL 1.

The objective of this baseline risk assessment is to evaluate and document the potential risks to human health associated with current and predicted future exposures to contaminants if no remedial action is taken. Thus, this assessment represents the risks for the "no-action" alternative in an FS.

The human health risk assessment methodology used in the Load Line 1 BHHRA is based on Risk Assessment Guidance for Superfund (RAGS) (EPA 1989a). Additional methodology has been taken from: Dermal Exposure Assessment: Principles and Applications (EPA 1992a); Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors (EPA 1991a); Exposure Factors Handbook (EPA 1989b); Integrated Risk Information System (EPA 2001, updated approximately monthly); and Health Effects Assessment Summary Tables (EPA 1997a). The inorganic and organic SRCs found in the various environmental media are quantitatively analyzed (when possible) to characterize the potential risks to human health from exposure to these contaminants. The results of the BHHRA are used to (1) document and evaluate risks to human health; (2) determine the need, if any, for remedial action; and (3) identify COCs that may require the development of chemical-specific remediation levels. The LL 1 BHHRA evaluates potential risks from exposure to the following environmental media: surface soil, subsurface soil, groundwater, sediment, and surface water.

This risk assessment is organized into six major sections. The screening process used to identify SRCs (discussed in detail in Chapter 4.0) and COPCs is discussed in Section 6.2. The exposure assessment, which is performed to identify the exposure pathways by which receptors may be exposed to contaminants and calculate potential intakes, is presented in Section 6.3. The toxicity assessment for the LL 1 COPCs is presented in Section 6.4. The results of the risk characterization are presented in Section 6.5. An assessment of the uncertainties associated with the risk characterization is provided in Section 6.6, and the conclusions of the BHHRA are summarized in Section 6.7.

6.2 DATA EVALUATION

This chapter provides a description of the two-stage data evaluation process used to identify COPCs for LL 1. The purpose of the BHHRA data evaluation screening process is to eliminate SRCs for which no further risk evaluation is needed. Data collected at LL 1 are aggregated by environmental medium (i.e., surface water, soil, sediment, and groundwater). Soil data are further aggregated by depth interval—surface soils from 0 to 1 ft bgs and subsurface soil greater than 1 ft bgs. Due to the presence of shallow bedrock at LL 1, subsurface soil samples were taken to a maximum of 3 ft bgs.

Data for surface and subsurface soils are aggregated into EUs based on historical use and geographic proximity as described in Section 4.1.2. The purpose of combining areas with similar use and geography is to characterize maximum concentrations of expected contamination. If areas with dissimilar histories are aggregated there is a potential to screen out contaminants that should be carried through the process. The aggregates selected to divide the LL 1 AOC into EUs achieve the intent of being protective of human and environmental health. Surface and subsurface soil data are grouped into the following seven EUs:

- Buildings CB-3 and CB-801;
- Buildings CB-4/4A and CA-6/6A;
- Buildings CB-13 and CB-10;
- Buildings CB-14, CB-17, and CA-15;
- Water Tower;
- Change Houses (CB-12, CB-23, CB-8, and CB-22); and
- Perimeter Area.

Soil aggregates are shown in Figure 4-1. Data from samples collected from railroad bed locations are not included in the BHHRA. These railroad bed samples were collected at the same time as the Phase II RI, but were collected for the purpose of evaluating the potential use of the area for clean hard fill disposal rather than as part of the Phase II nature and extent characterization.

Surface water and sediment data are aggregated by conveyance. Five conveyances were identified

1. Outlets D, E, and F and Criggy's Pond,
2. Outlet C and Charlie's Pond,
3. Outlets A and B,
4. North area, and
5. Off-AOC.

Surface water and sediment aggregates are shown in Figure 4-2. Samples collected from manholes, sanitary sewers, and storm sewers are not included in the BHHRA.

Groundwater data are available from sampling events in 1996, 1999, and 2000. Only data from the 1999 and 2000 sampling events are included in the BHHRA since these data better represent current and potential future conditions than data that are 5-years old. Qualitative evaluation of data from these various sampling events indicates that chemical concentrations are similar for all three sampling events. Groundwater data are aggregated as

- Load Line 1 Building Area; all wells completed in sandstone bedrock.

- Wells MW-64 and MW-65 located north and south of Criggy's Pond; wells completed in unconsolidated glacial sediment.

Section 6.2.1 provides a summary of the SRC selection process and the data assumptions used during that process. Section 6.2.2 presents the screening process by which COPCs were determined.

6.2.1 Site-Related Contaminant Screening

This section provides a description of the screening process used to identify SRCs and the data assumptions used in the process.

6.2.1.1 Site-related contaminant screening process

Data evaluation was conducted prior to the risk assessment to establish that the data are of sufficient quality for use in the quantitative risk assessment (Chapter 3.0 and Appendix G) and to identify SRCs (Chapter 4.0). SRCs were identified for each EU data set for each medium. This data evaluation consisted of four steps: (1) a DQA, (2) background screening, (3) frequency-of-detection/weight-of-evidence screening, and (4) screening of essential human nutrients as described below.

- **Data Quality** – Analytical results were reported by the laboratory in electronic form and loaded into a LL 1 database. Site data were then extracted from the database so that only one result is used for each station and depth sampled. QC data, such as sample splits and duplicates, and laboratory reanalyses and dilutions were not included in the determination of SRCs for this risk assessment. Field screening data that were considered in the evaluation of nature and extent of contamination at LL 1 are not included in the data set for the risk assessment. Samples rejected in the validation process are also excluded from the risk assessment. The percentage of rejected data is less than 1%. A complete summary of data quality issues is presented in the DQA of this report (see Appendix G).

- **Background Screen** – For each inorganic constituent detected, concentrations in LL 1 samples were screened against available naturally occurring background levels. This Phase II RI does not include determination of LL 1-specific background data. Analytical results are screened against the final facility-wide background values for RVAAP, published in the *Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 1999b). This screening step, which applies only to the inorganics, is used to determine if detected inorganics are site related or naturally occurring. If the maximum detected concentration of a constituent exceeds the background value, the constituent is considered AOC-related. All detected organic compounds are considered to be SRCs.

- **Frequency-of-Detection/Weight-of-Evidence Screen** – Each chemical for each environmental medium was evaluated to determine its frequency of detection. Chemicals that were never detected were eliminated as SRCs. For sample aggregations with at least 20 samples and a frequency of detection of less than 5%, a weight-of-evidence approach was used to determine if the chemical is AOC-related. The magnitudes and locations (clustering) of the detections and potential source of the chemical were evaluated. If the detected results showed no clustering, the chemical is not an SRC in another medium at that location, the concentrations are not substantially elevated relative to the detection limit, and the chemical was not used in the area under investigation, they are considered spurious, and the chemical was eliminated from further consideration. This screen is applied to all organic and inorganic chemicals with the exception of explosives and propellants. All detected explosives and propellants are included in the list of SRCs regardless of their frequency of detection.

- **Essential Nutrients** – Chemicals that are considered essential nutrients (calcium, chloride, iodine, iron, magnesium, potassium, phosphorus, and sodium) are an integral part of the human food supply and are often added to foods as supplements. EPA recommends that these chemicals not be evaluated as COPCs so long as they are (1) present at low concentrations (i.e., only slightly elevated above naturally occurring levels) and (2) toxic at very high doses (i.e., much higher than those that could be associated with contact at the site). Recommended daily allowance (RDA) and recommended daily intake (RDI) values are available for seven of these metals. Based on these RDA/RDI values, a receptor ingesting 100 mg of soil per day would receive less than the RDA/RDI of calcium, magnesium, phosphorous, potassium, and sodium, even if the soil consisted of the pure mineral (i.e., soil concentrations > 1,000,000 mg/kg). Receptors ingesting 100 mg soil per day would require soil concentrations of 1,500 mg/kg iodine and 100,000 to 180,000 mg/kg iron to meet their RDA/RDI for

these metals. Concentrations of essential nutrients do not exceed these levels at LL 1; thus, these constituents are not addressed as contaminants.

6.2.1.2 Site-related contaminant screening assumptions

The data set used to determine SRCs includes data collected from both Phase I and Phase II. Many Phase 1 soil sampling locations were excavated, graded over, or otherwise disturbed during building demolition activities at LL 1. Data from these sampling stations are not included in the data set used for this BHHRA. Specific assumptions applied to these data can be found in Section 4.0 (Nature and Extent of Contamination). The following assumptions, used in the development of SRCs for the BHHRA, are noted:

- Physical chemical data (e.g., alkalinity, pH, etc.) are not considered to be SRCs and, therefore, are not considered to be COPCs for LL 1.

- Filtered data are not used in the determination of surface water SRCs (i.e., only unfiltered data are evaluated for surface water). Unfiltered data include both soluble and insoluble chemicals. These data represent untreated/unprocessed water drawn from a surface water sampling station. However, due to problems with the groundwater samples having high turbidity, filtered metals data for groundwater are used in this risk assessment (Mohr 1998). See Section 4.6 for a detailed discussion on filtered groundwater data.

- Soil data are subdivided into two data sets—surface and subsurface—based on sampling depths used for LL 1. Surface soils were collected from 0 to 1 ft bgs, and subsurface soil from 1 to 3 ft bgs.

SRCs are determined for each medium in each EU using all available data after the data assumptions listed above are applied. The determination of COPCs follows for each medium.

6.2.2 Chemical of Potential Concern Screening

The objective of this evaluation is to identify SRCs that may pose a potentially significant risk to human health.

6.2.2.1 Chemical of potential concern screening process

The first step in this process—the selection of SRCs—has previously been addressed in Section 4.1. The second step of the process is to screen data against risk-based screening values. The risk-based screening levels are conservative values published by EPA. The maximum detected concentration of each chemical in each environmental medium is compared against the appropriate risk-based screening value. Chemicals detected below these concentrations are screened from further consideration. The risk-based screening values for each environmental medium are described below.

- For surface soil, subsurface soil, and sediment, a conservative screen is performed using one-tenth of the most current residential PRGs published by EPA Region 9 (EPA 1998d). These values are very conservative [based on a 10^{-7} risk level and a hazard quotient (HQ) of 0.1]. For informational purposes only, data from these same three media are also compared against one-tenth of the Region 9 industrial soil PRGs. Region 9 PRGs can be found on the EPA Region 9 World Wide Web site (http://www.epa.gov/region09/waste/sfund/prg/index.html).

- Surface water data are screened using one-tenth of the EPA Region 9 tap water PRGs, which are also available at http://www.epa.gov/region09/waste/sfund/prg/index.html.

- Groundwater data are compared against one-tenth of the EPA Region 9 tap water PRGs.

Chemicals that are not SRCs are not considered for evaluation as COPCs. The maximum detected concentration for each medium (i.e., surface soil, subsurface soil, sediment, surface water, and groundwater) is compared to the appropriate risk-based screening values. COPCs are selected for each EU. Criteria for determining COPCs are as follows:

- Chemicals not detected in a medium are not considered SRCs and consequently are not considered to be COPCs.

- SRCs whose maximum detected concentration is below screening values used for the medium are not considered to be COPCs. For example, if the maximum detected concentration for a surface soil SRC falls below the residential risk-based screening value (i.e., one-tenth of the EPA Region 9 PRG), then this SRC is not considered a COPC.

- SRCs whose maximum detected concentration meets or exceeds any screening value remain on the COPC list. For example, if a groundwater SRC's maximum detected concentration is greater than one-tenth of the EPA Region 9 tap water PRG, this SRC remains on the groundwater COPC list.

- Detected SRCs without risk-based screening values remain on the COPC list. That is, SRCs without screening criteria will not be eliminated from the COPC list.

6.2.2.2 Chemical of potential concern screening assumptions

The following assumptions were applied during the screening process to select COPCs:

- Total chromium is evaluated conservatively by screening against one-tenth of the EPA Region 9 PRGs for hexavalent chromium. This is a conservative assumption since (1) chromium VI was analyzed for and was detected at lower concentrations than total chromium, (2) hexavalent chromium is more toxic than trivalent chromium, and (3) hexavalent chromium is a less commonly occurring form of the metal.

- Alpha-chlordane and gamma-chlordane are evaluated by screening against one-tenth of the EPA Region 9 PRGs for chlordane.

6.2.2.3 Chemical of potential concern screening results

The COPC screening process and results are summarized in Appendix Q, Tables Q-1 through Q-6. These tables include

- summary statistics, including frequency of detection, range of non-detected concentrations, range of detected concentrations, arithmetic average concentration, and upper 95% confidence limit (UCL_{95}) on the mean concentration;

- all screening values (background concentrations and PRGs as appropriate);

- SRC determinations; and

- final COPC status.

The COPCs are classified as quantitative COPCs or qualitative COPCs based on the availability of EPA-approved toxicity information. COPCs are classified as quantitative if EPA-approved toxicity information is available. Risks and hazards are quantified for these COPCs. COPCs are classified as qualitative if no EPA-approved toxicity information is available. Risks and hazards cannot be calculated for these COPCs; however, toxicity profiles are provided (Section 6.8) for both quantitative and qualitative COPCs. The results of the COPC selection process and which COPCs will be addressed quantitatively and qualitatively for each medium are provided in Appendix Q, Table Q-6. The analytes determined to be qualitative COPCs are discussed in Section 6.4.5. Quantitative COPCs are evaluated quantitatively (i.e., by calculating risks and/or hazards) in Section 6.5.

6.3 EXPOSURE ASSESSMENT

The objectives of the exposure assessment are to estimate the magnitude, frequency, and duration of potential human exposure to COPCs. The four primary steps of the exposure assessment are to

- characterize the exposure setting to identify the potentially exposed human receptors, their activity patterns, and any other characteristics that might increase or decrease their likelihood of exposure;

- identify each exposure pathway by which a receptor may be exposed to the COPCs (e.g., private well use);

- identify the concentrations of COPCs to which the receptors may be exposed; and

- quantify each receptors potential intake of each COPC.

The output of the exposure assessment is used in conjunction with the output of the toxicity assessment (Section 6.4) to quantify risks and hazards to receptors in the risk characterization (Section 6.5).

This section is organized in the following manner:

- identify the exposure setting, including defining current and potential future land use and human receptors;

- identify exposure pathways associated with each land use/receptor combination;

- identify the exposure models and model parameter values used to quantify the potential exposures to each identified receptor; and

- quantify potential intakes.

6.3.1 Exposure Setting

The RVAAP installation is located in two counties of northeastern Ohio, Portage County and Trumbull County, with a majority of the facility lying in Portage County. According to the 2000 Census, the total population of Portage and Trumbull counties was 152,061 and 225,116, respectively. The largest population centers in the area are the towns of Ravenna (population 11,771), which is located

approximately 2 miles to the west, and Newton Falls (population 5,002), which is located approximately 1 mile to the southwest.

6.3.1.1 Land use

The land use immediately surrounding the facility is primarily rural. Approximately 55% of Portage County is either woodland or farmland (Portage County Soil and Water Conservation District Resources Inventory 1985; Census Bureau 1992). To the south of the facility is the Michael J. Kirwan Reservoir, which is used for recreational purposes. The Reservoir is south of the site, across State Route 5. The Reservoir is fed by the West Branch of the Mahoning River, which flows south aong the western edge of the installation. Hinkley Creek flows south across the western portion of the facility and eventually flows into the West Branch of the Mahoning River. The major surface drainages at RVAAP—Sand Creek and the South Fork of Eagle Creek—exit the facility property and eventually flow east to the Mahoning River.

Residential groundwater use occurs outside of the facility, with most of the residential wells tapping into either the Sharon Conglomerate or the surficial unconsolidated aquifer. Groundwater from on-site production wells was used during operations at the facility (USACE 1996); however, all but two of these production wells have been abandoned. These two wells, located in the central portion of the facility, provide sanitary water to the facility. In addition, a supply well located adjacent to former Building T-5301 (Winklepeck Burning Grounds) remains intact for potential future nonpotable water uses (decontamination and wash water). This well is not currently used. The Sharon Conglomerate is the major producing aquifer at the facility. The chemicals detected in the soil at LL 1 during Phase I are generally explosives and metals and therefore are relatively immobile in groundwater. In addition, groundwater sampling of selected residential wells adjacent to RVAAP, conducted by the Ohio EPA during 1997, found no indications of explosives in groundwater at the locations sampled.

Currently, surface water is primarily used only by wildlife. Based on conversations with site personnel, it is likely that some recreational trespasser use of surface water occurs on a limited basis in portions of RVAAP outside LL 1; this use is primarily associated with fishing. It is unlikely that any fishing occurs near LL 1 since the drainages at the site are small and intermittent.

Land use within the facility is restricted access. In 1993, the land use changed from “maintained caretaker” status to “inactive-modified (un-maintained) caretaker” status (Department of the Army, Environmental Assessment, 1993). This new status indicated that the facility was no longer needed to mobilize for war efforts. The only remaining federally mandated mission for the facility was identified as ammunition and bulk explosives storage. Funding decreased for building maintenance and maintenance activities such as mowing. LL 1, which lies in the eastern portion of the facility, is outside of any of the proposed ammunition storage areas. The facility is currently maintained by a contracted caretaker, Tol-Test, Inc. Site workers infrequently visit the load line, e.g., to evaluate the status of beaver dams; however, mowing no longer takes place. The Ohio National Guard (ONG) currently occupies parts of RVAAP and conducts training exercises. Personnel from the ONG may occasionally travel through AOCs at RVAAP but generally restrict training to areas outside of AOCs. No training exercises are known to be conducted within LL 1.

The OHARNG operates the Ravenna Training and Logistics Site (RTLS) on the eastern portion of RVAAP. Until recently, the OHARNG leased 1,010 hectares (2,497 acres) within RVAAP from the federal government along the eastern boundary of the facility and in the southeast-central portion of the facility along Newton Falls Road (see Figures 1-1 and 1-2). Once the RVAAP status changed from “Maintained” to “Modified” caretaker status, the OHARNG began negotiations with the Army Operations Support Command (OSC) to acquire more land at the facility. In a MOA dated December 1998, 6,544 hectares (16,164 acres) of land at RVAAP was transferred from the Army OSC to the National Guard Bureaus, effective May 1999, for expanded training missions. On May 13, 2002, an additional 3,774 acres of land was transferred from RVAAP to the National

Guard via an amendment to the MOA. Approximately 1,481 acres of land remain under control of the OSC (active mission areas and AOCs). As AOCs are remediated, transfer of remaining acreage from OSC to the National Guard will be conducted. Figure 1-2 shows the locations of all AOCs at the facility. As indicated on the figure, LL 1 is located within the land area retained by the Army OSC. As part of the land transfer, the Army OSC retained access to all roads and railways. The OSC retains responsibility for all salvage demolition and environmental remediation activities within the contaminated areas.

As part of acquiring the RVAAP lands, the OHARNG has taken on the facility's forestry and land management responsibilities. This includes, but is not limited to, managing deer hunts and other animal harvesting activities (e.g., trapping and fishing); forestry activities; and nature study activities, such as academic research, bird studying and watching, tours, field trips, etc. These activities currently occur in most of the AOCs as well as outside the AOCs.

Also noted on the figure are areas within the newly acquired OHARNG areas that are either leased back to the Army for use as continued munitions storage or are identified areas that will not be utilized by the OHARNG because of the desire to preserve natural areas [e.g., approximately 81 hectares (200 acres) north of Smalley Road deemed "pristine hemlock forest and gorge" and 344 hectares (850 acres) of wetlands]. In addition, the OHARNG is identifying naturally or culturally sensitive areas in the facility that will not be used for training.

Based on these factors, much of the newly acquired land will not be usable for training purposes. This results in a continued shortfall of land for training purposes. Because of this, the OHARNG has expressed a strong interest in acquiring land within the OSC "contaminated areas" as soon as the AOCs are remediated to an acceptable degree. Much of the lands within the contaminated areas are the most suitable areas for developing National Guard training operations. LL 1 is one of these areas. Based on an interview with Lieutenant Colonel Tom Tadsen (July 7, 1998), the OHARNG officer in charge of the RTLS, LL 1 would be suitable for maneuver training as well as for other potential operations.

Development of RVAAP for National Guard training purposes will occur over several years. Factors that will go into this development will include

- OSC ammunition storage needs,
- building salvage and demolition plans and schedules,
- preservation of sensitive areas (e.g., wetlands),
- OHARNG training needs and planning,
- schedules for environmental remediation of the AOCs, and
- funding available to OSC and the OHARNG for all of the above activities.

Based on these considerations and the complexity of addressing all of the above issues, the most likely near-term (2-10 years) use of the LL 1 area is "institutional maintained." The most plausible long-term land use is a combination of OHARNG training use and controlled recreational use.

In addition to these most likely future uses of the site, this BHHRA also will evaluate additional potential future land uses that reflect more open use of the land, including open industrial, open recreational, and open residential. The land uses that will be evaluated as part of the BHHRA are listed in Table 6-1.

6.3.1.2 Potential receptors

Potential human receptors have been identified for each of the land use scenarios in Table 6-1. Note that in several cases a land use designation results in multiple types of activities occurring simultaneously (e.g., National Guard training and recreational activities could both occur under the "National Guard/Managed Recreational" scenario).

Table 6-1. Potential Receptors for the Load Line 1 BHHRA

Land Use Designation	Description	Potential Receptors
Modified Caretaker/ Managed Recreational	Activities that are currently taking place at the sites, including light maintenance and controlled land management (e.g., controlled hunting and recreational activities)	Government contractors (e.g., security guards or maintenance workers) Permitted hunters, trappers, and nature study participants Trespassers
National Guard/ Managed Recreational	National Guard training activities and controlled recreational activities (e.g., controlled hunting)	National Guard personnel and trainees Permitted hunters, trappers, and nature study participants Trespassers
Open Recreational	Uncontrolled recreational activities	Hunters, trappers, and nature study participants
Open Industrial	Commercial industrial operations	Full-time industrial workers
Open Residential	Residential housing and farming	On-site resident farmer (adult and child)

6.3.2 Exposure Pathways

An exposure pathway is made up of the following components:

- source,
- release mechanism (e.g., volatilization),
- transport pathway,
- exposure point,
- exposure route, and
- receptor.

Potential exposure pathways associated with each receptor and land use category are identified in Figure 6-1.

A discussion of each land use/receptor/pathway combination is provided below. The exposure parameters for each pathway are provided in Table 6-2. Release mechanisms and transport pathways are discussed in detail in Chapter 5.0 of this report.

6.3.2.1 Modified caretaker/managed recreational land use

This land use scenario describes the current use of the land. Decision-making using this scenario would imply that no land use changes will occur in the foreseeable future. Current OSC personnel at the site were interviewed to define receptor-exposure activities for this existing scenario (Table 6-3) (interview with Tim Morgan, OSC Forester, July 8, 1998).

Since the exposure frequencies and durations associated with the authorized uses by adults are significantly greater than the unauthorized uses, the unauthorized adult receptors are not evaluated quantitatively in the risk assessment. Authorized uses do not include use by children; therefore, the child trespasser is evaluated quantitatively in this assessment.

Pathway	Modified Caretaker – Managed Recreational			National Guard – Managed Recreational			Open Recreational	Open Industrial	Open Residential[a]	
	Security Guard (1)	Hunter/ Trapper (2)	Trespasser (3)	National Guard (4)	Hunter/ Trapper (2)	Trespasser (3)	Recreator (5)	Industrial Worker (6)	Resident Farmer – Adult (7)	Resident Farmer – Child (8)
Surface Soil										
Incidental soil ingestion	●	●	●	●	●	●	●	●	●	●
Dermal contact with soil	●	●	●	●	●	●	●	●	●	●
Inhalation of VOCs and dust	●	●	●	●	●	●	●	●	●	●
Subsurface Soil										
Incidental soil ingestion				●				●	●	●
Dermal contact with soil				●				●	●	●
Inhalation of VOCs and dust				●				●	●	●
Sediment										
Incidental sediment ingestion		●	●	●	●	●	●		●	●
Dermal contact with sediment		●	●	●	●	●	●		●	●
Inhalation of VOCs and dust		●	●	●	●	●	●		●	●
Surface Water										
Incidental ingestion while swimming		●	●	●	●	●	●		●	●
Dermal contact while swimming		●	●	●	●	●	●		●	●
										●
Groundwater										
Ingestion				●					●	●
Dermal contact				●					●	●
Inhalation of VOCs				●					●	●
Foodstuff										
Ingestion of venison, game		●			●				●	●
Ingestion of beef, pork									●	●
Ingestion of milk products									●	●
Ingestion of vegetables									●	●
Ingestion of fish		●			●				●	●

Figure 6-1. Conceptual Exposure Model for Load Line 1

Table 6-2. Parameters Used to Quantify Exposures for Each Medium and Receptor at Load Line 1

Parameter	Units	Security Guard/ Maintenance Worker (1)	Hunter/Trapper (2)	Child Trespasser (3)	National Guard Trainee (4)	Open Recreator (5)	Open Industrial Worker (6)	Resident Farmer (Adult) (7)	Resident Farmer (Child) (8)
Pathway									
Surface Soil									
Incidental ingestion									
Soil ingestion rate	kg/day	0.0001[a]	0.0001[a]	0.0002[a]	0.0001[a]	0.0001[a]	0.0001[a]	0.0001[a]	0.0002[a]
Exposure time	hours/day	1[b]	2[b]	2b	8[b]	1[b]	24	24	24
Exposure frequency	days/year	250[a]	90[b]	50b	180[b]	75[b]	250[a]	350[a]	350[a]
Exposure duration	years	25[a]	30[b]	10[p]	25[b]	30[a]	25[a]	30[a]	6[a]
Body weight	kg	70[a]	70[a]	45[q]	70[a]	70[a]	70[a]	70[a]	15[a]
Carcinogen averaging time	days	25550[a]	25550[a]	25550[a]	25550[a]	25550[a]	25550[a]	25550[a]	25550[a]
Noncarcinogen averaging time	days	9125[a]	10950[a]	3650[a]	9125[a]	10950[a]	9125[a]	10950[a]	2190[a]
Fraction Ingested	unitless	1[b]	1[b]	1[b]	1[b]	1[b]	1[b]	1[b]	1[b]
Conversion Factor	days/hour	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042
Dermal contact									
Skin area	m^2/event	0.33[d]	0.57[d]	0.815[e]	0.33[d]	0.57[d]	0.33[d]	0.57[d]	0.22[v]
Adherence factor	mg/cm^2	0.7[c]	0.07[c]	0.2[c]	0.3[c]	0.07[c]	0.2[c]	0.4[c]	0.2[v]
Absorption fraction	unitless	chemical specific (if chemical-specific values are not available, default values used are: VOCs = 1%, SVOCs = 10%, metals = 0.1%)[r]							
Exposure frequency	events/year	250[a]	90[b]	50[b]	180[b]	75[b]	250[a]	350[a]	350[a]
Exposure duration	years	25[a]	30[b]	10[p]	25[b]	30[a]	25[a]	30[a]	6[a]
Body weight	kg	70[a]	70[a]	45[q]	70[a]	70[a]	70[a]	70[a]	15[a]
Carcinogen averaging time	days	25550[a]	25550[a]	25550[a]	25550[a]	25550[a]	25550[a]	25550[a]	25550[a]
Noncarcinogen averaging time	days	9125[a]	10950[a]	3650[a]	9125[a]	10950[a]	9125[a]	10950[a]	2190[a]
Conversion Factor	$(kg\text{-}cm^2)/(mg\text{-}m^2)$	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Inhalation of VOCs and dust									
Inhalation rate	m^3/day	20[a]	20[a]	20[a]	44.4[v]	20[a]	20[a]	20[a]	10[s]
Exposure time	hours/day	1[b]	2[b]	2[b]	8[b]	1[b]	24	24	24
Exposure frequency	days/year	250[a]	90[b]	50[b]	180[b]	75[b]	250[a]	350[a]	350[a]

Table 6-2. Parameters Used to Quantify Exposures for Each Medium and Receptor at Load Line 1 (continued)

Parameter	Units	Security Guard/ Maintenance Worker (1)	Hunter/Trapper (2)	Child Trespasser (3)	National Guard Trainee (4)	Open Recreator (5)	Open Industrial Worker (6)	Resident Farmer (Adult) (7)	Resident Farmer (Child) (8)
Exposure duration	years	25[a]	30[b]	10[p]	25[b]	30[a]	25[a]	30[a]	6[a]
Body weight	kg	70[a]	70[a]	45[q]	70[a]	70[a]	70[a]	70[a]	15[a]
Carcinogen averaging time	days	25550[a]	25550[a]	25550[a]	25550[a]	25550[a]	25550[a]	25550[a]	25550[a]
Noncarcinogen averaging time	days	9125[a]	10950[a]	3650[a]	9125[a]	10950[a]	9125[a]	10950[a]	2190[a]
Conversion Factor	days/hour	0.042	0.042	0.042	0.042	0.042	0.042	0.042	0.042
Subsurface Soil									
Incidental ingestion									
Soil ingestion rate	kg/day	NA	NA	NA	0.0001[a]	NA	0.0001[a]	0.0001[a]	0.0002[a]
Exposure time	hours/day	NA	NA	NA	8[b]	NA	24	24	24
Exposure frequency	days/year	NA	NA	NA	28[b]	NA	250[a]	350[a]	350[a]
Exposure duration	years	NA	NA	NA	25[b]	NA	25[a]	30[a]	6[a]
Body weight	kg	NA	NA	NA	70[a]	NA	70[a]	70[a]	15[a]
Carcinogen averaging time	days	NA	NA	NA	25550[a]	NA	25550[a]	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	NA	NA	9125 [a]	NA	9125 [a]	10950[a]	2190[a]
Fraction Ingested	unitless	NA	NA	NA	1[b]	NA	1[b]	1[b]	1[b]
Conversion Factor	days/hour	NA	NA	NA	0.042	NA	0.042	0.042	0.042
Dermal contact									
Skin area	m^2/event	NA	NA	NA	0.33[d]	NA	0.33[d]	0.57[d]	0.22[v]
Adherence factor	mg/cm^2	NA	NA	NA	0.3[c]	NA	0.2[c]	0.4[c]	0.2[v]
Absorption fraction	unitless	NA	NA	NA	chem spec[r]	NA	chemical specific[r]		
Exposure frequency	events/year	NA	NA	NA	28[b]	NA	250[a]	350[a]	350[a]
Exposure duration	years	NA	NA	NA	25[b]	NA	25[a]	30[a]	6[a]
Body weight	kg	NA	NA	NA	70[a]	NA	70[a]	70[a]	15[a]
Carcinogen averaging time	days	NA	NA	NA	25550[a]	NA	25550[a]	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	NA	NA	9125[a]	NA	9125[a]	10950[a]	2190[a]
Conversion Factor	$(kg\text{-}cm^2)/(mg\text{-}m^2)$	NA	NA	NA	0.01	NA	0.01	0.01	0.01

Table 6-2. Parameters Used to Quantify Exposures for Each Medium and Receptor at Load Line 1 (continued)

Parameter	Units	Security Guard/ Maintenance Worker (1)	Hunter/Trapper (2)	Child Trespasser (3)	National Guard Trainee (4)	Open Recreator (5)	Open Industrial Worker (6)	Resident Farmer (Adult) (7)	Resident Farmer (Child) (8)
Inhalation of VOCs and dust									
Inhalation rate	m^3/day	NA	NA	NA	44.4[v]	NA	20[a]	20[a]	10[s]
Exposure time	hours/day	NA	NA	NA	8[b]	NA	24	24	24
Exposure frequency	days/year	NA	NA	NA	28[b]	NA	250[a]	350[a]	350[a]
Exposure duration	years	NA	NA	NA	25[b]	NA	25[a]	30[a]	6[a]
Body weight	kg	NA	NA	NA	70[a]	NA	70[a]	70[a]	15[a]
Carcinogen averaging time	days	NA	NA	NA	25550[a]	NA	25550[a]	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	NA	NA	9125[a]	NA	9125[a]	10950[a]	2190[a]
Conversion Factor	days/hour	NA	NA	NA	0.042	NA	0.042	0.042	0.042
Sediment									
Incidental ingestion									
Soil ingestion rate	kg/day	NA	0.0001[a]	0.0002[a]	0.0001[a]	0.0001[a]	NA	0.0001[a]	0.0002[a]
Exposure time	hours/day	NA	2[b]	2[b]	8[b]	1[b]	NA	24	24
Exposure frequency	days/year	NA	90[b]	50[b]	28[b]	75[b]	NA	350[a]	350[a]
Exposure duration	years	NA	30[b]	10[p]	25[b]	30[a]	NA	30[a]	6[a]
Body weight	kg	NA	70[a]	45[q]	70[a]	70[a]	NA	70[a]	15[a]
Carcinogen averaging time	days	NA	25550[a]	25550[a]	25550[a]	25550[a]	NA	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	10950[a]	3650[a]	9125[a]	10950[a]	NA	10950[a]	2190[a]
Fraction Ingested	unitless	NA	1[b]	1[b]	1[b]	1[b]	NA	1[b]	1[b]
Conversion Factor	days/hour	NA	0.042	0.042	0.042	0.042	NA	0.042	0.042
Dermal contact									
Skin area	m^2/event	NA	0.57[d]	0.815[e]	0.33[d]	0.57[d]	NA	0.57[d]	0.22[v]
Adherence factor	mg/cm^2	NA	0.07[c]	0.2[c]	0.3[c]	0.07[c]	NA	0.4[c]	0.2[v]
Absorption fraction	unitless	NA	chemical specific[r]				NA	chem spec[r]	
Exposure frequency	events/year	NA	90[b]	50[b]	28[b]	75[b]	NA	350[a]	350[a]
Exposure duration	years	NA	30[b]	10[p]	25[b]	30[a]	NA	30[a]	6[a]
Body weight	kg	NA	70[a]	45[q]	70[a]	70[a]	NA	70[a]	15[a]

Table 6-2. Parameters Used to Quantify Exposures for Each Medium and Receptor at Load Line 1 (continued)

Parameter	Units	Security Guard/ Maintenance Worker (1)	Hunter/Trapper (2)	Child Trespasser (3)	National Guard Trainee (4)	Open Recreator (5)	Open Industrial Worker (6)	Resident Farmer (Adult) (7)	Resident Farmer (Child) (8)
Carcinogen averaging time	days	NA	25550[a]	25550[a]	25550[a]	25550[a]	NA	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	10950[a]	3650[a]	9125[a]	10950[a]	NA	10950[a]	2190[a]
Conversion Factor	$(kg\text{-}cm^2)/(mg\text{-}m^2)$	NA	0.01	0.01	0.01	0.01	NA	0.01	0.01
Inhalation of VOCs and dust									
Inhalation rate	m^3/day	NA	20[a]	20[a]	44.4[v]	20[a]	NA	20[a]	10[s]
Exposure time	hours/day	NA	2[b]	2[b]	8[b]	1[b]	NA	24	24
Exposure frequency	days/year	NA	90[b]	50[p]	28[b]	75[b]	NA	350[a]	350[a]
Exposure duration	years	NA	30[b]	10[p]	25[b]	30[a]	NA	30[a]	6[a]
Body weight	kg	NA	70[a]	45[q]	70[a]	70[a]	NA	70[a]	15[a]
Carcinogen averaging time	days	NA	25550[a]	25550[a]	25550[a]	25550[a]	NA	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	10950[a]	3650[a]	9125[a]	10950[a]	NA	10950[a]	2190[a]
Conversion Factor	days/hour	NA	0.042	0.042	0.042	0.042	NA	0.042	0.042
Surface Water									
Incidental ingestion while swimming/wading									
Drinking water ingestion rate	L/day	NA	NA	NA	NA	NA	NA	2[a]	1.5[t]
Incidental water ingestion rate	L/hour	NA	0.05[f]	0.05[f]	0.05[f]	0.05[f]	NA	NA	NA
Exposure time	hours/day	NA	2[b]	2[b]	8[b]	1[b]	NA	NA	NA
Exposure frequency	days/year	NA	90[b]	50[b]	28[b]	45[b]	NA	350[a]	350[a]
Exposure duration	years	NA	30[b]	10[p]	25[b]	30[a]	NA	30[a]	6[a]
Body weight	kg	NA	70[a]	45[q]	70[a]	70[a]	NA	70[a]	15[a]
Carcinogen averaging time	days	NA	25550[a]	25550[a]	25550[a]	25550[a]	NA	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	10950[a]	3650[a]	9125[a]	10950[a]	NA	10950[a]	2190[a]
Dermal contact while swimming/wading									
Skin area	m^2	NA	0.57[d]	1.733[h]	0.57[d]	1.94[g]	NA	1.94[g]	0.866[u]
Exposure time	hours/day	NA	2[b]	2[b]	8[b]	1[b]	NA	0.25[f]	0.25[f]
Exposure frequency	days/year	NA	90[b]	50[b]	28[b]	45[b]	NA	350[a]	350[a]
Exposure duration	years	NA	30[b]	10[p]	25[b]	30[a]	NA	30[a]	6[a]

Table 6-2. Parameters Used to Quantify Exposures for Each Medium and Receptor at Load Line 1 (continued)

Parameter	Units	Security Guard/ Maintenance Worker (1)	Hunter/Trapper (2)	Child Trespasser (3)	National Guard Trainee (4)	Open Recreator (5)	Open Industrial Worker (6)	Resident Farmer (Adult) (7)	Resident Farmer (Child) (8)
Body weight	kg	NA	70[a]	45[q]	70[a]	70[a]	NA	70[a]	15[a]
Carcinogen averaging time	days	NA	25550[a]	25550[a]	25550[a]	25550[a]	NA	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	10950[a]	3650[a]	9125[a]	10950[a]	NA	10950[a]	2190[a]
Conversion Factor	(m/cm)(L/m^3)	NA	10	10	10	10	NA	10	10
Groundwater									
Drinking water ingestion									
Drinking water ingestion rate	L/day	NA	NA	NA	1[a]	NA	NA	2[a]	1.5[t]
Exposure frequency	days/year	NA	NA	NA	180[b]	NA	NA	350[a]	350[a]
Exposure duration	years	NA	NA	NA	25[b]	NA	NA	30[a]	6[a]
Body weight	kg	NA	NA	NA	70[a]	NA	NA	70[a]	15[a]
Carcinogen averaging time	days	NA	NA	NA	25550[a]	NA	NA	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	NA	NA	9125[a]	NA	NA	10950[a]	2190[a]
Dermal contact while showering									
Skin area	m^2	NA	NA	NA	1.94[g]	NA	NA	1.94[g]	0.866[u]
Exposure time	hours/day	NA	NA	NA	0.25[f]	NA	NA	0.25[f]	0.25[f]
Exposure frequency	days/year	NA	NA	NA	180[b]	NA	NA	350[a]	350[a]
Exposure duration	years	NA	NA	NA	25[b]	NA	NA	30[a]	6[a]
Body weight	kg	NA	NA	NA	70[a]	NA	NA	70[a]	15[a]
Carcinogen averaging time	days	NA	NA	NA	25550[a]	NA	NA	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	NA	NA	9125[a]	NA	NA	10950[a]	2190[a]
Conversion Factor	(m/cm)(L/m^3)	NA	NA	NA	10	NA	NA	10	10
Inhalation of VOCs during household water use									
Inhalation rate	m^3/day	NA	NA	NA	20[a]	NA	NA	20[a]	10[s]
Exposure frequency	days/year	NA	NA	NA	180[b]	NA	NA	350[a]	350[a]
Exposure duration	years	NA	NA	NA	25[b]	NA	NA	30[a]	6[a]
Body weight	kg	NA	NA	NA	70[a]	NA	NA	70[a]	15[a]
Carcinogen averaging time	days	NA	NA	NA	25550[a]	NA	NA	25550[a]	25550[a]

Table 6-2. Parameters Used to Quantify Exposures for Each Medium and Receptor at Load Line 1 (continued)

Parameter	Units	Security Guard/ Maintenance Worker (1)	Hunter/Trapper (2)	Child Trespasser (3)	National Guard Trainee (4)	Open Recreator (5)	Open Industrial Worker (6)	Resident Farmer (Adult) (7)	Resident Farmer (Child) (8)
Noncarcinogen averaging time	days	NA	NA	NA	9125[a]	NA	NA	10950[a]	2190[a]
Volitilization factor	L/m^3	NA	NA	NA	0.5[a]	NA	NA	0.5[a]	0.5
Foodstuffs									
Ingestion of venison									
Conversion factor	unitless	NA	1.25	NA	NA	NA	NA	1.25	1.25
Browse ingestion rate	kg dry weight/day	NA	0.87[b]	NA	NA	NA	NA	0.87[b]	0.87
Fraction browse ingested from site	unitless	Exposure Area specific based on home range and exposure area size.							
Fat ratio (venison to beef)	unitless	NA	0.2	NA	NA	NA	NA	0.2	0.2
Venison ingestion rate	kg/day	NA	0.03[b]	NA	NA	NA	NA	0.03[b]	0.03[b]
Fraction ingested	unitless	NA	1[b]	NA	NA	NA	NA	1[b]	1[b]
Exposure frequency	days/year	NA	365[b]	NA	NA	NA	NA	365[b]	365[b]
Exposure duration	years	NA	30[b]	NA	NA	NA	NA	30[a]	6[a]
Body weight	kg	NA	70[a]	NA	NA	NA	NA	70[a]	15[a]
Carcinogen averaging time	days	NA	25550[a]	NA	NA	NA	NA	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	10950[a]	NA	NA	NA	NA	10950[a]	2190[a]
Ingestion of beef, pork									
Resuspension multiplier	unitless	NA	NA	NA	NA	NA	NA	0.25[i]	0.25[i]
Quantity of pasture ingested	kg dry weight/day	NA	NA	NA	NA	NA	NA	7.2[j]	7.2[j]
Fraction of year cow is on-site	unitless	NA	NA	NA	NA	NA	NA	1[b]	1[b]
Fraction of cow's food from on-site	unitless	NA	NA	NA	NA	NA	NA	0.9[b]	0.9[b]
Quantity of soil ingested by cow	kg/day	NA	NA	NA	NA	NA	NA	1[k]	1[k]
Beef ingestion rate	kg/day	NA	NA	NA	NA	NA	NA	0.075[l]	0.075[l]
Fraction ingested	unitless	NA	NA	NA	NA	NA	NA	1[b]	1[b]
Exposure frequency	days/year	NA	NA	NA	NA	NA	NA	365[b]	365[b]
Exposure duration	years	NA	NA	NA	NA	NA	NA	30[a]	6[a]
Body weight	kg	NA	NA	NA	NA	NA	NA	70[a]	15[a]
Carcinogen averaging time	days	NA	NA	NA	NA	NA	NA	25550[a]	25550[a]

Table 6-2. Parameters Used to Quantify Exposures for Each Medium and Receptor at Load Line 1 (continued)

Parameter	Units	Security Guard/ Maintenance Worker (1)	Hunter/Trapper (2)	Child Trespasser (3)	National Guard Trainee (4)	Open Recreator (5)	Open Industrial Worker (6)	Resident Farmer (Adult) (7)	Resident Farmer (Child) (8)
Noncarcinogen averaging time	days	NA	NA	NA	NA	NA	NA	10950[a]	2190[a]
Ingestion of milk products									
Resuspension multiplier	unitless	NA	NA	NA	NA	NA	NA	0.25[i]	0.25[i]
Quantity of pasture ingested	kg dry weight/day	NA	NA	NA	NA	NA	NA	16.1[j]	16.1[j]
Fraction of year cow is on-site	unitless	NA	NA	NA	NA	NA	NA	1[b]	1[b]
Fraction of cow's food from on-site	unitless	NA	NA	NA	NA	NA	NA	0.6[b]	0.6[b]
Quantity of soil ingested by cow	kg/day	NA	NA	NA	NA	NA	NA	1[k]	1[k]
Milk ingestion rate	kg/day	NA	NA	NA	NA	NA	NA	0.305[l]	0.509[m]
Fraction ingested	unitless	NA	NA	NA	NA	NA	NA	1[b]	1[b]
Exposure frequency	days/year	NA	NA	NA	NA	NA	NA	365[b]	365[b]
Exposure duration	years	NA	NA	NA	NA	NA	NA	30[a]	6[a]
Body weight	kg	NA	NA	NA	NA	NA	NA	70[a]	15[a]
Carcinogen averaging time	days	NA	NA	NA	NA	NA	NA	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	NA	NA	NA	NA	NA	10950[a]	2190[a]
Ingestion of vegetables									
Resuspension multiplier	unitless	NA	NA	NA	NA	NA	NA	0.26[n]	0.26[n]
Vegetable ingestion rate	kg/day	NA	NA	NA	NA	NA	NA	0.2[l]	0.2[l]
Fraction ingested	unitless	NA	NA	NA	NA	NA	NA	0.4[l]	0.4[l]
Exposure frequency	days/year	NA	NA	NA	NA	NA	NA	365[b]	365[b]
Exposure duration	years	NA	NA	NA	NA	NA	NA	30[a]	6[a]
Body weight	kg	NA	NA	NA	NA	NA	NA	70[a]	15[a]
Carcinogen averaging time	days	NA	NA	NA	NA	NA	NA	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	NA	NA	NA	NA	NA	10950[a]	2190[a]
Ingestion of fish									
Fish ingestion rate	kg/day	NA	0.054[o]	NA	NA	NA	NA	0.054[o]	0.054[o]
Fraction ingested	unitless	NA	1[b]	NA	NA	NA	NA	1[b]	1[b]
Exposure frequency	days/year	NA	365[b]	NA	NA	NA	NA	365[b]	365[b]

Table 6-2. Parameters Used to Quantify Exposures for Each Medium and Receptor at Load Line 1 (continued)

Parameter	Units	Security Guard/ Maintenance Worker (1)	Hunter/Trapper (2)	Child Trespasser (3)	National Guard Trainee (4)	Open Recreator (5)	Open Industrial Worker (6)	Resident Farmer (Adult) (7)	Resident Farmer (Child) (8)
Exposure duration	years	NA	30[b]	NA	NA	NA	NA	30[a]	6[a]
Body weight	kg	NA	70[a]	NA	NA	NA	NA	70[a]	15[a]
Carcinogen averaging time	days	NA	25550[a]	NA	NA	NA	NA	25550[a]	25550[a]
Noncarcinogen averaging time	days	NA	10950[a]	NA	NA	NA	NA	10950[a]	2190[a]

[a] RAGS, Part B (EPA 1991a).
[b] The security guard exposure time is less than the standard occupational value because while a security guard works 8 h/day at RVAAP, the exposure time of 1 h/day at LL 1 is conservative because a security guard will walk around the LL 1 area rarely, if at all, and has no reason to spend all day at a single location. Security patrols occur daily across the site but not within LL 1; patrolmen usually remain in their vehicles during these patrols.
[c] Security Guard/Maintenance Worker = Adult Groundskeeper (95th percentile); Hunter/Trapper = Residential Default; Child Trespasser = Child Default and Teen Soccer (95th percentile); National Guard Trainee = Construction Worker (95th percentile); Open Recreator = Adult Soccer (95th percentile); Open Industrial Worker = Industrial Default; Resident Farmer = Adult Farmer (95th percentile) (Dermal Guidance, Draft January 2000, from Mark Johnson EPA Region V).
[d] Security Guard/Maintenance Worker, National Guard Trainee, and Open Industrial = Industrial Default; Hunter/Trapper, Open Recreator, and Resident Farmer = Adult Residential Default.
[e] Average surface area for head, hands, forearms, torso, and lower legs for a child (EPA 1992b).
[f] RAGS, Part A (EPA 1989a).
[g] Average total body surface area for an adult (EPA 1992b).
[h] Average total body surface area for a child (EPA 1992b).
[i] Plant mass loading factor for pasture (Hinton 1992).
[j] International Atomic Energy agency 1994.
[k] Soil ingestion by dairy cattle (Darwin 1990).
[l] Exposure Factors Handbook (EPA 1989b), child is assumed to be the same as adult default value except for milk ingestion.
[m] Pao, et al., 1982.
[n] Plant mass loading factor for vegetables (Pinder 1989).
[o] Standard default Exposure Factors (EPA 1991b), child is assumed to be the same as adult default value.
[p] OEPA personal communication, June 1999, assumes exposure age 8-18.
[q] Average body weight for child age 8-18 (EPA 1992b).
[r] Chemical-specific ABS values available from EPA Region V are provided in Table Q.3-1. When chemical-specific values are not available the following default values are used: SVOCs = 10%, (Dermal Guidance, Draft January 2000, from Mark Johnson EPA Region V), VOCs = 1%, inorganics = 0.1% (EPA Region 4 Supplemental Guidance to RAGS: Region 4 Bulletins).
[s] Recommended value for child age 6-8 (EPA 1997).
[t] 90th percentile value for child age 3-5 (EPA 1997).
[u] 50th percentile value for male child age 6-7 (EPA 1997).
[v] Per OEPA comment 2002.
NA = not applicable for this scenario.
VOC = Volatile organic compound.

Table 6-3. Modified Caretaker/Managed Recreational Receptors and Activities

Receptor	Typical Activities
Authorized Uses	
Security guard – maintenance worker	Security patrol, remediation
Hunters and trappers	Deer hunting, trapping, fishing
Nature study participants	University studies, bird watching
Unauthorized Uses	
National Guard personnel outside of authorized areas	National Guard trainee trespassing
Trespassers	Children playing and wading or swimming, Unauthorized hunting

Security guard – maintenance worker

Current government activities at LL 1 are limited to maintenance activities (including checking on beaver damage) and environmental remediation activities. The buildings at LL 1 previously were demolished, and this area is not mowed. Security patrols occur daily across the installation but not within LL 1; patrolmen usually remain within their vehicles during these patrols. Although the security guard is not currently exposed to contaminated media at LL 1 on a daily basis, the potential exposure of this receptor is evaluated in this BHHRA. Therefore, as a worst-case assumption, it is assumed that a security guard leaves his or her vehicle on a daily basis and is exposed to surface soil, sediment, and surface water. Parameter values used to assess exposure to this receptor in the BHHRA are provided in Table 6-2.

Hunter/trapper

Permitted deer and waterfowl hunting takes place every fall at the RVAAP. It is managed jointly by the facility staff and the State Division of Wildlife. According to Tim Morgan, OSC forester, deer hunting takes place during 6-12 weekends each year. Hunts do occur at LL 1 and most other AOCs. Hunters are escorted and allowed a maximum of two deer per year. It is possible that a single hunter could participate in hunts over several years. Hunters could be exposed to COPCs via direct contact with surface soil (including inhalation of fugitive dust) as well as through the ingestion of deer meat. Waterfowl hunters may also be exposed to surface water, sediment, and surface soil.

Trapping takes place three months of the year (November through January) primarily to control beaver and raccoon populations. Trapper pairs are assigned from 0.4 to 1.6 hectares (1 to 4 acres) and are allowed to check and set traps daily, although most do not. Traps are generally set near ponds (near existing dams) and along roadsides. According to Tim Morgan, OSC forester, the most common catches include beaver, mink, muskrat, weasel, raccoon, possum, rabbit, and squirrel. In 1997, 450 raccoon, 74 beaver, and 300 muskrat were trapped, as well as additional species.

Fishing is currently allowed only under a catch and release program (includes Criggy's Pond), although trespassers may fish the viable ponds.

Based on the available information, it is assumed that the hunter, trapper, and fisher may be the same individual and could be exposed to surface soils, sediments, and surface water over a three-month period. This individual also has a steady diet of venison and fish collected from the LL 1 AOC. See Table 6-2 for parameter values used to evaluate exposures to the hunter/trapper in this BHHRA.

Nature study participant

Research projects associated with nearby Youngstown State University take place at RVAAP. These projects include a migratory bird study, foodchain studies, a salamander study, a bat study, archeological studies, and bird tours. All studies take place outside of AOCs. The frequency that study participants come to the site varies but is generally less than from 3 to 4 times/week for several months, as opposed to years. Because these receptors are generally short-term visitors to the facility and would likely result in minimal risks/hazards from acute exposures at LL 1, they will not be addressed quantitatively in this risk assessment.

Trespasser

RVAAP is a controlled access facility (it is fenced, gated, and patrolled by security guards); however, it is still possible that a trespasser may enter the site and be exposed to surface soil, sediment, and surface water. The most likely adult trespassers are hunters or National Guard trainees entering unauthorized areas. These adult trespassers will have similar exposures, but with a much lower frequency, to the Hunter/Trapper and National Guard Trainee receptors that are included in the BHHRA. Therefore, a separate adult trespasser is not evaluated quantitatively in this risk assessment.

A child trespasser (ages 8-18) is evaluated quantitatively for exposure to contaminated surface soil, sediment, and surface water.

6.3.2.2 National Guard/managed recreational land use

Three receptor categories have been identified under this scenario. One of the assumptions for this scenario is that as part of acquiring the RVAAP lands, the OHARNG will take on the forestry and land management responsibilities at the facility. Therefore, two of the receptors for this scenario are the same receptors identified for the "Modified Caretaker/Managed Recreational" land use—the hunter/trapper and the child trespasser. Unique to this land use designation is the National Guard receptor. Information describing this receptor has been obtained from two primary sources: the Range and Training Land Program Development Plan, issued in draft form by the OHRNG in late 1998, and a July 1998 interview with Lt. Col. Tom Tadsen, officer in charge of the RTLS for the OHARNG. The Development Plan reviewed available training capacity and compared it to long-term training needs. In the process, it described the types of training that could potentially take place at RVAAP (Table 6-4).

In general, National Guard units participate in weekend training at RTLS, with some 2-week training. Weekend training that currently takes place at the RTLS is summarized as follows:

- day/night wheeled vehicle convoys, involving drives on paved road and including staged ambushes;
- night blackout drives;
- self-propelled artillery driver training for armored vehicles, involving great dust generation;
- command-post exercises, including setting up tactical operations and sleeping on the ground;
- armored vehicle recovery, involving recovery of vehicles from a prepared site;
- dismounted road march, on-foot marches on paved and unpaved areas, including stream crossings;
- Bailey Bridge assembly, launching, and disassembly over and adjacent to streams; and
- defense of a fixed position, requiring foxholes up to 5 ft deep.

An example of week-long training is "early warning team" training, involving all-week tracking of aircraft and artillery from tent positions.

Table 6-4. National Guard Training Activities

Training Type	Currently Available	Needed
Maneuver Training Areas		
Light Maneuver Area	X	
Other		
Tracked vehicle driver's course	X	
Personnel and equipment drop zone	X	
Convoy training route	X	
Tracked vehicle driver's training course	X	
Land navigation course	X	
Hand grenade qualification course		X
Hand grenade familiarization range		X
Military operations in urban terrain (MOUT)		X

According to RTLS staff (pers. Comm. Lt. Col. Tadsen, July 7, 1998), the most likely training uses of LL 1, should it become available, could include orienteering and other transient training activities.

The number of trainees at the RTLS and the number of weekends the facility is in use continues to increase. This will increase even more as more lands are developed for training. In 2000, there were 55,923 training man-days at the facility. This number has been, and is expected to continue to, increase each year. According to the Development Plan, the typical training year includes weekends (less holiday weekends) and annual training (2-week duration), which for the RTLS is 173 days/year.

In general, individual trainees visit the facility only from one to two times per year. The maximum amount of time a trainee is expected to be at the facility in a year is 2 weeks. However, OHARNG personnel are stationed at the RTLS administration area full-time. These personnel are responsible for managing training activities and schedules and for insuring units are in compliance with facility requirements. This involves checking on units during their activities. It is assumed that, as a worst-case, an individual stationed at RTLS could visit a training area approximately 180 days/year.

National Guard receptors are assumed to be exposed to surface soil (0 to 1 ft bgs), subsurface soil (>1 ft bgs), surface water, and sediment. Exposure to surface soil and subsurface soil are evaluated separately because intrusive activities included in the National Guard Trainee scenario (e.g., digging foxholes) are (1) limited in area (i.e., some areas of the AOC may never be dug into), (2) potentially limited to a subset of receptors (i.e., different groups of trainees will engage in different activities), and (3) are uncertain (i.e., intrusive activities are an option, they may never occur, or they may occur sometime in the future); therefore, it is important to evaluate exposure to both surface and subsurface soil. Separation of these two media allows risk managers to make decisions regarding future use and depth/type of remediation.

According to RTLS staff (pers. Comm. Lt. Col. Tadsen, July 7, 1998), all potable water will come from the local municipal water supply. There are currently no plans to obtain water from groundwater wells. However, based on the possibility that this decision could be reversed in the future, this BHHRA also evaluates the exposure of the National Guard receptor from groundwater use.

Parameter values used to evaluate the National Guard receptors in this BHHRA are provided in Table 6-2.

6.3.2.3 Open recreational land use

This potential land use scenario has been developed to provide information on potential future risk should the RVAAP revert to a recreational-type use. Various potential recreational uses are possible including a

state or federal recreational area, a wildlife sanctuary, a park, ball fields, etc. Because this use is not clearly defined, the exposure pathway analysis involves a reasonable worst-case assessment of recreational receptor activities. It is assumed that a recreator could be exposed to surface soils, stream sediments, and surface water. No groundwater use is assumed for this land use. Specific pathways and parameters used to define this scenario are listed in Table 6-2.

6.3.2.4 Open industrial land use

Like the open recreational scenario, the exposure assessment for this land use is designed to cover reasonable worst-case receptor-activity patterns that could occur under a future commercial/industrial land use. Under this land use, it is assumed that excavation, fill, and construction work (activities such as the rare occasion of digging a foundation for a post or bridge) could take place; therefore, receptors could be exposed to subsurface soil. Because of this, the activities associated with a construction-worker scenario are covered within this open industrial land use scenario, and a separate construction-worker scenario is not evaluated. Most of the parameter values for this open industrial land use scenario, listed in Table 6-2, are standard CERCLA industrial exposure assumptions (EPA 1991a).

6.3.2.5 Open residential land use

This land use scenario represents a true baseline assessment against which all decisions, including decisions to maintain institutional controls, can be made. It represents the worst-case exposures for all land use/receptor combinations. The adult and child resident farmer is assumed to be exposed chronically to all media, including groundwater and foodstuffs. It is assumed that the farmer lives on the LL 1 land, raises livestock and vegetables, hunts, and digs into subsurface soils (see Table 6-2). Parameters used to represent activity patterns are listed in Table 6-2 and generally come from standard default values defined by the EPA (1991a).

6.3.3 Quantification of Intake

Intake is defined as the amount of contaminant that could be in contact with the body (e.g., lungs, gut) per unit body weight per unit time. Dose is defined as the amount of contaminant that could be absorbed into the bloodstream per unit body weight per unit time. For the LL 1 BHHRA, the intakes (for inhalation and ingestion exposures) and doses (for dermal exposures) were quantified for each receptor using methods presented in the SAP Addendum #2 (USACE 2000b) and the Technical Memorandum (USACE 2001). The equations used to estimate intake and dose are presented in the following subsections for soils, sediments, surface water, groundwater, and ingestion of foodstuffs. The exposure parameters used in these equations are provided in Table 6-2. Parameter values were selected based on EPA guidance with input from the OHARNG and RVAAP facility staff.

6.3.3.1 Soils and sediments exposure pathways

Incidental ingestion of soils and sediments was estimated for chemicals using Eq. 1:

$$Chemical\ Intake\ (mg/kg\text{-}day) = \frac{C_S \times IR_S \times EF \times ED \times FI \times ET \times CF}{BW \times AT}, \qquad \textbf{(1)}$$

where

C_s = chemical concentration in soils or sediments (mg/kg),
IR_s = ingestion rate (kg/day),
EF = exposure frequency (days/year),

ED = exposure duration (years),
FI = fraction ingested (value of 1, unitless),
ET = exposure time adjustment (hr/day),
CF = conversion factor for ET (day/hr),
BW = body weight (kg),
AT = averaging time (days) for carcinogens or noncarcinogens.

The dermally absorbed dose (DAD) from chemicals in soils and sediments was calculated by using Eq. 2.

$$\textit{Chemical DAD (mg/kg – day)} = \frac{C_s \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}, \quad \textbf{(2)}$$

where

C_s = chemical concentration in soils or sediments (mg/kg),
CF = conversion factor [$(10^{-6}$ kg/mg) × (10^4 cm^2/m^2)],
SA = skin surface area exposed to soil (m2/event),
AF = soil to skin adherence factor (1 mg/cm^2),
ABS = chemical-specific absorption factor (when chemical-specific values are not available the following defaults are used: 0.1% for inorganics, 1.0% for VOCs, and 10% for SVOCs),
EF = exposure frequency (events/year),
ED = exposure duration (years),
BW = body weight (kg),
AT = averaging time (days) for carcinogens or noncarcinogens.

Inhalation of soils or dry sediments was calculated using Eq. 3:

$$\textit{Chemical Intake (mg/kg – day)} = \frac{C_s \times IR_a \times EF \times ED \times (VF^{-1} + PEF^{-1}) \times ET \times CF}{BW \times AT}, \quad \textbf{(3)}$$

where

C_s = chemical concentration in soils or sediments (mg/kg),
IRa = inhalation rate (m3/day),
EF = exposure frequency (days/year),
ED = exposure duration (years),
VF = volatilization factor (chemical-specific m3/kg),
PEF = particulate emission factor m3/kg),
ET = exposure time adjustment (hr/day),
CF = conversion factor for ET (day/hr),
BW = body weight (kg),
AT = averaging time (days) for carcinogens or noncarcinogens.

The general PEF value used for all LL 1 receptors except the National Guard is the default value for Cleveland Ohio assuming a 0.5-acre source area (9.24E+08 m^3/kg). This PEF value was calculated using the EPA Soil Screening Guidance on-line at http://risk.lsd.ornl.gov/epa/ssl1.htm. The EUs ranged in size from approximately one-quarter acre (Water Tower) to more than 10 acres (Perimeter Area); however, the contamination tends to be limited to small areas around the buildings. Therefore, a 0.5-acre contaminated source area is considered appropriate. A smaller PEF value (1.67×10^6) was used for the National Guard

scenario because the activities of this receptor are assumed to generate more dust. This PEF value was calculated from a dust loading factor (DLF) of 600 μg/m^3 (DOE 1993) as:

PEF = 1/(DLF × Conversion Factor) = 1/(600 μg/m^3 × 1E-09 kg/μg) = 1.67E+06 m^3/kg

6.3.3.2 Groundwater and surface water exposure pathways

Drinking water ingestion was estimated using Eq. 4:

$$\textit{Chemical Intake (mg/kg – day)} = \frac{C_w \times IR_w \times EF \times ED}{BW \times AT}, \qquad \textbf{(4)}$$

where

C_w = chemical concentration in water (mg/L),
IRw = ingestion rate (L/day),
EF = exposure frequency (days/year),
ED = exposure duration (years),
BW = body weight (kg),
AT = averaging time (days) for carcinogens or noncarcinogens.

Incidental ingestion of surface water while swimming was estimated using Eq. 5:

$$\textit{Chemical Intake (mg/kg - day)} = \frac{C_w \times IR_w \times ET \times EF \times ED}{BW \times AT}, \qquad \textbf{(5)}$$

where

C_w = chemical concentration in water (mg/L),
IRw = ingestion rate (L/hr),
ET = exposure time (hr/day),
EF = exposure frequency (days/year),
ED = exposure duration (years),
BW = body weight (kg),
AT = averaging time (days) for carcinogens or noncarcinogens.

The dermally absorbed dose from dermal contact with chemicals in surface water or groundwater was calculated by using Eq. 6:

$$\textit{Chemical DAD (mg/kg - day)} = \frac{C_w \times CF \times PC \times SA \times ET \times EF \times ED}{BW \times AT}, \qquad \textbf{(6)}$$

where

C_w = chemical concentration in water (mg/L),
CF = conversion factor [(m/100 cm) × (1,000 L/m3)],
PC = permeability constant (chemical-specific cm/hr),
SA = skin surface area exposed to soil (m^2),
ET = exposure time (hr/day),

EF = exposure frequency (days/year),
ED = exposure duration (years),
BW = body weight (kg),
AT = averaging time (days) for carcinogens and noncarcinogens.

Inhalation of VOCs from groundwater during household water use was estimated by using Eq. 7:

$$Chemical\ Intake\,(mg/kg\text{ - }day) = \frac{C_w \times IR_w \times K \times EF \times ED \times ET \times CF}{BW \times AT}, \qquad \textbf{(7)}$$

where

C_w = chemical concentration in water (mg/L),
IRw = inhalation rate (m3/day),
K = volatilization factor (0.0005 × 1,000 L/m3),
EF = exposure frequency (days/year),
ED = exposure duration (years),
ET = exposure time adjustment (hr/day),
CF = conversion factor for ET (day/hr),
BW = body weight (kg),
AT = averaging time (days) for carcinogens or noncarcinogens.

Inhalation of VOCs from surface water is not quantified because no volatile COPCs have been identified in surface water.

6.3.3.3 Ingestion of foodstuffs

Ingestion of chemicals from the consumption of foodstuffs was estimated by using Eq. 8. Supplemental equations for calculating the concentration of chemical in the food source are presented in SAP Addendum No. 1 (USACE 1999a).

$$Chemical\ Intake\,(mg/kg\text{ - }d) = \frac{C_f \times IR_f \times EF \times ED}{BW \times AT}, \qquad \textbf{(8)}$$

where

C_f = chemical concentration in food (mg/kg),
IRf = ingestion rate of food (kg/day),
EF = exposure frequency (day/year),
ED = exposure duration (years),
BW = body weight (kg),
AT = averaging time (days) for carcinogens and noncarcinogens.

6.3.4 Exposure Point Concentrations

The EPC represents the chemical concentration a receptor is likely to come in contact with over the duration of exposure. Exposure concentrations from direct contact with environmental media (soils, sediment, groundwater, surface water) are based on the sampling results of the media as described in

Section 6.3.4.1. Exposure concentrations for contaminants that have migrated into secondary media (beef, milk, venison, fish, and vegetables) are modeled from the equations presented in Section 6.3.4.2.

6.3.4.1 Measured exposure point concentrations

Exposure from direct contact pathways represents exposure to media at the source, and the EPC is based on data collected at the source. Current measured concentrations of chemicals were used to represent future concentrations in the medium or media of interest. The results of contaminant fate and transport analysis (Chapter 5.0) indicate that while peak contaminant concentrations in groundwater beneath the source areas may exceed drinking water MCLs or RBCs, none of the modeled constituents are predicted to reach the LL 1 site boundary at measurable concentrations.

The EPCs developed for each COPC represent an UCL_{95} on the mean or the maximum detected value for all locations within the EU, whichever is smaller. EPCs were calculated using EPA guidance, *Supplemental Guidance to RAGS: Calculating the Concentration Term* (EPA 1992b). The data were tested using the Shapiro-Wilk test to determine distribution, normal or lognormal, of the concentrations. The UCL_{95} on the mean was calculated using the normal distribution equation (see Eq. 9) when the concentrations are normally distributed, when concentrations are not judged to be normally or lognormally distributed, when the data set contains fewer than 5 detections, or when the frequency of detection is less than 50%. For these situations, the UCL_{95} on the mean is calculated using the following equation:

$$UCL_{95}(normal) = \bar{x}_n + \frac{(t)(s_x)}{\sqrt{n}}, \qquad \textbf{(9)}$$

where

$\bar{x}_n$ = mean of the untransformed data,
t = student-t statistic,
sx = standard deviation of the untransformed data,
n = number of sample results available.

For lognormally distributed concentrations, the UCL_{95} on the mean is calculated using the following equation:

$$UCL_{95}(lognormal) = e^{\left(\bar{x}_l + 0.5(s_l^2) + \frac{(S_l)(H)}{\sqrt{n-1}}\right)}, \qquad \textbf{(10)}$$

where

e = constant (base of the natural log, equal to 2.718),
$\bar{x}l$ = mean of the transformed data [l = log (x)],
sl = standard deviation of the transformed data,
H = H-statistic,
n = number of sample results available.

6.3.4.2 Modeled exposure point concentrations

Direct sampling results are not available for the evaluation of ingestion of foodstuffs (i.e., beef, milk, venison, fish, and vegetables). Exposure concentrations were modeled for these media using the equations presented below. The starting concentration of COPCs in soil, surface water, and sediment is equal to the

EPC calculated for direct exposure pathways as described in Section 6.3.4.1 above. Other parameter values are provided in Appendix Q, Table Q-7.

Chemical Concentration in Beef

Concentrations in beef cattle are calculated from the concentration in the cattle's food sources due to soil and water contamination. The contaminant levels in pastures are estimated by the equation:

$$C_p = C_s \times (R_{upp} + R_{es}),$$

where

C_p = concentration of contaminant in pasture (mg/kg, calculated),
Cs = concentration of contaminant in soil (mg/kg),
R_{upp} = multiplier for dry root uptake for pasture (unitless),
R_{es} = resuspension multiplier (unitless).

The multiplier for dry root uptake for pasture, R_{upp}, is estimated as:

$$R_{upp} = Bv_{dry},$$

where

R_{upp} = multiplier for dry root uptake for pasture (unitless),
Bv_{dry} = soil-to-plant uptake, dry weight (kg/kg, chemical-specific, or $38 \times K_{ow}^{-0.58}$),
K_{ow} = octanol-water partitioning coefficient (unitless, chemical-specific).

The resuspension multiplier is estimated as:

$$R_{es} = MLF,$$

where

R_{es} = resuspension multiplier (unitless),
MLF = plant mass loading factor (unitless, 0.25 for pasture).

The concentration of contaminants in beef cattle from ingestion of contaminated pasture, soil, and water is estimated using the following equation:

$$C_b = BTF_{beef} \times [(C_p \times Q_{pb} \times f_{pb} \times f_{sb}) + (C_s \times Q_{sb} \times f_{pb}) + (C_w \times Q_{wb})],$$

where

C_b = concentration of contaminant in beef (mg/kg dry weight),
BTF_{beef} = beef transfer coefficient (day/kg, chemical-specific, or 2.5 × 10-8 × Kow),
K_{ow} = octanol-water partitioning coefficient (unitless, chemical-specific),
C_p = concentration of contaminant in pasture (mg/kg, calculated),
Q_{pb} = quantity of pasture ingested by beef cattle (kg/day),
f_{pb} = fraction of year beef cattle is on-site (kg/day),
f_{sb} = fraction of beef cattle's food that is from the site (kg/day),
C_s = concentration of contaminant in soil (mg/kg),

Q_{sb} = quantity of soil ingested by beef cattle (kg/day),
C_w = concentration of contaminant in water (mg/L),
Q_{wb} = quantity of water ingested by beef cattle (L/day).

Chemical concentration in milk

Milk concentrations from dairy cattle are calculated from the concentration in the cattle's food sources due to soil and water contamination. The contaminant levels in pastures are estimated in the same fashion as for beef cattle (see Section 6.3.4.2).

The concentration of contaminants in dairy cattle's milk, from ingestion of contaminated pasture, soil, and water, is estimated using the following equation:

$$C_m = BTF_{milk} \times [(C_p \times Q_{pd} \times f_{pd} \times f_{sd}) + (C_s \times Q_{sd} \times f_{pd}) + (C_w \times Q_{wd})],$$

where

C_m = concentration of contaminant in milk (mg/kg),
BTF_{milk} = milk transfer coefficient (day/kg, chemical-specific, or $7.9 \times 10^{-9} \times K_{ow}$),
K_{ow} = octanol-water partitioning coefficient (unitless, chemical-specific),
C_p = concentration of contaminant in pasture (mg/kg, calculated),
Q_{pd} = quantity of pasture ingested by dairy cattle (kg/day),
f_{pd} = fraction of year dairy cattle is on-site (kg/day),
f_{sd} = fraction of dairy cattle's food that is from the site (kg/day),
C_s = concentration of contaminant in soil (mg/kg),
Q_{sd} = quantity of soil ingested by dairy cattle (kg/day),
C_w = concentration of contaminant in water (mg/L),
Q_{wd} = quantity of water ingested by dairy cattle (L/day).

Chemical concentration in venison

Concentrations in venison are estimated by calculating the concentration in venison food sources due to soil contamination. The contaminant levels in forage are estimated by the following:

$$C_p = (CF)(C_s)(B_p)$$

where

C_p = concentration of contaminant in forage (mg/kg dry weight),
CF = conversion factor to adjust for soil containing 20% moisture (1.25 unitless),
C_s = concentration of contaminant in soil (mg/kg),
B_p = soil-to-forage biotransfer factor (mg chemical per kg of dry plant/mg of chemical per kg or dry soil)(chemical-specific).

The B_p for metals is taken from the available literature. The B_p for SVOCs is calculated using the following formulas:

$$\log B_p = 1.588 - 0.578 \log K_{ow}$$

where

$\log B_p$ = soil-to-forage biotransfer factor (mg chemical per kg of dry plant/mg of chemical per kg or dry soil)(chemical-specific),
K_{ow} = octanol-water partitioning coefficient (unitless, chemical-specific).

A B_p is not estimated for VOCs, because these chemicals are expected to volatilize rapidly from soils and plants and thus are insignificant in food chain pathways.

The concentration of contaminants in venison from ingestion of contaminated forage is estimated using the following equation:

$$C_v = (Q_p)(C_p)(FI_e)(B_v)$$

where

C_v = contaminant concentration in venison (mg/kg),
Q_p = browse ingestion rate (0.87 kg dry weight/day),
C_p = contaminant concentration in browse (mg/kg dry weight),
FI_e = fraction browse ingested from the contaminated site (site area/home range),
B_v = biotransfer factor for venison (days/kg).

The B_v for beef is used for deer due to a lack of available literature values for deer. Both of these animals are ruminants; therefore, the uptake and bioaccumulation of contaminants is likely to be similar. The meat of deer contains less fat than commercial beef—14.4% fat for beef as compared to 2.9% for venison. Organic chemicals have a greater affinity to fat and thus would not accumulate as much in venison. Therefore, the beef biotransfer factors for organics are adjusted by 2.9/14.4 (0.20) to reflect this lower accumulation rate. The fraction browse ingested from the contaminated site is EU-specific. Fraction browse for each of the seven EUs is shown below. These values are based on a 175-hectare home range for deer.

- Buildings CB-3 and CB-801 = 0.011;
- Buildings CB-4/4A and CA-6/6A = 0.042;
- Buildings CB-13 and CB-10 = 0.018;
- Buildings CB-14, CB-17, and CA-15 = 0.017;
- Water Tower = 0.0016;
- Change Houses (CB-12, CB-23, CB-8, and CB-22) = 0.0051; and
- Perimeter Area = 0.98.

The B_v values for metals are taken from the published literature. The B_v values for organics are calculated as follows:

$$B_v = R_f \times 10^{-7.6 + \log K_{ow}},$$

where

B_v = biotransfer factor for venison (days/kg),
R_f = ratio of the fat content in venison to the fat content of beef (0.20),
K_{ow} = octanol-water partitioning coefficient (unitless, chemical-specific).

Chemical concentrations in fish

Fish may bioconcentrate contaminants from water and sediment. The contaminant concentration in fish due to bioconcentrating contaminants from surface water is estimated using the following equation:

$$C_{fw} = (C_w)(BCF),$$

where

C_{fw} = contaminant concentration in fish from surface water (mg/kg),
C_w = contaminant concentration in water (mg/L),
BCF = fish bioconcentration factor (L/kg).

Many BCF factors for fish are available from the literature. In the absence of a BCF literature value for an organic, the value is estimated using the following equation:

$$\log BCF = 0.76 \times K_{ow} - 0.23,$$

where

BCF = fish bioconcentration factor (L/kg),
K_{ow} = octanol-water partitioning coefficient (unitless, chemical-specific).

Chemical concentration in homegrown vegetables

The model to estimate the chemical concentration in homegrown vegetables is comprised of contributions from irrigation and soil resuspension.

The root uptake from the irrigation component is estimated by the equation:

$$Irr_{rup} = (Ir \times F \times Bv_{wet} \times [1 - e^{(-\lambda_B \times t_b)}] / (P \times \lambda_B),$$

where

Irr_{rup} = multiplier in vegetable equation for root uptake from irrigation (L/kg),
Ir = irrigation rate (L/m^2-day),
F = irrigation period as a fraction (unitless),
Bv_{wet} = soil-to-plant uptake factor, wet weight (kg/kg),
λ_B = effective rate for removal (1/day, calculated as $\lambda_i + \lambda_{HL}$),
λ_i = decay rate (1/day, assume 0 for chemicals),
λ_{HL} = soil leaching rate (1/day),
t_b = long-term deposition and buildup (days),
P = area density for root zone (kg/m^2).

The resuspension from irrigation component is estimated by the equation:

$$Irr_{res} = (Ir \times F \times MLF \times [1 - e^{(-\lambda_B \times t_b)}] / (P \times \lambda_B),$$

where

Irr_{res} = multiplier in vegetable equation for resuspension from irrigation (L/kg),
Ir = irrigation rate (L/m^2-day),

F = irrigation period as a fraction (unitless),
MLF = plant mass loading factor (unitless, 0.26 for vegetables),
λ_B = effective rate for removal (1/day, calculated as $\lambda_i + \lambda_{HL}$),
λ_i = decay rate (1/day, assume 0 for chemicals),
λ_{HL} = soil leaching rate (1/day),
t_b = long-term deposition and buildup (days),
P = area density for root zone (kg/m^2).

The aerial deposition from irrigation component is estimated by the equation:

$$Irr_{dep} = (Ir \times F \times I_f \times T \times [1 - e^{(-\lambda_E \times t_v)}] / (Y_v \times \lambda_E),$$

where

Irr_{dep} = multiplier in vegetable equation for aerial deposition from irrigation (L/kg),
Ir = irrigation rate (L/m^2-day),
F = irrigation period as a fraction (unitless),
I_f = interception fraction (unitless),
T = translocation factor (unitless),
λ_E = decay for removal on produce (1/day, calculated as $\lambda_i + 0.693/t_w$),
λ_i = decay rate (1/day, assume 0 for chemicals),
t_w = weathering half-life (days),
t_v = above-ground exposure time (days),
Y_v = plant yield (wet) (kg/m^2).

The chemical concentration in homegrown vegetables is estimated with the equation:

$$C_{veg} = C_w \times (Irr_{rup} + Irr_{res} + Irr_{dep}) + C_s \times (Bv_{wet} + MLF),$$

where

C_w = concentration of contaminant in water (mg/L),
Irr_{rup} = multiplier in vegetable equation for root uptake from irrigation (L/kg),
Irr_{res} = multiplier in vegetable equation for resuspension from irrigation (L/kg),
Irr_{dep} = multiplier in vegetable equation for aerial deposition from irrigation (L/kg),
C_s = concentration of contaminant in soil (mg/kg),
Bv_{wet} = soil-to-plant uptake, wet weight (kg/kg, chemical-specific, or $7.7 \times K_{ow}^{-0.58}$),
K_{ow} = octanol-water partitioning coefficient (unitless, chemical-specific),
MLF = plant mass loading factor (unitless, 0.26 for vegetables).

6.3.5 Intake Results

Results of the exposure assessment are presented in tabular format in Section 6.5. These results are combined with information presented in Section 6.4 (Toxicity Assessment) to estimate risks and hazards for each receptor in Section 6.5.

6.4 TOXICITY ASSESSMENT

The purpose of the toxicity assessment is to evaluate the potential for COPCs to cause adverse health effects in exposed individuals. Where possible, it provides an estimate of the relationship between the

intake or dose of a COPC and the likelihood or severity of adverse health effects as a result of that exposure. Toxic effects have been evaluated extensively by EPA. This section provides the results of the EPA evaluation of the chemicals identified as COPCs at LL 1.

6.4.1 Toxicity Information and U. S. Environmental Protection Agency Guidance for Noncarcinogens

Noncarcinogenic effects are evaluated by comparing an exposure or intake/dose with a reference dose (RfD) or reference air concentration (RfC). The RfD and RfCs are determined using available dose-response data for individual chemicals. Scientists determine the exposure concentration or intake/dose below which no adverse effects are seen and add a safety factor (from 10 to 1,000) to determine the RfD or RfC. RfDs and RfCs are identified by scientific committees supported by the EPA. The RfDs available for the COPCs present in LL 1 media are listed in Appendix Q, Table Q-8 (EPA 1996, 1997, 2001). In this BHHRA, RfCs, measured in milligrams per cubic meter, were converted to RfDs expressed in units of milligrams per kilogram body weight per day by using the default adult inhalation rate and body weight [i.e., (RfC × 20 m^3/day)/70 kg = RfD] (EPA 1989a).

Chronic RfDs are developed for protection from long-term exposure to a chemical (from 7 years to a lifetime); subchronic RfDs are used to evaluate short-term exposure (from 2 weeks to 7 years) (EPA 1989). Since the potential receptors at LL 1 are not considered to have short-term exposures, a conservative approach has been taken for this BHHRA by using only chronic RfDs [chronic RfDs generally result in HQs that are at least as large as (sometimes larger than) HQs calculated from subchronic RfDs].

Toxic effects are diverse and measured in various target body organs (e.g., they range from eye irritation to kidney or liver damage). The EPA is currently reviewing methods for accounting for the difference in severity of effects; however, existing RfDs do not address this issue.

6.4.2 Toxicity Information and U. S. Environmental Protection Agency Guidance for Carcinogens

For carcinogens, risks are estimated as the probability that an individual will develop cancer over a lifetime as a result of exposure to the carcinogen. Cancer risk from exposure to contamination is expressed as excess cancer risk, which is cancer occurrence in addition to normally expected rates of cancer development. Excess cancer risk is estimated using a Cancer Slope Factor (CSF). The CSF is defined as a plausible upper-bound estimate of the probability of a response (i.e., cancer) per unit intake of a chemical over a lifetime (EPA 1989).

EPA expresses inhalation cancer potency as unit risk based on chemical concentration in air (i.e., risk per μg of chemical per m^3 of ambient air). These unit risks were converted to CSFs expressed in units of risk per mg of chemical per kg body weight per day by using the default adult inhalation rate and body weight [i.e., (Unit Risk × 70 kg × 1,000 μg/mg)/ 20 m^3/day].

CSFs used in the evaluation of risk from carcinogenic COPCs are listed in Appendix Q, Table Q-9 (EPA 1996, 1997, 2001).

6.4.3 Estimated Toxicity Values for Dermal Exposure

Oral and inhalation RfDs and CSFs are currently available. Dermal RfDs and CSFs were estimated from oral toxicity values using chemical-specific gastrointestinal absorption factors (GAFs) to calculate total absorbed dose. This conversion is necessary because most oral RfDs and CSFs are expressed as the amount

of chemical administered per time and body weight; however, dermal exposure is expressed as an absorbed dose. Dermal toxicity factors are calculated from oral toxicity factors as shown below (EPA 1992a):

$$RfD_{dermal} = RfD_{oral} \times GAF$$
$$CSF_{dermal} = CSF_{oral}/GAF$$

Chemical-specific GAF values (EPA 2000) are used in this equation when available. Not all COPCs have chemical-specific GAF values. When quantitative data are insufficient, a default GAF is used. A default value of 1.0 is used for organic chemicals, and a default value of 0.2 is used for inorganic COPCs.

The GAF and resulting dermal toxicity values used in this BHHRA are listed in Appendix Q, Tables Q-8 and Q-9.

6.4.4 Assumptions Used in the Toxicity Assessment

Assumptions made in assigning toxicity values for COPCs at LL 1 are

- Thallium as a metal is evaluated using the toxicity values for thallium carbonate. This is the form of thallium with the most conservative toxicity values.

- Total chromium is evaluated using the toxicity values for Chromium III. This is the form of chromium other than Chromium VI (which is evaluated as a separate COPC) with the most conservative toxicity values.

- Alpha-chlordane and gamma-chlordane are evaluated with the toxicity of chlordane.

- Endrin aldehyde is evaluated with the toxicity of endrin.

- Toxicity Equivalency Factors (TEFs) are applied to carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs) (EPA 1996). The following TEFs are used to convert the cPAHs identified as COPCs at LL 1 to an equivalent concentration of benzo(a)pyrene.

cPAH	TEF
Benzo(a)pyrene	1
Benz(a)anthracene	0.1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.01
Chrysene	0.001
Dibenzo(a,h)anthracene	1
Indeno(1,2,3-*c,d*)pyrene	0.1

6.4.5 Chemicals without U. S. Environmental Protection Agency Toxicity Values

No RfDs or CSFs are available for some detected chemicals at LL 1 because the noncarcinogenic and/or carcinogenic effects of these chemicals have not yet been determined. Although these chemicals may contribute to health effects from exposure to contaminated media at LL 1, their effects cannot be quantified at the present time. In addition, epidemiological studies have indicated that several chemicals are not carcinogenic; consequently, these species do not have CSFs. A qualitative summary of toxicity information for some LL 1 COPCs without toxicity values is presented in Section 6.8 (Toxicity Profiles). The COPCs evaluated qualitatively are identified by medium in Appendix Q, Table Q-6.

Previously withdrawn or provisional toxicity values are used for one COPC at LL 1: benzo(a)pyrene uses a provisional inhalation CSF. Without this provisional value, the inhalation pathway could not be quantitatively evaluated for this chemical.

No RfDs or CSFs are available for lead. The EPA (1999) recommends the use of the Interim Adult Lead Methodology (ALM) to support its goal of limiting risk of elevated fetal blood lead concentrations due to lead exposures to women of child-bearing age. This model is used to estimate the probability that the fetal blood lead level will exceed 10 µg/dL as a result of maternal exposure. Two equations are available to evaluate blood lead levels. The first requires only a soil ingestion rate and was considered most appropriate for the analysis at LL 1. Complete documentation of the model is available at http://www.epa.gov/superfund/programs/lead/prods.htm. The model-supplied default values were used for all parameters with the exception of the site-specific media concentration and exposure frequency. Input parameters and results of this model are provided in Appendix Q Tables Q-10 through Q-21. The Integrated Exposure Uptake Biokinetic (IEUBK) model for lead in children (available at http://www.epa.gov/superfund/programs/lead/ieubk.htm) was used to evaluate the On-Site Resident Farmer child. The IEUBK model is used to predict the risk of elevated blood lead (PbB)levels in children (under the age of seven)that are exposed to environmental lead (Pb) from many sources.The model also predicts the risk (*e.g.*,probability)that a typical child,exposed to specified media Pb concentrations,will have a PbB level greater or equal to the level associated with adverse health effects (10 µg/dL). This model was not used to evaluate the child trespasser because this receptor is assumed to be age 8 to 18. default input parameters were used. Results of this model are provided in Appendix Q Tables Q-22 through Q-33.

6.5 RISK CHARACTERIZATION

The purpose of the risk characterization is to evaluate the information obtained through the exposure and toxicity assessments to estimate potential risks and hazards. Potential carcinogenic effects are characterized by using projected intakes and chemical-specific dose-response data (i.e., CSFs) to estimate the probability that an individual will develop cancer over a lifetime. Potential noncarcinogenic effects are characterized by comparing projected intakes of contaminants to toxicity values (i.e., RfDs). The numerical risk and hazard estimates presented in this chapter must be interpreted in the context of the uncertainties and assumptions associated with the risk assessment process and with the data upon which the risk estimates are based (see Section 6.6).

This chapter is divided into three sections: methodology (Section 6.5.1), results (Section 6.5.2), and estimation of RGOs for chemicals of concern (Section 6.5.3).

6.5.1 Methodology

Risk characterization integrates the findings of the exposure and toxicity assessments to estimate the potential for receptors to experience adverse effects as a result of exposure to contaminated media a LL 1.

6.5.1.1 Risk characterization for carcinogens

For carcinogens, risk is expressed as the probability that an individual will develop cancer over a lifetime as a result of exposure to the carcinogen. Cancer risk from exposure to contamination is expressed as Incremental Lifetime Cancer Risk (ILCR), or the increased chance of cancer above the normal background rate of cancer. In the United States, the background chance of contracting cancer is approximately 3 in 10, or 3×10^{-1} (American Cancer Society 1990). EPA (1990b) indicates that remediation goals should represent an ILCR to an individual between 10^{-6} and 10^{-4} with a cancer risk of

10^{-6} serving as the point of departure. While the 10^{-6} point of departure expresses EPA's preference for setting cleanup levels at the more protective end of the risk range, it is not a presumption that the final cleanup will attain that risk level. Consideration of site-specific and remedy-specific factors (i.e., exposure factors, uncertainty factors, and technical factors) enters into the determination of where within the acceptable risk range of 10^{-6} to 10^{-4} final remediation decisions will fall.

The ILCR is calculated using the equation below (EPA 1989a):

$$ILCR = I \times CSF$$

where

I = chronic daily intake or dermally absorbed dose calculated in the exposure assessment (mg/kg-day),
CSF = cancer slope factor $(mg/kg\text{-}day)^{-1}$.

For a given exposure pathway, the total risk to a receptor exposed to several carcinogenic COPCs is the sum of the ILCRs for each carcinogen as shown below:

$$ILCR_{total} = \sum_{i} ILCR_i$$

where

$ILCR_{total}$ = total probability of cancer incidence associated with all carcinogenic COPCs,
$ILCR_i$ = ILCR for the i^{th} COPC.

6.5.1.2 Risk characterization for noncarcinogens

In addition to developing cancer from exposure to contaminants, an individual may experience other toxic effects. The term "toxic effects" is used here to describe a wide variety of systemic effects ranging from minor irritations, such as eye irritation and headaches, to more substantial effects such as kidney or liver disease and neurological damage. The risks associated with toxic (i.e., noncarcinogenic) chemicals are evaluated by comparing an estimated exposure (i.e., intake or dose) from site media to an acceptable exposure expressed as a RfD. The RfD is the threshold level below which no toxic effects are expected to occur in a population, including sensitive subpopulations. The ratio of intake over the RfD is the HQ (EPA 1989a) and is calculated as:

$$HQ = I/RfD$$

where

I = daily intake of a COPC (mg/kg-day),
RfD = reference dose (mg/kg-day).

The HQs for each COPC are summed to obtain a hazard index (HI) as shown below:

$$HI = \sum_{i} HQ_i$$

where

HI = hazard index for all toxic effects,
HQ_i = hazard quotient for the i^{th} COPC.

An HI greater than 1 has been defined as the level of concern for potential adverse noncarcinogenic health effects (EPA 1989a). This approach differs from the probabilistic approach used to evaluate carcinogens. A HQ of 0.01 does not imply a 1 in 100 chance of an adverse effect, but indicates only that the estimated intake is 100 times less than the threshold level at which adverse health effects may occur.

6.5.1.3 Identification of chemicals of concern

COCs are defined for each medium as those contaminants that have an ILCR greater than 10^{-6} and/or an HI greater than 1 for a given land use scenario and that are not eliminated by the uncertainty analysis.

6.5.2 Risk Characterization Results

Estimated risks for LL 1 are evaluated by EU and exposure medium for each land use/receptor combination. Four environmental media were evaluated at LL 1: soil, surface water, sediment, and groundwater. Soil data are further aggregated by depth interval—surface soils from 0 to 1 ft bgs and subsurface soil greater than 1 ft bgs.

The EUs are evaluated to provide an estimate of risk from a Reasonable Maximum Exposure (RME). The RME incorporates a reasonable estimate of the concentration to which a receptor may be exposed (UCL95 on the mean). The use of the UCL95 on the mean as the exposure point concentration implies that a receptor may come into contact with contaminants throughout the EU.

Risks are characterized for each EU/exposure medium/land use/receptor combination. COCs are identified if the total ILCR for a chemical exceeds 10^{-6} or if total HIs exceed 1 for a land use/receptor combination.

6.5.2.1 Groundwater

Risks are estimated for the National Guard and On-Site Resident Farmer receptors for data collected from monitoring wells within the LL 1 building area and completed in the sandstone bedrock and from monitoring wells north and south of Criggy's Pond completed in the unconsolidated glacial sediment. Risk and hazard results are presented in Tables 6-5a and 6-5b and are summarized in Table 6-6 below.

Arsenic is identified as a COC for both the National Guard and the On-Site Resident Farmer (adult and child) scenarios for wells in the LL 1 building area with risks of 3E-05 (National Guard) and 1E-04 (On-Site Resident Farmer Adult and Child) and an HI of 2.5 (On-Site Resident Farmer Child). Arsenic is naturally present in groundwater in the Ravenna area. A discussion of background concentrations and their potential impact on the result of the risk assessment is provided in the uncertainty analysis (Section 6.6.4).

Table 6-5a. Groundwater Hazards - Direct Contact

COPC	EPC (µg/L)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
National Guard/Managed Recreational - National Guard									
EU: Load Line 1 Building Area									
Antimony	2.2E+00	1.5E-05	7.5E-08		3.9E-02	1.3E-03		4.0E-02	
Arsenic	7.8E+00	5.5E-05	2.7E-07		1.8E-01	9.4E-04		1.9E-01	
Cadmium	2.6E+00	1.8E-05	8.9E-08		3.7E-02	3.5E-03		4.0E-02	
Cyanide	5.1E+00	3.6E-05	1.3E-06		1.8E-03	1.4E-04		1.9E-03	
Manganese	3.0E+03	2.1E-02	1.0E-04		4.7E-01	5.7E-02		5.2E-01	
Nickel	8.3E+01	5.8E-04	2.8E-06		2.9E-02	3.5E-03		3.3E-02	
Thallium	6.0E-01	4.2E-06	2.1E-08		5.3E-02	2.6E-04		5.3E-02	
Inorganics Pathway Total					8.1E-01	6.6E-02		8.8E-01	
1,3-Dinitrobenzene	4.6E-01	3.3E-06	3.8E-08		3.3E-02	3.8E-04		3.3E-02	
2,4,6-Trinitrotoluene	5.4E+00	3.8E-05	6.2E-07		7.6E-02	1.2E-03		7.7E-02	
2,4-Dinitrotoluene	2.4E+00	1.7E-05	3.1E-07		8.3E-03	1.5E-04		8.5E-03	
2,6-Dinitrotoluene	1.5E+00	1.1E-05	1.3E-07		1.1E-02	1.3E-04		1.1E-02	
Bis(2-ethylhexyl)phthalate	3.6E+00	2.5E-05	2.8E-06		1.3E-03	1.4E-04		1.4E-03	
Chloroform	1.2E+00	8.5E-06	3.6E-07	8.5E-05	8.5E-04	3.6E-05		8.8E-04	
Methylene chloride	2.5E+00	1.8E-05	3.9E-07	1.8E-04	3.0E-04	6.4E-06	2.1E-04	5.1E-04	
RDX	1.4E+01	9.8E-05	9.0E-06		3.3E-02	3.0E-03		3.6E-02	
Organics Pathway Total					1.6E-01	5.1E-03	2.1E-04	1.7E-01	
Pathway Total - Chemicals					9.7E-01	7.1E-02	2.1E-04	1.0E+00	
EU: North and South of Criggy's Pond									
Methylene chloride	2.3E+00	1.6E-05	3.5E-07	1.6E-04	2.7E-04	5.9E-06	1.9E-04	4.6E-04	
Organics Pathway Total					2.7E-04	5.9E-06	1.9E-04	4.6E-04	
Pathway Total - Chemicals					2.7E-04	5.9E-06	1.9E-04	4.6E-04	
Open Residential - Resident Farmer (Adult)									
EU: Load Line 1 Building Area									
Antimony	2.2E+00	6.0E-05	1.5E-07		1.5E-01	2.4E-03		1.5E-01	
Arsenic	7.8E+00	2.1E-04	5.2E-07		7.2E-01	1.8E-03		7.2E-01	
Cadmium	2.6E+00	7.1E-05	1.7E-07		1.4E-01	6.9E-03		1.5E-01	
Cyanide	5.1E+00	1.4E-04	2.5E-06		7.0E-03	2.7E-04		7.2E-03	
Manganese	3.0E+03	8.3E-02	2.0E-04		1.8E+00	1.1E-01		1.9E+00	H
Nickel	8.3E+01	2.3E-03	5.5E-06		1.1E-01	6.9E-03		1.2E-01	
Thallium	6.0E-01	1.6E-05	4.0E-08		2.1E-01	5.0E-04		2.1E-01	
Inorganics Pathway Total					3.1E+00	1.3E-01		3.3E+00	
1,3-Dinitrobenzene	4.6E-01	1.3E-05	7.4E-08		1.3E-01	7.4E-04		1.3E-01	
2,4,6-Trinitrotoluene	5.4E+00	1.5E-04	1.2E-06		2.9E-01	2.4E-03		3.0E-01	
2,4-Dinitrotoluene	2.4E+00	6.5E-05	6.0E-07		3.2E-02	3.0E-04		3.3E-02	
2,6-Dinitrotoluene	1.5E+00	4.2E-05	2.5E-07		4.2E-02	2.5E-04		4.2E-02	
Bis(2-ethylhexyl)phthalate	3.6E+00	9.9E-05	5.5E-06		4.9E-03	2.8E-04		5.2E-03	
Chloroform	1.2E+00	3.3E-05	7.1E-07	1.6E-04	3.3E-03	7.1E-05		3.4E-03	
Methylene chloride	2.5E+00	6.9E-05	7.5E-07	3.4E-04	1.1E-03	1.3E-05	4.0E-04	1.6E-03	
RDX	1.4E+01	3.8E-04	1.8E-05		1.3E-01	5.9E-03		1.3E-01	
Organics Pathway Total					6.3E-01	9.9E-03	4.0E-04	6.4E-01	
Pathway Total - Chemicals					3.8E+00	1.4E-01	4.0E-04	3.9E+00	
EU: North and South of Criggy's Pond									
Methylene chloride	2.3E+00	6.3E-05	6.9E-07	3.2E-04	1.1E-03	1.1E-05	3.7E-04	1.4E-03	
Organics Pathway Total					1.1E-03	1.1E-05	3.7E-04	1.4E-03	
Pathway Total - Chemicals					1.1E-03	1.1E-05	3.7E-04	1.4E-03	
Open Residential - Resident Farmer (Child)									
EU: Load Line 1 Building Area									
Antimony	2.2E+00	2.1E-04	3.0E-07		5.3E-01	5.1E-03		5.3E-01	
Arsenic	7.8E+00	7.5E-04	1.1E-06		2.5E+00	3.8E-03		2.5E+00	H

Table 6-5a. Groundwater Hazards - Direct Contact (continued)

COPC	EPC (µg/L)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Cadmium	2.6E+00	2.5E-04	3.6E-07		5.0E-01	1.4E-02		5.1E-01	
Cyanide	5.1E+00	4.9E-04	5.3E-06		2.4E-02	5.6E-04		2.5E-02	
Manganese	3.0E+03	2.9E-01	4.2E-04		6.4E+00	2.3E-01		6.6E+00	H
Nickel	8.3E+01	7.9E-03	1.1E-05		4.0E-01	1.4E-02		4.1E-01	
Thallium	6.0E-01	5.8E-05	8.3E-08		7.2E-01	1.0E-03		7.2E-01	
Inorganics Pathway Total					1.1E+01	2.7E-01		1.1E+01	
1,3-Dinitrobenzene	4.6E-01	4.4E-05	1.5E-07		4.4E-01	1.5E-03		4.4E-01	
2,4,6-Trinitrotoluene	5.4E+00	5.2E-04	2.5E-06		1.0E+00	5.1E-03		1.0E+00	H
2,4-Dinitrotoluene	2.4E+00	2.3E-04	1.2E-06		1.1E-01	6.2E-04		1.1E-01	
2,6-Dinitrotoluene	1.5E+00	1.5E-04	5.3E-07		1.5E-01	5.3E-04		1.5E-01	
Bis(2-ethylhexyl)phthalate	3.6E+00	3.5E-04	1.1E-05		1.7E-02	5.7E-04		1.8E-02	
Chloroform	1.2E+00	1.2E-04	1.5E-06	3.8E-04	1.2E-02	1.5E-04		1.2E-02	
Methylene chloride	2.5E+00	2.4E-04	1.6E-06	8.0E-04	4.0E-03	2.6E-05	9.4E-04	5.0E-03	
RDX	1.4E+01	1.3E-03	3.7E-05		4.5E-01	1.2E-02		4.6E-01	
Organics Pathway Total					2.2E+00	2.1E-02	9.4E-04	2.2E+00	
Pathway Total - Chemicals					1.3E+01	2.9E-01	9.4E-04	1.4E+01	
EU: North and South of Criggy's Pond									
Methylene chloride	2.3E+00	2.2E-04	1.4E-06	7.4E-04	3.7E-03	2.4E-05	8.6E-04	4.6E-03	
Organics Pathway Total					3.7E-03	2.4E-05	8.6E-04	4.6E-03	
Pathway Total - Chemicals					3.7E-03	2.4E-05	8.6E-04	4.6E-03	

[a] COPCs are identified as chemicals of concern (COCs) if the total HI across all pathways is > 1 (H) or if the total ILCR is > 1E-06 (R).
COPC = chemical of potential concern.
EPC = exposure point concentration.
ILCR = Incremental Lifetime Cancer Risk.

Table 6-5b. Groundwater Risks - Direct Contact

COPC	EPC (µg/L)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
National Guard/Managed Recreational - National Guard									
EU: Load Line 1 Building Area									
Arsenic	7.8E+00	2.0E-05	9.6E-08		3.0E-05	1.5E-07		3.0E-05	R
Inorganics Pathway Total					3.0E-05	1.5E-07		3.0E-05	
2,4,6-Trinitrotoluene	5.4E+00	1.4E-05	2.2E-07		4.1E-07	6.7E-09		4.1E-07	
2,4-Dinitrotoluene	2.4E+00	5.9E-06	1.1E-07		4.0E-06	7.4E-08		4.1E-06	R
2,6-Dinitrotoluene	1.5E+00	3.8E-06	4.6E-08		2.6E-06	3.2E-08		2.6E-06	R
4,4'-DDE	3.4E+00	8.5E-06	9.9E-06		2.9E-06	3.4E-06		6.2E-06	R
Bis(2-ethylhexyl)phthalate	3.6E+00	9.1E-06	1.0E-06		1.3E-07	1.4E-08		1.4E-07	
Chloroform	1.2E+00	3.0E-06	1.3E-07	3.0E-05	1.8E-08	7.9E-10	2.4E-06	2.4E-06	R
Methylene chloride	2.5E+00	6.3E-06	1.4E-07	6.3E-05	4.7E-08	1.0E-09	1.0E-07	1.5E-07	
RDX	1.4E+01	3.5E-05	3.2E-06		3.9E-06	3.6E-07		4.2E-06	R
Organics Pathway Total					1.4E-05	3.8E-06	2.5E-06	2.0E-05	
Pathway Total - Chemicals					4.4E-05	4.0E-06	2.5E-06	5.0E-05	
EU: North and South of Criggy's Pond									
Methylene chloride	2.3E+00	5.8E-06	1.3E-07	5.8E-05	4.3E-08	9.5E-10	9.5E-08	1.4E-07	
Organics Pathway Total					4.3E-08	9.5E-10	9.5E-08	1.4E-07	
Pathway Total - Chemicals					4.3E-08	9.5E-10	9.5E-08	1.4E-07	
Open Residential - Resident Farmer (Adult)									
EU: Load Line 1 Building Area									
Arsenic	7.8E+00	9.2E-05	2.2E-07		1.4E-04	3.5E-07		1.4E-04	R
Inorganics Pathway Total					1.4E-04	3.5E-07		1.4E-04	
2,4,6-Trinitrotoluene	5.4E+00	6.3E-05	5.2E-07		1.9E-06	1.6E-08		1.9E-06	R
2,4-Dinitrotoluene	2.4E+00	2.8E-05	2.6E-07		1.9E-05	1.7E-07		1.9E-05	R
2,6-Dinitrotoluene	1.5E+00	1.8E-05	1.1E-07		1.2E-05	7.4E-08		1.2E-05	R
4,4'-DDE	3.4E+00	4.0E-05	2.3E-05		1.3E-05	7.8E-06		2.1E-05	R
Bis(2-ethylhexyl)phthalate	3.6E+00	4.2E-05	2.4E-06		5.9E-07	3.3E-08		6.2E-07	
Chloroform	1.2E+00	1.4E-05	3.0E-07	7.0E-05	8.6E-08	1.9E-09	5.7E-06	5.8E-06	R
Methylene chloride	2.5E+00	3.0E-05	3.2E-07	1.5E-04	2.2E-07	2.4E-09	2.4E-07	4.7E-07	
RDX	1.4E+01	1.6E-04	7.5E-06		1.8E-05	8.3E-07		1.9E-05	R
Organics Pathway Total					6.5E-05	9.0E-06	5.9E-06	8.0E-05	
Pathway Total - Chemicals					2.0E-04	9.3E-06	5.9E-06	2.2E-04	
EU: North and South of Criggy's Pond									
Methylene chloride	2.3E+00	2.7E-05	2.9E-07	1.4E-04	2.0E-07	2.2E-09	2.2E-07	4.3E-07	
Organics Pathway Total					2.0E-07	2.2E-09	2.2E-07	4.3E-07	
Pathway Total - Chemicals					2.0E-07	2.2E-09	2.2E-07	4.3E-07	
Open Residential - Resident Farmer (Child)									
EU: Load Line 1 Building Area									
Arsenic	7.8E+00	6.4E-05	9.3E-08		9.7E-05	1.5E-07		9.7E-05	R
Inorganics Pathway Total					9.7E-05	1.5E-07		9.7E-05	
2,4,6-Trinitrotoluene	5.4E+00	4.4E-05	2.2E-07		1.3E-06	6.5E-09		1.3E-06	R
2,4-Dinitrotoluene	2.4E+00	1.9E-05	1.1E-07		1.3E-05	7.2E-08		1.3E-05	R
2,6-Dinitrotoluene	1.5E+00	1.2E-05	4.5E-08		8.5E-06	3.1E-08		8.5E-06	R
4,4'-DDE	3.4E+00	2.8E-05	9.6E-06		9.4E-06	3.3E-06		1.3E-05	R
Bis(2-ethylhexyl)phthalate	3.6E+00	3.0E-05	9.8E-07		4.1E-07	1.4E-08		4.3E-07	
Chloroform	1.2E+00	9.9E-06	1.3E-07	3.3E-05	6.0E-08	7.7E-10	2.6E-06	2.7E-06	R
Methylene chloride	2.5E+00	2.1E-05	1.3E-07	6.9E-05	1.5E-07	1.0E-09	1.1E-07	2.7E-07	
RDX	1.4E+01	1.1E-04	3.1E-06		1.3E-05	3.5E-07		1.3E-05	R
Organics Pathway Total					4.6E-05	3.7E-06	2.8E-06	5.2E-05	
Pathway Total - Chemicals					1.4E-04	3.9E-06	2.8E-06	1.5E-04	

Table 6-5b. Groundwater Risks - Direct Contact (continued)

COPC	EPC (µg/L)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
EU: North and South of Criggy's Pond									
Methylene chloride	2.3E+00	1.9E-05	1.2E-07	6.3E-05	1.4E-07	9.2E-10	1.0E-07	2.5E-07	
Organics Pathway Total					1.4E-07	9.2E-10	1.0E-07	2.5E-07	
Pathway Total - Chemicals					1.4E-07	9.2E-10	1.0E-07	2.5E-07	

[a] COPCs are identified as chemicals of concern (COCs) if the total HI across all pathways is > 1 (H) or if the total ILCR is > 1E-06 (R).
COPC = chemical of potential concern.
EPC = exposure point concentration.
ILCR = Incremental Lifetime Cancer Risk.

Table 6-6. Total Hazards/Risks and Chemicals of Concern in Groundwater

Receptor	Noncarcinogens		Carcinogens	
	HI	COCs	ILCR	COCs
LL 1 Building Area (sandstone bedrock)				
National Guard	1		5E-05	2,4-Dinitrotoluene 2,6-Dinitrotoluene RDX 4,4'-DDE Chloroform Arsenic
On-Site Resident Farmer (Adult)	4	Manganese	2E-04	2,4,6-Trinitrotoluene 2,4-Dinitrotoluene 2,6-Dinitrotoluene RDX 4,4'-DDE Chloroform Arsenic
On-Site Resident Farmer (Child)	14	Arsenic Manganese	2E-04	2,4,6-Trinitrotoluene 2,4-Dinitrotoluene 2,6-Dinitrotoluene RDX 4,4'-DDE Chloroform Arsenic
North and South of Criggy's Pond (unconsolidated glacial sediment)				
National Guard	0.0005		1E-07	
On-Site Resident Farmer (Adult)	0.001		4E-07	
On-Site Resident Farmer (Child)	0.005		3E-07	

COC = chemical of concern.
HI = hazard index.
ILCR = Incremental Lifetime Cancer Risk.
LL = Load Line.

Manganese is identified as a COC for the On-Site Resident Farmer scenario for wells in the LL 1 Building Area with an HQ of 2 for the adult and 7 for the child. Manganese is naturally present in groundwater in the RVAAP area. A discussion of background concentrations and their potential impact on the result of the risk assessment is provided in the uncertainty analysis (Section 6.6.4).

The National Guard receptor is currently not exposed to groundwater, but is evaluated in this BHHRA for potential future exposure. For the National Guard's potential future exposure to groundwater, total risk summed across all COPCs and all exposure pathways is estimated to be 5E-05 for the LL 1 building area and 1E-07 for the area north and south of Criggy's Pond. Five carcinogenic COCs were identified for the National Guard exposure to groundwater at the LL 1 building area; 2,4-dinitrotoluene, 2,6-dinitrotoluene, RDX, 4,4'-DDE, and chloroform. No COCs were identified for National Guard exposure to groundwater collected from monitoring wells north and south of Criggy's Pond. The total HI summed across all COPCs and all exposure pathways is estimated to be 1 for the LL 1 building area and 0.0005 for the area north and south of Criggy's Pond; therefore, no noncarcinogenic COCs were identified for the National Guard scenario.

Evaluation of the On-Site Resident Farmer scenario results in total risks summed across all COPCs and all exposure pathways of 2E-04 (adult and child) for the LL 1 building area and 4E-07 (adult) and 3E-07 (child) for the area north and south of Criggy's Pond. Six carcinogenic COCs were identified for the residential exposure to groundwater at the LL 1 building area; 2,4,6-trinitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, RDX, 4,4'-DDE, and chloroform. The total HIs summed across all COPCs and all exposure pathways are estimated to be 4 (adult) and 14 (child) for the LL 1 building area and 0.001 (adult) and 0.005 (child) for the area north and south of Criggy's Pond. The only noncarcinogenic COC for residential exposure to groundwater at the LL 1 building area are arsenic and manganese. No COCs were identified for residential exposure to groundwater collected from monitoring wells north and south of Criggy's Pond.

6.5.2.2 Surface water and sediment

Risks are estimated for the Child Trespasser, Hunter/Trapper, National Guard, Recreator, and On-Site Resident Farmer receptors for surface water and sediment at five EUs. Surface water and sediment EUs are defined by the following aggregates:

- Outlets D, E, and F and Criggy's Pond,
- Outlet C and Charlie's Pond,
- Outlets A and B,
- North area, and
- Off-AOC.

Surface water – direct contact

Risk and hazard results for direct exposure to surface water via ingestion and dermal contact are presented in Tables 6-7(a and b) and summarized in Table 6-8 for the Off-AOC, Outlet C and Charlie's Pond, and Outlets D, E, and F and Criggy's Pond EUs. Surface water samples were not collected at the North area.

At Outlet C and Charlie's Pond, arsenic is identified as the only COC for all receptors except the On-Site Resident Farmer Child. Arsenic and manganese are identified as COCs for the On-Site Resident Farmer Child at this EU.

No surface water COCs are identified for the Child Trespasser or Recreator at Outlets D, E, and F and Criggy's Pond. Arsenic is the only COC for the other receptors at this EU.

Table 6-7a. Surface Water Hazards - Direct Contact

COPC	EPC (µg/L)	Daily Intake (mg/kg-d)		Hazard Quotient (HQ)		Total HI across all pathways	COC[a]
		Ingestion	Dermal	Ingestion	Dermal		
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Child Trespasser							
Off-AOC							
Arsenic	8.0E+00	2.4E-06	8.4E-07	8.1E-03	3.0E-03	1.1E-02	
Manganese	1.8E+03	5.5E-04	1.9E-04	1.2E-02	1.0E-01	1.1E-01	
Inorganics Pathway Total				2.0E-02	1.1E-01	1.3E-01	
2,4-Dinitrotoluene	1.2E-01	3.6E-08	4.8E-08	1.8E-05	2.4E-05	4.2E-05	
2,6-Dinitrotoluene	8.0E-02	2.4E-08	2.1E-08	2.4E-05	2.1E-05	4.5E-05	
Bis(2-ethylhexyl)phthalate	1.2E+01	3.7E-06	2.9E-05	1.8E-04	1.5E-03	1.6E-03	
RDX	1.6E-01	4.9E-08	3.2E-07	1.6E-05	1.1E-04	1.2E-04	
Organics Pathway Total				2.4E-04	1.6E-03	1.8E-03	
Pathway Total - Chemicals				2.0E-02	1.1E-01	1.3E-01	
Outlet C and Charlie's Pond							
Arsenic	3.1E+01	9.4E-06	3.3E-06	3.1E-02	1.1E-02	4.3E-02	
Manganese	5.1E+02	1.6E-04	5.4E-05	3.4E-03	2.9E-02	3.3E-02	
Inorganics Pathway Total				3.5E-02	4.1E-02	7.6E-02	
Pathway Total - Chemicals				3.5E-02	4.1E-02	7.6E-02	
Outlets D, E, and F and Criggy's Pond							
Arsenic	5.1E+00	1.6E-06	5.4E-07	5.2E-03	1.9E-03	7.1E-03	
Inorganics Pathway Total				5.2E-03	1.9E-03	7.1E-03	
Pathway Total - Chemicals				5.2E-03	1.9E-03	7.1E-03	
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Hunter/Trapper							
Off-AOC							
Arsenic	8.0E+00	2.8E-06	3.2E-07	9.4E-03	1.1E-03	1.1E-02	
Manganese	1.8E+03	6.3E-04	7.2E-05	1.4E-02	3.9E-02	5.3E-02	
Inorganics Pathway Total				2.3E-02	4.0E-02	6.3E-02	
2,4-Dinitrotoluene	1.2E-01	4.2E-08	1.8E-08	2.1E-05	9.0E-06	3.0E-05	
2,6-Dinitrotoluene	8.0E-02	2.8E-08	8.0E-09	2.8E-05	8.0E-06	3.6E-05	
Bis(2-ethylhexyl)phthalate	1.2E+01	4.2E-06	1.1E-05	2.1E-04	5.5E-04	7.7E-04	
RDX	1.6E-01	5.6E-08	1.2E-07	1.9E-05	4.1E-05	5.9E-05	
Organics Pathway Total				2.8E-04	6.1E-04	8.9E-04	
Pathway Total - Chemicals				2.3E-02	4.1E-02	6.4E-02	
Outlet C and Charlie's Pond							
Arsenic	3.1E+01	1.1E-05	1.2E-06	3.6E-02	4.4E-03	4.1E-02	
Manganese	5.1E+02	1.8E-04	2.0E-05	3.9E-03	1.1E-02	1.5E-02	
Inorganics Pathway Total				4.0E-02	1.5E-02	5.6E-02	
Pathway Total - Chemicals				4.0E-02	1.5E-02	5.6E-02	
Outlets D, E, and F and Criggy's Pond							
Arsenic	5.1E+00	1.8E-06	2.0E-07	6.0E-03	7.2E-04	6.7E-03	
Inorganics Pathway Total				6.0E-03	7.2E-04	6.7E-03	
Pathway Total - Chemicals				6.0E-03	7.2E-04	6.7E-03	
National Guard/Managed Recreational - National Guard							
Off-AOC							
Arsenic	8.0E+00	3.5E-06	4.0E-07	1.2E-02	1.4E-03	1.3E-02	
Manganese	1.8E+03	7.9E-04	9.0E-05	1.7E-02	4.9E-02	6.6E-02	
Inorganics Pathway Total				2.9E-02	5.0E-02	7.9E-02	
2,4-Dinitrotoluene	1.2E-01	5.2E-08	2.3E-08	2.6E-05	1.1E-05	3.7E-05	
2,6-Dinitrotoluene	8.0E-02	3.5E-08	1.0E-08	3.5E-05	1.0E-05	4.5E-05	

Table 6-7a. Surface Water Hazards - Direct Contact (continued)

COPC	EPC (µg/L)	Daily Intake (mg/kg-d)		Hazard Quotient (HQ)		Total HI across all pathways	COC[a]
		Ingestion	Dermal	Ingestion	Dermal		
Bis(2-ethylhexyl)phthalate	1.2E+01	5.3E-06	1.4E-05	2.6E-04	6.9E-04	9.5E-04	
RDX	1.6E-01	7.0E-08	1.5E-07	2.3E-05	5.1E-05	7.4E-05	
Organics Pathway Total				3.5E-04	7.6E-04	1.1E-03	
Pathway Total - Chemicals				2.9E-02	5.1E-02	8.0E-02	
Outlet C and Charlie's Pond							
Arsenic	3.1E+01	1.4E-05	1.5E-06	4.5E-02	5.4E-03	5.1E-02	
Manganese	5.1E+02	2.2E-04	2.5E-05	4.9E-03	1.4E-02	1.9E-02	
Inorganics Pathway Total				5.0E-02	1.9E-02	6.9E-02	
Pathway Total - Chemicals				5.0E-02	1.9E-02	6.9E-02	
Outlets D, E, and F and Criggy's Pond							
Arsenic	5.1E+00	2.2E-06	2.5E-07	7.5E-03	8.9E-04	8.3E-03	
Inorganics Pathway Total				7.5E-03	8.9E-04	8.3E-03	
Pathway Total - Chemicals				7.5E-03	8.9E-04	8.3E-03	
Open Recreational - Recreator							
Off-AOC							
Arsenic	8.0E+00	7.0E-07	2.7E-07	2.3E-03	9.6E-04	3.3E-03	
Manganese	1.8E+03	1.6E-04	6.1E-05	3.4E-03	3.3E-02	3.7E-02	
Inorganics Pathway Total				5.8E-03	3.4E-02	4.0E-02	
2,4-Dinitrotoluene	1.2E-01	1.0E-08	1.5E-08	5.2E-06	7.7E-06	1.3E-05	
2,6-Dinitrotoluene	8.0E-02	7.0E-09	6.8E-09	7.0E-06	6.8E-06	1.4E-05	
Bis(2-ethylhexyl)phthalate	1.2E+01	1.1E-06	9.4E-06	5.3E-05	4.7E-04	5.2E-04	
RDX	1.6E-01	1.4E-08	1.0E-07	4.7E-06	3.5E-05	3.9E-05	
Organics Pathway Total				7.0E-05	5.2E-04	5.9E-04	
Pathway Total - Chemicals				5.9E-03	3.5E-02	4.1E-02	
Outlet C and Charlie's Pond							
Arsenic	3.1E+01	2.7E-06	1.1E-06	9.1E-03	3.7E-03	1.3E-02	
Manganese	5.1E+02	4.5E-05	1.7E-05	9.8E-04	9.5E-03	1.0E-02	
Inorganics Pathway Total				1.0E-02	1.3E-02	2.3E-02	
Pathway Total - Chemicals				1.0E-02	1.3E-02	2.3E-02	
Outlets D, E, and F and Criggy's Pond							
Arsenic	5.1E+00	4.5E-07	1.7E-07	1.5E-03	6.1E-04	2.1E-03	
Inorganics Pathway Total				1.5E-03	6.1E-04	2.1E-03	
Pathway Total - Chemicals				1.5E-03	6.1E-04	2.1E-03	
Open Residential - Resident Farmer (Adult)							
Off-AOC							
Arsenic	8.0E+00	2.2E-04	5.3E-07	7.3E-01	1.9E-03	7.3E-01	
Manganese	1.8E+03	4.9E-02	1.2E-04	1.1E+00	6.5E-02	1.1E+00	H
Inorganics Pathway Total				1.8E+00	6.7E-02	1.9E+00	
2,4-Dinitrotoluene	1.2E-01	3.2E-06	3.0E-08	1.6E-03	1.5E-05	1.6E-03	
2,6-Dinitrotoluene	8.0E-02	2.2E-06	1.3E-08	2.2E-03	1.3E-05	2.2E-03	
Bis(2-ethylhexyl)phthalate	1.2E+01	3.3E-04	1.8E-05	1.6E-02	9.2E-04	1.7E-02	
RDX	1.6E-01	4.4E-06	2.0E-07	1.5E-03	6.7E-05	1.5E-03	
Organics Pathway Total				2.2E-02	1.0E-03	2.3E-02	
Pathway Total - Chemicals				1.8E+00	6.8E-02	1.9E+00	

Table 6-7a. Surface Water Hazards - Direct Contact (continued)

COPC	EPC (µg/L)	Daily Intake (mg/kg-d)		Hazard Quotient (HQ)		Total HI across all pathways	COC[a]
		Ingestion	Dermal	Ingestion	Dermal		
Outlet C and Charlie's Pond							
Arsenic	3.1E+01	8.5E-04	2.1E-06	2.8E+00	7.2E-03	2.8E+00	H
Manganese	5.1E+02	1.4E-02	3.4E-05	3.0E-01	1.8E-02	3.2E-01	
Inorganics Pathway Total				3.1E+00	2.6E-02	3.2E+00	
Pathway Total - Chemicals				3.1E+00	2.6E-02	3.2E+00	
Outlets D, E, and F and Criggy's Pond							
Arsenic	5.1E+00	1.4E-04	3.4E-07	4.7E-01	1.2E-03	4.7E-01	
Inorganics Pathway Total				4.7E-01	1.2E-03	4.7E-01	
Pathway Total - Chemicals				4.7E-01	1.2E-03	4.7E-01	
Open Residential - Resident Farmer (Child)							
Off-AOC							
Arsenic	8.0E+00	7.7E-04	1.1E-06	2.6E+00	3.9E-03	2.6E+00	H
Manganese	1.8E+03	1.7E-01	2.5E-04	3.7E+00	1.3E-01	3.9E+00	H
Inorganics Pathway Total				6.3E+00	1.4E-01	6.4E+00	
2,4-Dinitrotoluene	1.2E-01	1.1E-05	6.2E-08	5.7E-03	3.1E-05	5.7E-03	
2,6-Dinitrotoluene	8.0E-02	7.7E-06	2.8E-08	7.7E-03	2.8E-05	7.7E-03	
Bis(2-ethylhexyl)phthalate	1.2E+01	1.2E-03	3.8E-05	5.8E-02	1.9E-03	5.9E-02	
RDX	1.6E-01	1.5E-05	4.2E-07	5.1E-03	1.4E-04	5.3E-03	
Organics Pathway Total				7.6E-02	2.1E-03	7.8E-02	
Pathway Total - Chemicals				6.4E+00	1.4E-01	6.5E+00	
Outlet C and Charlie's Pond							
Arsenic	3.1E+01	3.0E-03	4.3E-06	9.9E+00	1.5E-02	9.9E+00	H
Manganese	5.1E+02	4.9E-02	7.1E-05	1.1E+00	3.8E-02	1.1E+00	H
Inorganics Pathway Total				1.1E+01	5.3E-02	1.1E+01	
Pathway Total - Chemicals				1.1E+01	5.3E-02	1.1E+01	
Outlets D, E, and F and Criggy's Pond							
Arsenic	5.1E+00	4.9E-04	7.1E-07	1.6E+00	2.5E-03	1.6E+00	H
Inorganics Pathway Total				1.6E+00	2.5E-03	1.6E+00	
Pathway Total - Chemicals				1.6E+00	2.5E-03	1.6E+00	

[a] COPCs are identified as chemicals of concern (COCs) if the total HI across all pathways is > 1 (H) or if the total ILCR is > 1E-06 (R).
AOC = area of concern.
COPC = chemical of potential concern.
EPC = exposure point concentration.
ILCR = Incremental Lifetime Cancer Risk.

Table 6-7b. Surface Water Risks - Direct Contact

COPC	EPC (µg/L)	Daily Intake (mg/kg-d)		Risk		Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Ingestion	Dermal		
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Child Trespasser							
Off-AOC							
Arsenic	8.0E+00	3.5E-07	1.2E-07	5.2E-07	1.9E-07	7.1E-07	
Manganese	1.8E+03	7.8E-05	2.7E-05				
Inorganics Pathway Total				5.2E-07	1.9E-07	7.1E-07	
2,4-Dinitrotoluene	1.2E-01	5.2E-09	6.8E-09	3.5E-09	4.6E-09	8.1E-09	
2,6-Dinitrotoluene	8.0E-02	3.5E-09	3.0E-09	2.4E-09	2.0E-09	4.4E-09	
Bis(2-ethylhexyl)phthalate	1.2E+01	5.2E-07	4.2E-06	7.3E-09	5.8E-08	6.6E-08	
RDX	1.6E-01	7.0E-09	4.6E-08	7.7E-10	5.0E-09	5.8E-09	
Organics Pathway Total				1.4E-08	7.0E-08	8.4E-08	
Pathway Total - Chemicals				5.4E-07	2.6E-07	8.0E-07	
Outlet C and Charlie's Pond							
Arsenic	3.1E+01	1.3E-06	4.7E-07	2.0E-06	7.4E-07	2.8E-06	R
Manganese	5.1E+02	2.2E-05	7.7E-06				
Inorganics Pathway Total				2.0E-06	7.4E-07	2.8E-06	
Pathway Total - Chemicals				2.0E-06	7.4E-07	2.8E-06	
Outlets D, E, and F and Criggy's Pond							
Arsenic	5.1E+00	2.2E-07	7.7E-08	3.3E-07	1.2E-07	4.5E-07	
Inorganics Pathway Total				3.3E-07	1.2E-07	4.5E-07	
Pathway Total - Chemicals				3.3E-07	1.2E-07	4.5E-07	
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Hunter/Trapper							
Off-AOC							
Arsenic	8.0E+00	1.2E-06	1.4E-07	1.8E-06	2.2E-07	2.0E-06	R
Manganese	1.8E+03	2.7E-04	3.1E-05				
Inorganics Pathway Total				1.8E-06	2.2E-07	2.0E-06	
2,4-Dinitrotoluene	1.2E-01	1.8E-08	7.7E-09	1.2E-08	5.3E-09	1.7E-08	
2,6-Dinitrotoluene	8.0E-02	1.2E-08	3.4E-09	8.2E-09	2.3E-09	1.1E-08	
Bis(2-ethylhexyl)phthalate	1.2E+01	1.8E-06	4.7E-06	2.5E-08	6.6E-08	9.2E-08	
RDX	1.6E-01	2.4E-08	5.2E-08	2.7E-09	5.8E-09	8.4E-09	
Organics Pathway Total				4.8E-08	8.0E-08	1.3E-07	
Pathway Total - Chemicals				1.9E-06	3.0E-07	2.2E-06	
Outlet C and Charlie's Pond							
Arsenic	3.1E+01	4.7E-06	5.3E-07	7.0E-06	8.4E-07	7.9E-06	R
Manganese	5.1E+02	7.7E-05	8.8E-06				
Inorganics Pathway Total				7.0E-06	8.4E-07	7.9E-06	
Pathway Total - Chemicals				7.0E-06	8.4E-07	7.9E-06	
Outlets D, E, and F and Criggy's Pond							
Arsenic	5.1E+00	7.7E-07	8.8E-08	1.2E-06	1.4E-07	1.3E-06	R
Inorganics Pathway Total				1.2E-06	1.4E-07	1.3E-06	
Pathway Total - Chemicals				1.2E-06	1.4E-07	1.3E-06	
National Guard/Managed Recreational - National Guard							
Off-AOC							
Arsenic	8.0E+00	1.3E-06	1.4E-07	1.9E-06	2.3E-07	2.1E-06	R
Manganese	1.8E+03	2.8E-04	3.2E-05				
Inorganics Pathway Total				1.9E-06	2.3E-07	2.1E-06	
2,4-Dinitrotoluene	1.2E-01	1.9E-08	8.0E-09	1.3E-08	5.5E-09	1.8E-08	
2,6-Dinitrotoluene	8.0E-02	1.2E-08	3.6E-09	8.5E-09	2.4E-09	1.1E-08	

Table 6-7b. Surface Water Risks - Direct Contact (continued)

COPC	EPC (µg/L)	Daily Intake (mg/kg-d)		Risk		Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Ingestion	Dermal		
Bis(2-ethylhexyl)phthalate	1.2E+01	1.9E-06	4.9E-06	2.6E-08	6.9E-08	9.5E-08	
RDX	1.6E-01	2.5E-08	5.4E-08	2.8E-09	6.0E-09	8.7E-09	
Organics Pathway Total				5.0E-08	8.3E-08	1.3E-07	
Pathway Total - Chemicals				1.9E-06	3.1E-07	2.2E-06	
Outlet C and Charlie's Pond							
Arsenic	3.1E+01	4.9E-06	5.5E-07	7.3E-06	8.7E-07	8.2E-06	R
Manganese	5.1E+02	8.0E-05	9.1E-06				
Inorganics Pathway Total				7.3E-06	8.7E-07	8.2E-06	
Pathway Total - Chemicals				7.3E-06	8.7E-07	8.2E-06	
Outlets D, E, and F and Criggy's Pond							
Arsenic	5.1E+00	8.0E-07	9.1E-08	1.2E-06	1.4E-07	1.3E-06	R
Inorganics Pathway Total				1.2E-06	1.4E-07	1.3E-06	
Pathway Total - Chemicals				1.2E-06	1.4E-07	1.3E-06	
Open Recreational - Recreator							
Off-AOC							
Arsenic	8.0E+00	3.0E-07	1.2E-07	4.5E-07	1.8E-07	6.4E-07	
Manganese	1.8E+03	6.8E-05	2.6E-05				
Inorganics Pathway Total				4.5E-07	1.8E-07	6.4E-07	
2,4-Dinitrotoluene	1.2E-01	4.5E-09	6.6E-09	3.0E-09	4.5E-09	7.5E-09	
2,6-Dinitrotoluene	8.0E-02	3.0E-09	2.9E-09	2.0E-09	2.0E-09	4.0E-09	
Bis(2-ethylhexyl)phthalate	1.2E+01	4.5E-07	4.0E-06	6.3E-09	5.7E-08	6.3E-08	
RDX	1.6E-01	6.0E-09	4.5E-08	6.6E-10	4.9E-09	5.6E-09	
Organics Pathway Total				1.2E-08	6.8E-08	8.0E-08	
Pathway Total - Chemicals				4.6E-07	2.5E-07	7.2E-07	
Outlet C and Charlie's Pond							
Arsenic	3.1E+01	1.2E-06	4.5E-07	1.8E-06	7.2E-07	2.5E-06	R
Manganese	5.1E+02	1.9E-05	7.5E-06				
Inorganics Pathway Total				1.8E-06	7.2E-07	2.5E-06	
Pathway Total - Chemicals				1.8E-06	7.2E-07	2.5E-06	
Outlets D, E, and F and Criggy's Pond							
Arsenic	5.1E+00	1.9E-07	7.5E-08	2.9E-07	1.2E-07	4.1E-07	
Inorganics Pathway Total				2.9E-07	1.2E-07	4.1E-07	
Pathway Total - Chemicals				2.9E-07	1.2E-07	4.1E-07	
Open Residential - Resident Farmer (Adult)							
Off-AOC							
Arsenic	8.0E+00	9.4E-05	2.3E-07	1.4E-04	3.6E-07	1.4E-04	R
Manganese	1.8E+03	2.1E-02	5.1E-05				
Inorganics Pathway Total				1.4E-04	3.6E-07	1.4E-04	
2,4-Dinitrotoluene	1.2E-01	1.4E-06	1.3E-08	9.5E-07	8.7E-09	9.5E-07	
2,6-Dinitrotoluene	8.0E-02	9.4E-07	5.7E-09	6.4E-07	3.9E-09	6.4E-07	
Bis(2-ethylhexyl)phthalate	1.2E+01	1.4E-04	7.9E-06	2.0E-06	1.1E-07	2.1E-06	R
RDX	1.6E-01	1.9E-06	8.7E-08	2.1E-07	9.5E-09	2.2E-07	
Organics Pathway Total				3.8E-06	1.3E-07	3.9E-06	
Pathway Total - Chemicals				1.4E-04	4.9E-07	1.5E-04	

Table 6-7b. Surface Water Risks - Direct Contact (continued)

COPC	EPC (µg/L)	Daily Intake (mg/kg-d)		Risk		Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Ingestion	Dermal		
Outlet C and Charlie's Pond							
Arsenic	3.1E+01	3.6E-04	8.8E-07	5.5E-04	1.4E-06	5.5E-04	R
Manganese	5.1E+02	6.0E-03	1.5E-05				
Inorganics Pathway Total				5.5E-04	1.4E-06	5.5E-04	
Pathway Total - Chemicals				5.5E-04	1.4E-06	5.5E-04	
Outlets D, E, and F and Criggy's Pond							
Arsenic	5.1E+00	6.0E-05	1.5E-07	9.0E-05	2.3E-07	9.0E-05	R
Inorganics Pathway Total				9.0E-05	2.3E-07	9.0E-05	
Pathway Total - Chemicals				9.0E-05	2.3E-07	9.0E-05	
Open Residential - Resident Farmer (Child)							
Off-AOC							
Arsenic	8.0E+00	6.6E-05	9.5E-08	9.9E-05	1.5E-07	9.9E-05	R
Manganese	1.8E+03	1.5E-02	2.1E-05				
Inorganics Pathway Total				9.9E-05	1.5E-07	9.9E-05	
2,4-Dinitrotoluene	1.2E-01	9.7E-07	5.3E-09	6.6E-07	3.6E-09	6.7E-07	
2,6-Dinitrotoluene	8.0E-02	6.6E-07	2.4E-09	4.5E-07	1.6E-09	4.5E-07	
Bis(2-ethylhexyl)phthalate	1.2E+01	9.9E-05	3.3E-06	1.4E-06	4.6E-08	1.4E-06	R
RDX	1.6E-01	1.3E-06	3.6E-08	1.4E-07	4.0E-09	1.5E-07	
Organics Pathway Total				2.6E-06	5.5E-08	2.7E-06	
Pathway Total - Chemicals				1.0E-04	2.0E-07	1.0E-04	
Outlet C and Charlie's Pond							
Arsenic	3.1E+01	2.5E-04	3.7E-07	3.8E-04	5.8E-07	3.8E-04	R
Manganese	5.1E+02	4.2E-03	6.1E-06				
Inorganics Pathway Total				3.8E-04	5.8E-07	3.8E-04	
Pathway Total - Chemicals				3.8E-04	5.8E-07	3.8E-04	
Outlets D, E, and F and Criggy's Pond							
Arsenic	5.1E+00	4.2E-05	6.1E-08	6.3E-05	9.6E-08	6.3E-05	R
Inorganics Pathway Total				6.3E-05	9.6E-08	6.3E-05	
Pathway Total - Chemicals				6.3E-05	9.6E-08	6.3E-05	

[a] COPCs are identified as chemicals of concern (COCs) if the total HI across all pathways is > 1 (H) or if the total ILCR is > 1E-06 (R).
AOC = area of concern.
COPC = chemical of potential concern.
EPC = exposure point concentration.
ILCR = Incremental Lifetime Cancer Risk.

Table 6-8. Total Hazards/Risks and Chemicals of Concern for Direct Contact with Surface Water

Receptor	Noncarcinogens		Carcinogens	
	HI	COCs	ILCR	COCs
Off-AOC				
Child Trespasser	0.1		8E-07	
Hunter/Trapper	0.06		2E-06	Arsenic
National Guard	0.08		2E-06	Arsenic
Recreator	0.04		7E-07	
On-Site Resident Farmer (Adult)	2	Manganese	2E-04	Arsenic, Bis(2-ethylhexyl)phthalate
On-Site Resident Farmer (Child)	7	Arsenic, Manganese	1E-04	Arsenic, Bis(2-ethylhexyl)phthalate
Outlet C and Charlie's Pond				
Child Trespasser	0.08		3E-06	Arsenic
Hunter/Trapper	0.06		8E-06	Arsenic
National Guard	0.07		8E-06	Arsenic
Recreator	0.02		3E-06	Arsenic
On-Site Resident Farmer (Adult)	3	Arsenic	6E-04	Arsenic
On-Site Resident Farmer (Child)	11	Arsenic, Manganese	4E-04	Arsenic
Outlets D, E, and F and Criggy's Pond				
Child Trespasser	0.007		5E-07	
Hunter/Trapper	0.007		1E-06	Arsenic
National Guard	0.008		1E-06	Arsenic
Recreator	0.002		4E-07	
On-Site Resident Farmer (Adult)	0.5		9E-05	Arsenic
On-Site Resident Farmer (Child)	2	Arsenic	6E-05	Arsenic

AOC = area of concern.
COPC = chemical of potential concern.
EPC = exposure point concentration.
ILCR = Incremental Lifetime Cancer Risk.

No surface water COC are identified for the Child Trespasser or Recreator at the off-AOC EU. Arsenic is identified as a COC for the Hunter/Trapper and National Guard scenarios, and bis(2-ethylhexyl)phthalate, arsenic, and manganese are COCs for the On-Site Resident Farmer (adult and child) scenario at this EU.

Surface water – indirect contact

In addition to the direct contact pathways described above, the Hunter/Trapper and On-Site Resident Farmer may be exposed to COPCs in surface water via ingestion of fish. Risk and hazard results for ingestion of fish are presented in Table 6-9 and summarized in Table 6-10 below for the Off-AOC, Outlet C and Charlie's Pond, and Outlets D, E, and F and Criggy's Pond EUs. Surface water samples were not collected at the North area.

Manganese, bis(2-ethylhexyl)phthalate, and RDX are identified as COCs for the Hunter/Trapper and On-Site Resident Farmer (adult and child) scenarios at the Off-Site EU. Manganese is identified as the only COC at Outlet C and Charlie's Pond. It should be noted that, due to the use of conservative fish bioconcentration factors and toxicity values, the background concentration of manganese in surface water

Table 6-9. Surface Water Hazards and Risks - Fish Ingestion

COPC	Water EPC (µg/L)	Fish Ingestion Non-carcinogen Daily Intake (mg/kg-d)	Fish Ingestion HQ	Fish Ingestion Carcinogen Daily Intake (mg/kg-d)	Fish Ingestion Risk	COC[a]
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Hunter/Trapper						
Off-AOC						
Manganese	1.8E+03	5.5E-01	4.0E+00	2.4E-01		H
Inorganics Pathway Total			4.0E+00			
2,4-Dinitrotoluene	1.2E-01	1.7E-06	8.7E-04	7.4E-07	5.1E-07	
2,6-Dinitrotoluene	8.0E-02	7.4E-07	7.4E-04	3.2E-07	2.2E-07	
Bis(2-ethylhexyl)phthalate	1.2E+01	2.9E-02	1.4E+00	1.2E-02	1.7E-04	R,H
RDX	1.6E-01	2.3E-05	7.8E-03	1.0E-05	1.1E-06	R
Organics Pathway Total			1.4E+00		1.7E-04	
Pathway Total			5.4E+00		1.7E-04	
Outlet C and Charlie's Pond						
Manganese	5.1E+02	1.6E-01	1.1E+00	6.7E-02		H
Inorganics Pathway Total			1.1E+00			
Pathway Total			1.1E+00			
Open Residential - Resident Farmer (Adult)						
Off-AOC						
Manganese	1.8E+03	5.5E-01	4.0E+00	2.4E-01		H
Inorganics Pathway Total			4.0E+00			
2,4-Dinitrotoluene	1.2E-01	1.7E-06	8.7E-04	7.4E-07	5.1E-07	
2,6-Dinitrotoluene	8.0E-02	7.4E-07	7.4E-04	3.2E-07	2.2E-07	
Bis(2-ethylhexyl)phthalate	1.2E+01	2.9E-02	1.4E+00	1.2E-02	1.7E-04	R,H
RDX	1.6E-01	2.3E-05	7.8E-03	1.0E-05	1.1E-06	R
Organics Pathway Total			1.4E+00		1.7E-04	
Pathway Total			5.4E+00		1.7E-04	
Outlet C and Charlie's Pond						
Manganese	5.1E+02	1.6E-01	1.1E+00	6.7E-02		H
Inorganics Pathway Total			1.1E+00			
Pathway Total			1.1E+00			
Open Residential - Resident Farmer (Child)						
Off-AOC						
Manganese	1.8E+03	2.6E+00	1.8E+01	2.2E-01		H
Inorganics Pathway Total			1.8E+01			
2,4-Dinitrotoluene	1.2E-01	8.1E-06	4.1E-03	6.9E-07	4.7E-07	
2,6-Dinitrotoluene	8.0E-02	3.4E-06	3.4E-03	3.0E-07	2.0E-07	
Bis(2-ethylhexyl)phthalate	1.2E+01	1.3E-01	6.7E+00	1.1E-02	1.6E-04	R,H
RDX	1.6E-01	1.1E-04	3.6E-02	9.4E-06	1.0E-06	R
Organics Pathway Total			6.7E+00		1.6E-04	
Pathway Total			2.5E+01		1.6E-04	
Outlet C and Charlie's Pond						
Manganese	5.1E+02	7.3E-01	5.2E+00	6.3E-02		H
Inorganics Pathway Total			5.2E+00			
Pathway Total			5.2E+00			

[a] COPCs are identified as chemicals of concern (COCs) if the total HI across all pathways is > 1 (H) or if the total ILCR is > 1E-06 (R).
COPC = chemical of potential concern.
EPC = exposure point concentration.
ILCR = Incremental Lifetime Cancer Risk.

Table 6-10. Total Hazards/Risks and Chemicals of Concern for Ingestion of Fish

Receptor	Noncarcinogens		Carcinogens	
	HI	COCs	ILCR	COCs
Off-AOC				
Hunter/Trapper	5	Manganese, Bis(2-ethylhexyl)phthalate	2E-04	RDX, Bis(2-ethylhexyl)phthalate
On-Site Resident Farmer (Adult)	5	Manganese, Bis(2-ethylhexyl)phthalate	2E-04	RDX, Bis(2-ethylhexyl)phthalate
On-Site Resident Farmer (Child)	25	Manganese, Bis(2-ethylhexyl)phthalate	2E-04	RDX, Bis(2-ethylhexyl)phthalate
Outlet C and Charlie's Pond				
Hunter/Trapper	1	Manganese		
On-Site Resident Farmer (Adult)	1	Manganese		
On-Site Resident Farmer (Child)	5	Manganese		

AOC = area of concern.
COC = chemical of concern.
HI = hazard index.
ILCR = Incremental Lifetime Cancer Risk.

would result in an HQ of three for fish ingestion by the Hunter/Trapper and On-Site Resident Farmer. The only COPC identified at Outlets D, E, and F and Criggy's Pond is arsenic. No BCF is available for arsenic.

Sediment

Risk and hazard results for sediment are presented in Tables 6-11(a and b) and summarized in Table 6-12 for the Off-AOC, Outlet C and Charlie's Pond, Outlets A and B, and Outlets D, E, and F and Criggy's Pond EUs. No sediment COPCs were identified at the North area.

No sediment COCs are identified for the Child Trespasser, National Guard, and Recreator scenarios at Off-AOC or Outlets D, E, and F and Criggy's Pond. Arsenic is the only COC identified at the Off-AOC (Hunter/Trapper, On-Site Resident Farmer Adult and Child). Arsenic, antimony, and manganese are the only COCs identified at Outlets D, E, and F and Criggy's Pond (On-Site Resident Farmer Adult and Child). No COCs are identified for other receptors at these EUs.

Arsenic is the only COC identified for the Child Trespasser and Hunter/Trapperscenarios at Outlet C and Charlie's Pond. Benzo(a)pyrene, PCB-1254, and arsenic are identified as COCs for the On-Site Resident Farmer (adult and child) scenario. No sediment COCs are identified for the Recreator or National Guard scenarios at this EU.

Various PAHs [including benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene] are identified as COCs at Outlets A and B for all receptors. Arsenic, 2,4-dinitrotoluene, and PCB-1254 are also identified as COCs for the On-Site Resident Farmer Adult and Child.

Lead is a COPC at the Outlet C and Charlie's Pond, Outlets A and B, and Outlets D, E, and F and Criggy's Pond EUs. With the exception of the On-Site Resident Farmer, all receptors had probabilities of fetal blood lead concentrations lower than the acceptable levels of less than 5%. For the On-Site Resident Farmer adult, probabilities are less than 9% at Outlets A and B, less than 1% in Outlet C and Charlie's Pond, and less than 29% in Outlets D, E, and F and Criggy's Pond. For the On-Site Resident Farmer child, the estimated probabilities of exceeding the target blood lead level of concern are less than 1% at Outlet C and Charlie's Pond, 19% at Outlets A and B, and 66% at Outlets D, E, and F and Criggy's Pond.

Table 6-11a. Sediment Hazards - Direct Contact

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Child Trespasser									
Off-AOC									
Arsenic	2.1E+01	1.1E-06	3.1E-06	1.2E-10	3.6E-03	1.1E-02		1.5E-02	
Chromium	1.5E+01	7.4E-07	7.2E-08	8.0E-11	4.9E-07	3.7E-06		4.2E-06	
Inorganics Pathway Total					3.6E-03	1.1E-02		1.5E-02	
Pathway Total - Chemicals					3.6E-03	1.1E-02		1.5E-02	
Outlet C and Charlie's Pond									
Arsenic	2.5E+01	1.3E-06	3.7E-06	1.4E-10	4.2E-03	1.3E-02		1.7E-02	
Chromium	1.6E+01	8.2E-07	8.0E-08	8.9E-11	5.5E-07	4.1E-06		4.7E-06	
Manganese	2.4E+03	1.2E-04	1.2E-05	1.3E-08	2.6E-03	6.3E-03	9.0E-04	9.8E-03	
Inorganics Pathway Total					6.8E-03	1.9E-02	9.0E-04	2.7E-02	
1,2-Dichloroethene	1.0E-02	5.1E-10	5.0E-10	5.5E-14	5.6E-08	5.5E-08		1.1E-07	
2,6-Dinitrotoluene	1.3E-01	6.8E-09	6.7E-08	7.4E-13	6.8E-06	6.7E-05		7.4E-05	
Benz(a)anthracene	7.7E-02	3.9E-09	5.0E-08	4.2E-13					
Benzo(a)pyrene	8.4E-02	4.3E-09	5.4E-08	4.6E-13					
Benzo(b)fluoranthene	1.8E-01	9.1E-09	1.2E-07	9.9E-13					
Indeno(1,2,3-cd)pyrene	7.6E-02	3.9E-09	4.9E-08	4.2E-13					
PCB-1254	8.7E-01	4.4E-08	6.0E-07	4.8E-12	2.2E-03	3.8E-02		4.0E-02	
Organics Pathway Total					2.2E-03	3.8E-02		4.0E-02	
Pathway Total - Chemicals					9.0E-03	5.7E-02	9.0E-04	6.7E-02	
Outlets A and B									
Antimony	5.2E+00	2.6E-07	2.6E-08	2.9E-11	6.6E-04	4.3E-04		1.1E-03	
Arsenic	1.8E+01	8.9E-07	2.6E-06	9.6E-11	3.0E-03	9.2E-03		1.2E-02	
Cadmium	1.5E+01	7.6E-07	7.4E-08	8.2E-11	7.6E-04	3.0E-03		3.7E-03	
Chromium	6.2E+01	3.1E-06	3.1E-07	3.4E-10	2.1E-06	1.6E-05		1.8E-05	
Chromium, hexavalent	5.4E+00	2.7E-07	2.7E-08	3.0E-11	9.1E-05	3.6E-04	1.0E-06	4.5E-04	
Thallium	9.0E-01	4.6E-08	4.5E-09	4.9E-12	5.7E-04	5.6E-05		6.3E-04	
Zinc	1.0E+03	5.1E-05	5.0E-06	5.5E-09	1.7E-04	5.5E-05		2.2E-04	
Inorganics Pathway Total					5.2E-03	1.3E-02	1.0E-06	1.8E-02	
1,2-Dichloroethene	7.6E-03	3.9E-10	3.8E-10	4.2E-14	4.3E-08	4.2E-08		8.5E-08	
2,4-Dinitrotoluene	2.0E+00	1.0E-07	9.9E-07	1.1E-11	5.1E-05	5.0E-04		5.5E-04	
Benz(a)anthracene	9.2E+00	4.7E-07	5.9E-06	5.1E-11					
Benzo(a)pyrene	9.5E+00	4.8E-07	6.1E-06	5.2E-11					
Benzo(b)fluoranthene	1.2E+01	6.1E-07	7.7E-06	6.6E-11					
Benzo(k)fluoranthene	5.4E+00	2.7E-07	3.5E-06	3.0E-11					
Chrysene	9.4E+00	4.8E-07	6.1E-06	5.2E-11					
Dibenz(a,h)anthracene	1.7E+00	8.6E-08	1.1E-06	9.3E-12					
Indeno(1,2,3-cd)pyrene	6.7E+00	3.4E-07	4.3E-06	3.7E-11					
PCB-1254	6.1E-01	3.1E-08	4.2E-07	3.4E-12	1.5E-03	2.6E-02		2.8E-02	
Organics Pathway Total					1.6E-03	2.7E-02		2.9E-02	
Pathway Total - Chemicals					6.8E-03	4.0E-02	1.0E-06	4.7E-02	

Table 6-11a. Sediment Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Outlets D, E, and F and Criggy's Pond									
Antimony	5.9E+02	3.0E-05	2.9E-06	3.3E-09	7.5E-02	4.9E-02		1.2E-01	
Arsenic	2.1E+01	1.1E-06	3.1E-06	1.2E-10	3.6E-03	1.1E-02		1.5E-02	
Chromium	1.2E+02	6.3E-06	6.2E-07	6.8E-10	4.2E-06	3.2E-05		3.6E-05	
Chromium, hexavalent	1.1E+01	5.6E-07	5.5E-08	6.0E-11	1.9E-04	7.3E-04	2.1E-06	9.2E-04	
Manganese	3.4E+03	1.7E-04	1.7E-05	1.9E-08	3.7E-03	9.1E-03	1.3E-03	1.4E-02	
Inorganics Pathway Total					8.3E-02	7.0E-02	1.3E-03	1.5E-01	
Pathway Total - Chemicals					8.3E-02	7.0E-02	1.3E-03	1.5E-01	
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Hunter/Trapper									
Off-AOC									
Arsenic	2.1E+01	6.2E-07	8.9E-07	1.3E-10	2.1E-03	3.1E-03		5.2E-03	
Chromium	1.5E+01	4.3E-07	2.0E-08	9.2E-11	2.8E-07	1.0E-06		1.3E-06	
Inorganics Pathway Total					2.1E-03	3.1E-03		5.2E-03	
Pathway Total - Chemicals					2.1E-03	3.1E-03		5.2E-03	
Outlet C and Charlie's Pond									
Arsenic	2.5E+01	7.3E-07	1.1E-06	1.6E-10	2.4E-03	3.7E-03		6.1E-03	
Chromium	1.6E+01	4.8E-07	2.3E-08	1.0E-10	3.2E-07	1.2E-06		1.5E-06	
Manganese	2.4E+03	6.9E-05	3.3E-06	1.5E-08	1.5E-03	1.8E-03	1.0E-03	4.3E-03	
Inorganics Pathway Total					3.9E-03	5.5E-03	1.0E-03	1.0E-02	
1,2-Dichloroethene	1.0E-02	2.9E-10	1.4E-10	6.4E-14	3.3E-08	1.6E-08		4.8E-08	
2,6-Dinitrotoluene	1.3E-01	3.9E-09	1.9E-08	8.5E-13	3.9E-06	1.9E-05		2.3E-05	
Benz(a)anthracene	7.7E-02	2.3E-09	1.4E-08	4.9E-13					
Benzo(a)pyrene	8.4E-02	2.5E-09	1.5E-08	5.3E-13					
Benzo(b)fluoranthene	1.8E-01	5.3E-09	3.3E-08	1.1E-12					
Indeno(1,2,3-cd)pyrene	7.6E-02	2.2E-09	1.4E-08	4.8E-13					
PCB-1254	8.7E-01	2.6E-08	1.7E-07	5.5E-12	1.3E-03	1.1E-02		1.2E-02	
Organics Pathway Total					1.3E-03	1.1E-02		1.2E-02	
Pathway Total - Chemicals					5.2E-03	1.6E-02	1.0E-03	2.2E-02	
Outlets A and B									
Antimony	5.2E+00	1.5E-07	7.3E-09	3.3E-11	3.8E-04	1.2E-04		5.0E-04	
Arsenic	1.8E+01	5.1E-07	7.4E-07	1.1E-10	1.7E-03	2.6E-03		4.3E-03	
Cadmium	1.5E+01	4.4E-07	2.1E-08	9.5E-11	4.4E-04	8.4E-04		1.3E-03	
Chromium	6.2E+01	1.8E-06	8.7E-08	3.9E-10	1.2E-06	4.4E-06		5.6E-06	
Chromium, hexavalent	5.4E+00	1.6E-07	7.6E-09	3.4E-11	5.3E-05	1.0E-04	1.2E-06	1.6E-04	
Thallium	9.0E-01	2.6E-08	1.3E-09	5.7E-12	3.3E-04	1.6E-05		3.5E-04	
Zinc	1.0E+03	2.9E-05	1.4E-06	6.4E-09	9.8E-05	1.6E-05		1.1E-04	
Inorganics Pathway Total					3.0E-03	3.7E-03	1.2E-06	6.7E-03	
1,2-Dichloroethene	7.6E-03	2.2E-10	1.1E-10	4.8E-14	2.5E-08	1.2E-08		3.7E-08	
2,4-Dinitrotoluene	2.0E+00	5.9E-08	2.8E-07	1.3E-11	2.9E-05	1.4E-04		1.7E-04	
Benz(a)anthracene	9.2E+00	2.7E-07	1.7E-06	5.8E-11					

Table 6-11a. Sediment Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Benzo(a)pyrene	9.5E+00	2.8E-07	1.7E-06	6.0E-11					
Benzo(b)fluoranthene	1.2E+01	3.5E-07	2.2E-06	7.6E-11					
Benzo(k)fluoranthene	5.4E+00	1.6E-07	9.9E-07	3.4E-11					
Chrysene	9.4E+00	2.8E-07	1.7E-06	6.0E-11					
Dibenz(a,h)anthracene	1.7E+00	5.0E-08	3.1E-07	1.1E-11					
Indeno(1,2,3-cd)pyrene	6.7E+00	2.0E-07	1.2E-06	4.3E-11					
PCB-1254	6.1E-01	1.8E-08	1.2E-07	3.9E-12	9.0E-04	7.5E-03		8.4E-03	
Organics Pathway Total					9.2E-04	7.6E-03		8.6E-03	
Pathway Total - Chemicals					3.9E-03	1.1E-02	1.2E-06	1.5E-02	
Outlets D, E, and F and Criggy's Pond									
Antimony	5.9E+02	1.7E-05	8.3E-07	3.8E-09	4.4E-02	1.4E-02		5.8E-02	
Arsenic	2.1E+01	6.2E-07	8.9E-07	1.3E-10	2.1E-03	3.1E-03		5.2E-03	
Chromium	1.2E+02	3.6E-06	1.7E-07	7.9E-10	2.4E-06	8.9E-06		1.1E-05	
Chromium, hexavalent	1.1E+01	3.2E-07	1.5E-08	7.0E-11	1.1E-04	2.1E-04	2.4E-06	3.2E-04	
Manganese	3.4E+03	9.9E-05	4.8E-06	2.1E-08	2.2E-03	2.6E-03	1.5E-03	6.2E-03	
Inorganics Pathway Total					4.8E-02	2.0E-02	1.5E-03	6.9E-02	
Pathway Total - Chemicals					4.8E-02	2.0E-02	1.5E-03	6.9E-02	
National Guard/Managed Recreational - National Guard									
Off-AOC									
Arsenic	2.1E+01	7.7E-07	6.9E-07	3.7E-10	2.6E-03	2.4E-03		5.0E-03	
Chromium	1.5E+01	5.3E-07	1.6E-08	2.6E-10	3.5E-07	8.1E-07		1.2E-06	
Inorganics Pathway Total					2.6E-03	2.4E-03		5.0E-03	
Pathway Total - Chemicals					2.6E-03	2.4E-03		5.0E-03	
Outlet C and Charlie's Pond									
Arsenic	2.5E+01	9.1E-07	8.1E-07	4.4E-10	3.0E-03	2.8E-03		5.9E-03	
Chromium	1.6E+01	5.9E-07	1.8E-08	2.8E-10	3.9E-07	9.0E-07		1.3E-06	
Manganese	2.4E+03	8.6E-05	2.5E-06	4.1E-08	1.9E-03	1.4E-03	2.9E-03	6.1E-03	
Inorganics Pathway Total					4.9E-03	4.2E-03	2.9E-03	1.2E-02	
1,2-Dichloroethene	1.0E-02	3.7E-10	1.1E-10	1.8E-13	4.1E-08	1.2E-08		5.3E-08	
2,6-Dinitrotoluene	1.3E-01	4.9E-09	1.5E-08	2.4E-12	4.9E-06	1.5E-05		1.9E-05	
Benz(a)anthracene	7.7E-02	2.8E-09	1.1E-08	1.4E-12					
Benzo(a)pyrene	8.4E-02	3.1E-09	1.2E-08	1.5E-12					
Benzo(b)fluoranthene	1.8E-01	6.6E-09	2.5E-08	3.2E-12					
Indeno(1,2,3-cd)pyrene	7.6E-02	2.8E-09	1.1E-08	1.3E-12					
PCB-1254	8.7E-01	3.2E-08	1.3E-07	1.5E-11	1.6E-03	8.3E-03		9.8E-03	
Organics Pathway Total					1.6E-03	8.3E-03		9.9E-03	
Pathway Total - Chemicals					6.5E-03	1.3E-02	2.9E-03	2.2E-02	
Outlets A and B									
Antimony	5.2E+00	1.9E-07	5.6E-09	9.1E-11	4.8E-04	9.4E-05		5.7E-04	
Arsenic	1.8E+01	6.4E-07	5.7E-07	3.1E-10	2.1E-03	2.0E-03		4.1E-03	
Cadmium	1.5E+01	5.5E-07	1.6E-08	2.6E-10	5.5E-04	6.5E-04		1.2E-03	

Table 6-11a. Sediment Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Chromium	6.2E+01	2.3E-06	6.7E-08	1.1E-09	1.5E-06	3.4E-06		4.9E-06	
Chromium, hexavalent	5.4E+00	2.0E-07	5.9E-09	9.5E-11	6.6E-05	7.8E-05	3.3E-06	1.5E-04	
Thallium	9.0E-01	3.3E-08	9.8E-10	1.6E-11	4.1E-04	1.2E-05		4.2E-04	
Zinc	1.0E+03	3.7E-05	1.1E-06	1.8E-08	1.2E-04	1.2E-05		1.3E-04	
Inorganics Pathway Total					3.8E-03	2.9E-03	3.3E-06	6.6E-03	
1,2-Dichloroethene	7.6E-03	2.8E-10	8.2E-11	1.3E-13	3.1E-08	9.2E-09		4.0E-08	
2,4-Dinitrotoluene	2.0E+00	7.3E-08	2.2E-07	3.5E-11	3.7E-05	1.1E-04		1.5E-04	
Benz(a)anthracene	9.2E+00	3.4E-07	1.3E-06	1.6E-10					
Benzo(a)pyrene	9.5E+00	3.5E-07	1.3E-06	1.7E-10					
Benzo(b)fluoranthene	1.2E+01	4.4E-07	1.7E-06	2.1E-10					
Benzo(k)fluoranthene	5.4E+00	2.0E-07	7.6E-07	9.5E-11					
Chrysene	9.4E+00	3.4E-07	1.3E-06	1.7E-10					
Dibenz(a,h)anthracene	1.7E+00	6.2E-08	2.4E-07	3.0E-11					
Indeno(1,2,3-cd)pyrene	6.7E+00	2.4E-07	9.4E-07	1.2E-10					
PCB-1254	6.1E-01	2.2E-08	9.3E-08	1.1E-11	1.1E-03	5.8E-03		6.9E-03	
Organics Pathway Total					1.2E-03	5.9E-03		7.1E-03	
Pathway Total - Chemicals					4.9E-03	8.8E-03	3.3E-06	1.4E-02	
Outlets D, E, and F and Criggy's Pond									
Antimony	5.9E+02	2.2E-05	6.4E-07	1.0E-08	5.4E-02	1.1E-02		6.5E-02	
Arsenic	2.1E+01	7.7E-07	6.8E-07	3.7E-10	2.6E-03	2.4E-03		5.0E-03	
Chromium	1.2E+02	4.5E-06	1.3E-07	2.2E-09	3.0E-06	6.9E-06		9.9E-06	
Chromium, hexavalent	1.1E+01	4.0E-07	1.2E-08	1.9E-10	1.3E-04	1.6E-04	6.8E-06	3.0E-04	
Manganese	3.4E+03	1.2E-04	3.7E-06	5.9E-08	2.7E-03	2.0E-03	4.2E-03	8.8E-03	
Inorganics Pathway Total					6.0E-02	1.5E-02	4.2E-03	7.9E-02	
Pathway Total - Chemicals					6.0E-02	1.5E-02	4.2E-03	7.9E-02	
Open Recreational - Recreator									
Off-AOC									
Arsenic	2.1E+01	2.6E-07	7.4E-07	5.6E-11	8.6E-04	2.6E-03		3.5E-03	
Chromium	1.5E+01	1.8E-07	1.7E-08	3.8E-11	1.2E-07	8.7E-07		9.9E-07	
Inorganics Pathway Total					8.6E-04	2.6E-03		3.5E-03	
Pathway Total - Chemicals					8.6E-04	2.6E-03		3.5E-03	
Outlet C and Charlie's Pond									
Arsenic	2.5E+01	3.1E-07	8.8E-07	6.6E-11	1.0E-03	3.1E-03		4.1E-03	
Chromium	1.6E+01	2.0E-07	1.9E-08	4.3E-11	1.3E-07	9.7E-07		1.1E-06	
Manganese	2.4E+03	2.9E-05	2.8E-06	6.2E-09	6.2E-04	1.5E-03	4.4E-04	2.6E-03	
Inorganics Pathway Total					1.6E-03	4.6E-03	4.4E-04	6.7E-03	
1,2-Dichloroethene	1.0E-02	1.2E-10	1.2E-10	2.6E-14	1.4E-08	1.3E-08		2.7E-08	
2,6-Dinitrotoluene	1.3E-01	1.6E-09	1.6E-08	3.6E-13	1.6E-06	1.6E-05		1.7E-05	
Benz(a)anthracene	7.7E-02	9.4E-10	1.2E-08	2.0E-13					
Benzo(a)pyrene	8.4E-02	1.0E-09	1.3E-08	2.2E-13					
Benzo(b)fluoranthene	1.8E-01	2.2E-09	2.7E-08	4.8E-13					

Table 6-11a. Sediment Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Indeno(1,2,3-cd)pyrene	7.6E-02	9.3E-10	1.2E-08	2.0E-13					
PCB-1254	8.7E-01	1.1E-08	1.4E-07	2.3E-12	5.3E-04	8.9E-03		9.4E-03	
Organics Pathway Total					5.3E-04	8.9E-03		9.5E-03	
Pathway Total - Chemicals					2.2E-03	1.4E-02	4.4E-04	1.6E-02	
Outlets A and B									
Antimony	5.2E+00	6.4E-08	6.1E-09	1.4E-11	1.6E-04	1.0E-04		2.6E-04	
Arsenic	1.8E+01	2.1E-07	6.2E-07	4.6E-11	7.1E-04	2.2E-03		2.9E-03	
Cadmium	1.5E+01	1.8E-07	1.8E-08	4.0E-11	1.8E-04	7.0E-04		8.9E-04	
Chromium	6.2E+01	7.5E-07	7.2E-08	1.6E-10	5.0E-07	3.7E-06		4.2E-06	
Chromium, hexavalent	5.4E+00	6.6E-08	6.3E-09	1.4E-11	2.2E-05	8.4E-05	5.0E-07	1.1E-04	
Thallium	9.0E-01	1.1E-08	1.1E-09	2.4E-12	1.4E-04	1.3E-05		1.5E-04	
Zinc	1.0E+03	1.2E-05	1.2E-06	2.7E-09	4.1E-05	1.3E-05		5.4E-05	
Inorganics Pathway Total					1.3E-03	3.1E-03	5.0E-07	4.3E-03	
1,2-Dichloroethene	7.6E-03	9.3E-11	8.9E-11	2.0E-14	1.0E-08	9.9E-09		2.0E-08	
2,4-Dinitrotoluene	2.0E+00	2.4E-08	2.3E-07	5.3E-12	1.2E-05	1.2E-04		1.3E-04	
Benz(a)anthracene	9.2E+00	1.1E-07	1.4E-06	2.4E-11					
Benzo(a)pyrene	9.5E+00	1.2E-07	1.4E-06	2.5E-11					
Benzo(b)fluoranthene	1.2E+01	1.5E-07	1.8E-06	3.2E-11					
Benzo(k)fluoranthene	5.4E+00	6.6E-08	8.2E-07	1.4E-11					
Chrysene	9.4E+00	1.1E-07	1.4E-06	2.5E-11					
Dibenz(a,h)anthracene	1.7E+00	2.1E-08	2.6E-07	4.5E-12					
Indeno(1,2,3-cd)pyrene	6.7E+00	8.2E-08	1.0E-06	1.8E-11					
PCB-1254	6.1E-01	7.5E-09	1.0E-07	1.6E-12	3.7E-04	6.3E-03		6.6E-03	
Organics Pathway Total					3.9E-04	6.4E-03		6.8E-03	
Pathway Total - Chemicals					1.6E-03	9.4E-03	5.0E-07	1.1E-02	
Outlets D, E, and F and Criggy's Pond									
Antimony	5.9E+02	7.3E-06	7.0E-07	1.6E-09	1.8E-02	1.2E-02		3.0E-02	
Arsenic	2.1E+01	2.6E-07	7.4E-07	5.6E-11	8.6E-04	2.6E-03		3.4E-03	
Chromium	1.2E+02	1.5E-06	1.5E-07	3.3E-10	1.0E-06	7.4E-06		8.5E-06	
Chromium, hexavalent	1.1E+01	1.3E-07	1.3E-08	2.9E-11	4.5E-05	1.7E-04	1.0E-06	2.2E-04	
Manganese	3.4E+03	4.1E-05	4.0E-06	9.0E-09	9.0E-04	2.2E-03	6.3E-04	3.7E-03	
Inorganics Pathway Total					2.0E-02	1.7E-02	6.3E-04	3.7E-02	
Pathway Total - Chemicals					2.0E-02	1.7E-02	6.3E-04	3.7E-02	
Open Residential - Resident Farmer (Adult)									
Off-AOC									
Arsenic	2.1E+01	2.9E-05	2.0E-05	6.3E-09	9.6E-02	6.9E-02		1.7E-01	
Chromium	1.5E+01	2.0E-05	4.5E-07	4.3E-09	1.3E-05	2.3E-05		3.7E-05	
Inorganics Pathway Total					9.6E-02	6.9E-02		1.7E-01	
Pathway Total - Chemicals					9.6E-02	6.9E-02		1.7E-01	
Outlet C and Charlie's Pond									
Arsenic	2.5E+01	3.4E-05	2.3E-05	7.4E-09	1.1E-01	8.2E-02		2.0E-01	

Table 6-11a. Sediment Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Chromium	1.6E+01	2.2E-05	5.1E-07	4.8E-09	1.5E-05	2.6E-05		4.1E-05	
Manganese	2.4E+03	3.2E-03	7.3E-05	7.0E-07	7.0E-02	4.0E-02	4.9E-02	1.6E-01	
Inorganics Pathway Total					1.8E-01	1.2E-01	4.9E-02	3.5E-01	
1,2-Dichloroethene	1.0E-02	1.4E-08	3.1E-09	3.0E-12	1.5E-06	3.5E-07		1.9E-06	
2,6-Dinitrotoluene	1.3E-01	1.8E-07	4.2E-07	4.0E-11	1.8E-04	4.2E-04		6.0E-04	
Benz(a)anthracene	7.7E-02	1.1E-07	3.1E-07	2.3E-11					
Benzo(a)pyrene	8.4E-02	1.2E-07	3.4E-07	2.5E-11					
Benzo(b)fluoranthene	1.8E-01	2.5E-07	7.3E-07	5.3E-11					
Indeno(1,2,3-cd)pyrene	7.6E-02	1.0E-07	3.1E-07	2.3E-11					
PCB-1254	8.7E-01	1.2E-06	3.8E-06	2.6E-10	6.0E-02	2.4E-01		3.0E-01	
Organics Pathway Total					6.0E-02	2.4E-01		3.0E-01	
Pathway Total - Chemicals					2.4E-01	3.6E-01	4.9E-02	6.5E-01	
Outlets A and B									
Antimony	5.2E+00	7.1E-06	1.6E-07	1.5E-09	1.8E-02	2.7E-03		2.1E-02	
Arsenic	1.8E+01	2.4E-05	1.6E-05	5.2E-09	8.0E-02	5.8E-02		1.4E-01	
Cadmium	1.5E+01	2.1E-05	4.7E-07	4.4E-09	2.1E-02	1.9E-02		3.9E-02	
Chromium	6.2E+01	8.4E-05	1.9E-06	1.8E-08	5.6E-05	9.9E-05		1.6E-04	
Chromium, hexavalent	5.4E+00	7.4E-06	1.7E-07	1.6E-09	2.5E-03	2.2E-03	5.6E-05	4.8E-03	
Thallium	9.0E-01	1.2E-06	2.8E-08	2.7E-10	1.5E-02	3.5E-04		1.6E-02	
Zinc	1.0E+03	1.4E-03	3.1E-05	3.0E-07	4.6E-03	3.5E-04		4.9E-03	
Inorganics Pathway Total					1.4E-01	8.2E-02	5.6E-05	2.2E-01	
1,2-Dichloroethene	7.6E-03	1.0E-08	2.4E-09	2.3E-12	1.2E-06	2.6E-07		1.4E-06	
2,4-Dinitrotoluene	2.0E+00	2.7E-06	6.2E-06	5.9E-10	1.4E-03	3.1E-03		4.5E-03	
Benz(a)anthracene	9.2E+00	1.3E-05	3.7E-05	2.7E-09					
Benzo(a)pyrene	9.5E+00	1.3E-05	3.9E-05	2.8E-09					
Benzo(b)fluoranthene	1.2E+01	1.6E-05	4.9E-05	3.6E-09					
Benzo(k)fluoranthene	5.4E+00	7.4E-06	2.2E-05	1.6E-09					
Chrysene	9.4E+00	1.3E-05	3.8E-05	2.8E-09					
Dibenz(a,h)anthracene	1.7E+00	2.3E-06	6.9E-06	5.0E-10					
Indeno(1,2,3-cd)pyrene	6.7E+00	9.2E-06	2.7E-05	2.0E-09					
PCB-1254	6.1E-01	8.4E-07	2.7E-06	1.8E-10	4.2E-02	1.7E-01		2.1E-01	
Organics Pathway Total					4.3E-02	1.7E-01		2.1E-01	
Pathway Total - Chemicals					1.8E-01	2.5E-01	5.6E-05	4.4E-01	
Outlets D, E, and F and Criggy's Pond									
Antimony	5.9E+02	8.1E-04	1.9E-05	1.8E-07	2.0E+00	3.1E-01		2.3E+00	H
Arsenic	2.1E+01	2.9E-05	2.0E-05	6.2E-09	9.6E-02	6.9E-02		1.6E-01	
Chromium	1.2E+02	1.7E-04	3.9E-06	3.7E-08	1.1E-04	2.0E-04		3.1E-04	
Chromium, hexavalent	1.1E+01	1.5E-05	3.4E-07	3.3E-09	5.0E-03	4.6E-03	1.1E-04	9.7E-03	
Manganese	3.4E+03	4.6E-03	1.1E-04	1.0E-06	1.0E-01	5.7E-02	7.0E-02	2.3E-01	
Inorganics Pathway Total					2.2E+00	4.4E-01	7.0E-02	2.7E+00	
Pathway Total - Chemicals					2.2E+00	4.4E-01	7.0E-02	2.7E+00	

Table 6-11a. Sediment Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Open Residential - Resident Farmer (Child)									
Off-AOC									
Arsenic	2.1E+01	2.7E-04	1.8E-05	1.5E-08	9.0E-01	6.3E-02		9.6E-01	
Chromium	1.5E+01	1.9E-04	4.1E-07	1.0E-08	1.2E-04	2.1E-05		1.4E-04	
Inorganics Pathway Total					9.0E-01	6.3E-02		9.6E-01	
Pathway Total - Chemicals					9.0E-01	6.3E-02		9.6E-01	
Outlet C and Charlie's Pond									
Arsenic	2.5E+01	3.2E-04	2.1E-05	1.7E-08	1.1E+00	7.4E-02		1.1E+00	H
Chromium	1.6E+01	2.1E-04	4.6E-07	1.1E-08	1.4E-04	2.3E-05		1.6E-04	
Manganese	2.4E+03	3.0E-02	6.6E-05	1.6E-06	6.5E-01	3.6E-02	1.1E-01	8.0E-01	
Inorganics Pathway Total					1.7E+00	1.1E-01	1.1E-01	1.9E+00	
1,2-Dichloroethene	1.0E-02	1.3E-07	2.8E-09	6.9E-12	1.4E-05	3.1E-07		1.5E-05	
2,6-Dinitrotoluene	1.3E-01	1.7E-06	3.8E-07	9.3E-11	1.7E-03	3.8E-04		2.1E-03	
Benz(a)anthracene	7.7E-02	9.8E-07	2.8E-07	5.3E-11					
Benzo(a)pyrene	8.4E-02	1.1E-06	3.1E-07	5.8E-11					
Benzo(b)fluoranthene	1.8E-01	2.3E-06	6.6E-07	1.2E-10					
Indeno(1,2,3-cd)pyrene	7.6E-02	9.7E-07	2.8E-07	5.3E-11					
PCB-1254	8.7E-01	1.1E-05	3.4E-06	6.0E-10	5.6E-01	2.1E-01		7.7E-01	
Organics Pathway Total					5.6E-01	2.1E-01		7.7E-01	
Pathway Total - Chemicals					2.3E+00	3.2E-01	1.1E-01	2.7E+00	
Outlets A and B									
Antimony	5.2E+00	6.7E-05	1.5E-07	3.6E-09	1.7E-01	2.4E-03		1.7E-01	
Arsenic	1.8E+01	2.2E-04	1.5E-05	1.2E-08	7.5E-01	5.2E-02		8.0E-01	
Cadmium	1.5E+01	1.9E-04	4.2E-07	1.0E-08	1.9E-01	1.7E-02		2.1E-01	
Chromium	6.2E+01	7.9E-04	1.7E-06	4.3E-08	5.3E-04	8.9E-05		6.1E-04	
Chromium, hexavalent	5.4E+00	6.9E-05	1.5E-07	3.7E-09	2.3E-02	2.0E-03	1.3E-04	2.5E-02	
Thallium	9.0E-01	1.1E-05	2.5E-08	6.2E-10	1.4E-01	3.2E-04		1.4E-01	
Zinc	1.0E+03	1.3E-02	2.8E-05	6.9E-07	4.3E-02	3.1E-04		4.3E-02	
Inorganics Pathway Total					1.3E+00	7.4E-02	1.3E-04	1.4E+00	
1,2-Dichloroethene	7.6E-03	9.7E-08	2.1E-09	5.3E-12	1.1E-05	2.4E-07		1.1E-05	
2,4-Dinitrotoluene	2.0E+00	2.6E-05	5.6E-06	1.4E-09	1.3E-02	2.8E-03		1.6E-02	
Benz(a)anthracene	9.2E+00	1.2E-04	3.4E-05	6.4E-09					
Benzo(a)pyrene	9.5E+00	1.2E-04	3.5E-05	6.6E-09					
Benzo(b)fluoranthene	1.2E+01	1.5E-04	4.4E-05	8.3E-09					
Benzo(k)fluoranthene	5.4E+00	6.9E-05	2.0E-05	3.7E-09					
Chrysene	9.4E+00	1.2E-04	3.4E-05	6.5E-09					
Dibenz(a,h)anthracene	1.7E+00	2.2E-05	6.2E-06	1.2E-09					
Indeno(1,2,3-cd)pyrene	6.7E+00	8.6E-05	2.4E-05	4.6E-09					
PCB-1254	6.1E-01	7.8E-06	2.4E-06	4.2E-10	3.9E-01	1.5E-01		5.4E-01	
Organics Pathway Total					4.0E-01	1.5E-01		5.6E-01	
Pathway Total - Chemicals					1.7E+00	2.3E-01	1.3E-04	1.9E+00	

Table 6-11a. Sediment Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Outlets D, E, and F and Criggy's Pond									
Antimony	5.9E+02	7.6E-03	1.7E-05	4.1E-07	1.9E+01	2.8E-01		1.9E+01	H
Arsenic	2.1E+01	2.7E-04	1.8E-05	1.5E-08	8.9E-01	6.2E-02		9.6E-01	
Chromium	1.2E+02	1.6E-03	3.5E-06	8.6E-08	1.1E-03	1.8E-04		1.2E-03	
Chromium, hexavalent	1.1E+01	1.4E-04	3.1E-07	7.6E-09	4.7E-02	4.1E-03	2.7E-04	5.1E-02	
Manganese	3.4E+03	4.3E-02	9.5E-05	2.3E-06	9.4E-01	5.2E-02	1.6E-01	1.2E+00	H
Inorganics Pathway Total					2.1E+01	4.0E-01	1.6E-01	2.1E+01	
Pathway Total - Chemicals					2.1E+01	4.0E-01	1.6E-01	2.1E+01	

[a] COPCs are identified as chemicals of concern (COCs) if the total hazard index (HI) across all pathways is > 1 (H) or if the total ILCR is > 1E-06 (R).
AOC = area of concern.
COPC = chemical of potential concern.
EPC = exposure point concentration.
HQ = hazard quotient.

Table 6-11b. Sediment Risks - Direct Contact

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Child Trespasser									
Off-AOC									
Arsenic	2.1E+01	1.5E-07	4.5E-07	1.7E-11	2.3E-07	7.1E-07	2.5E-10	9.4E-07	
Chromium	1.5E+01	1.1E-07	1.0E-08	1.1E-11					
Inorganics Pathway Total					2.3E-07	7.1E-07	2.5E-10	9.4E-07	
Pathway Total - Chemicals					2.3E-07	7.1E-07	2.5E-10	9.4E-07	
Outlet C and Charlie's Pond									
Arsenic	2.5E+01	1.8E-07	5.3E-07	2.0E-11	2.7E-07	8.4E-07	2.9E-10	1.1E-06	R
Chromium	1.6E+01	1.2E-07	1.1E-08	1.3E-11					
Manganese	2.4E+03	1.7E-05	1.7E-06	1.8E-09					
Inorganics Pathway Total					2.7E-07	8.4E-07	2.9E-10	1.1E-06	R
1,2-Dichloroethene	1.0E-02	7.2E-11	7.1E-11	7.8E-15					
2,6-Dinitrotoluene	1.3E-01	9.7E-10	9.5E-09	1.1E-13	6.6E-10	6.5E-09		7.1E-09	
Benz(a)anthracene	7.7E-02	5.6E-10	7.1E-09	6.0E-14	4.1E-10	8.9E-09	1.9E-14	9.3E-09	
Benzo(a)pyrene	8.4E-02	6.1E-10	7.7E-09	6.6E-14	4.4E-09	9.7E-08	2.0E-13	1.0E-07	
Benzo(b)fluoranthene	1.8E-01	1.3E-09	1.7E-08	1.4E-13	9.5E-10	2.1E-08	4.4E-14	2.2E-08	
Indeno(1,2,3-cd)pyrene	7.6E-02	5.5E-10	7.0E-09	6.0E-14	4.0E-10	8.8E-09	1.8E-14	9.2E-09	
PCB-1254	8.7E-01	6.3E-09	8.6E-08	6.8E-13	1.3E-08	2.2E-07	1.4E-12	2.3E-07	
Organics Pathway Total					1.9E-08	3.6E-07	1.7E-12	3.8E-07	
Pathway Total - Chemicals					2.9E-07	1.2E-06	3.0E-10	1.5E-06	
Outlets A and B									
Antimony	5.2E+00	3.8E-08	3.7E-09	4.1E-12					
Arsenic	1.8E+01	1.3E-07	3.7E-07	1.4E-11	1.9E-07	5.9E-07	2.1E-10	7.8E-07	
Cadmium	1.5E+01	1.1E-07	1.1E-08	1.2E-11			7.4E-11	7.4E-11	
Chromium	6.2E+01	4.5E-07	4.4E-08	4.8E-11					
Chromium, hexavalent	5.4E+00	3.9E-08	3.8E-09	4.2E-12			1.8E-10	1.8E-10	
Thallium	9.0E-01	6.5E-09	6.4E-10	7.1E-13					
Zinc	1.0E+03	7.3E-06	7.1E-07	7.9E-10					
Inorganics Pathway Total					1.9E-07	5.9E-07	4.6E-10	7.8E-07	
1,2-Dichloroethene	7.6E-03	5.5E-11	5.4E-11	6.0E-15					
2,4-Dinitrotoluene	2.0E+00	1.4E-08	1.4E-07	1.6E-12	9.9E-09	9.6E-08		1.1E-07	
Benz(a)anthracene	9.2E+00	6.7E-08	8.5E-07	7.2E-12	4.9E-08	1.1E-06	2.2E-12	1.1E-06	R
Benzo(a)pyrene	9.5E+00	6.9E-08	8.8E-07	7.5E-12	5.0E-07	1.1E-05	2.3E-11	1.2E-05	R
Benzo(b)fluoranthene	1.2E+01	8.7E-08	1.1E-06	9.4E-12	6.3E-08	1.4E-06	2.9E-12	1.5E-06	R
Benzo(k)fluoranthene	5.4E+00	3.9E-08	5.0E-07	4.2E-12	2.9E-09	6.3E-08	1.3E-13	6.5E-08	
Chrysene	9.4E+00	6.8E-08	8.7E-07	7.4E-12	5.0E-10	1.1E-08	2.3E-14	1.1E-08	
Dibenz(a,h)anthracene	1.7E+00	1.2E-08	1.6E-07	1.3E-12	9.0E-08	2.0E-06	4.1E-12	2.1E-06	R
Indeno(1,2,3-cd)pyrene	6.7E+00	4.9E-08	6.2E-07	5.3E-12	3.5E-08	7.8E-07	1.6E-12	8.1E-07	
PCB-1254	6.1E-01	4.4E-09	6.1E-08	4.8E-13	8.8E-09	1.5E-07	9.6E-13	1.6E-07	
Organics Pathway Total					7.6E-07	1.7E-05	3.5E-11	1.7E-05	
Pathway Total - Chemicals					9.5E-07	1.7E-05	4.9E-10	1.8E-05	

Table 6-11b. Sediment Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Outlets D, E, and F and Criggy's Pond									
Antimony	5.9E+02	4.3E-06	4.2E-07	4.7E-10					
Arsenic	2.1E+01	1.5E-07	4.5E-07	1.6E-11	2.3E-07	7.1E-07	2.5E-10	9.3E-07	
Chromium	1.2E+02	9.0E-07	8.8E-08	9.7E-11					
Chromium, hexavalent	1.1E+01	8.0E-08	7.8E-09	8.6E-12			3.6E-10	3.6E-10	
Manganese	3.4E+03	2.4E-05	2.4E-06	2.7E-09					
Inorganics Pathway Total					2.3E-07	7.1E-07	6.1E-10	9.3E-07	
Pathway Total - Chemicals					2.3E-07	7.1E-07	6.1E-10	9.3E-07	
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Hunter/Trapper									
Off-AOC									
Arsenic	2.1E+01	2.7E-07	3.8E-07	5.8E-11	4.0E-07	6.0E-07	8.7E-10	1.0E-06	R
Chromium	1.5E+01	1.8E-07	8.8E-09	4.0E-11					
Inorganics Pathway Total					4.0E-07	6.0E-07	8.7E-10	1.0E-06	
Pathway Total - Chemicals					4.0E-07	6.0E-07	8.7E-10	1.0E-06	
Outlet C and Charlie's Pond									
Arsenic	2.5E+01	3.1E-07	4.5E-07	6.8E-11	4.7E-07	7.1E-07	1.0E-09	1.2E-06	R
Chromium	1.6E+01	2.0E-07	9.8E-09	4.4E-11					
Manganese	2.4E+03	3.0E-05	1.4E-06	6.4E-09					
Inorganics Pathway Total					4.7E-07	7.1E-07	1.0E-09	1.2E-06	
1,2-Dichloroethene	1.0E-02	1.3E-10	6.0E-11	2.7E-14					
2,6-Dinitrotoluene	1.3E-01	1.7E-09	8.1E-09	3.7E-13	1.1E-09	5.5E-09		6.7E-09	
Benz(a)anthracene	7.7E-02	9.7E-10	6.0E-09	2.1E-13	7.1E-10	7.6E-09	6.5E-14	8.3E-09	
Benzo(a)pyrene	8.4E-02	1.1E-09	6.6E-09	2.3E-13	7.7E-09	8.3E-08	7.1E-13	9.1E-08	
Benzo(b)fluoranthene	1.8E-01	2.3E-09	1.4E-08	4.9E-13	1.7E-09	1.8E-08	1.5E-13	1.9E-08	
Indeno(1,2,3-cd)pyrene	7.6E-02	9.6E-10	6.0E-09	2.1E-13	7.0E-10	7.5E-09	6.4E-14	8.2E-09	
PCB-1254	8.7E-01	1.1E-08	7.3E-08	2.4E-12	2.2E-08	1.8E-07	4.7E-12	2.1E-07	
Organics Pathway Total					3.4E-08	3.0E-07	5.7E-12	3.4E-07	
Pathway Total - Chemicals					5.0E-07	1.0E-06	1.0E-09	1.5E-06	
Outlets A and B									
Antimony	5.2E+00	6.5E-08	3.1E-09	1.4E-11					
Arsenic	1.8E+01	2.2E-07	3.2E-07	4.8E-11	3.3E-07	5.0E-07	7.2E-10	8.3E-07	
Cadmium	1.5E+01	1.9E-07	9.0E-09	4.1E-11			2.6E-10	2.6E-10	
Chromium	6.2E+01	7.8E-07	3.7E-08	1.7E-10					
Chromium, hexavalent	5.4E+00	6.8E-08	3.3E-09	1.5E-11			6.2E-10	6.2E-10	
Thallium	9.0E-01	1.1E-08	5.4E-10	2.4E-12					
Zinc	1.0E+03	1.3E-05	6.0E-07	2.7E-09					
Inorganics Pathway Total					3.3E-07	5.0E-07	1.6E-09	8.3E-07	
1,2-Dichloroethene	7.6E-03	9.6E-11	4.6E-11	2.1E-14					
2,4-Dinitrotoluene	2.0E+00	2.5E-08	1.2E-07	5.4E-12	1.7E-08	8.2E-08		9.9E-08	
Benz(a)anthracene	9.2E+00	1.2E-07	7.2E-07	2.5E-11	8.4E-08	9.1E-07	7.8E-12	9.9E-07	
Benzo(a)pyrene	9.5E+00	1.2E-07	7.4E-07	2.6E-11	8.7E-07	9.4E-06	8.0E-11	1.0E-05	R
Benzo(b)fluoranthene	1.2E+01	1.5E-07	9.4E-07	3.3E-11	1.1E-07	1.2E-06	1.0E-11	1.3E-06	R

Table 6-11b. Sediment Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Benzo(k)fluoranthene	5.4E+00	6.8E-08	4.2E-07	1.5E-11	5.0E-09	5.3E-08	4.6E-13	5.8E-08	
Chrysene	9.4E+00	1.2E-07	7.4E-07	2.6E-11	8.6E-10	9.3E-09	7.9E-14	1.0E-08	
Dibenz(a,h)anthracene	1.7E+00	2.1E-08	1.3E-07	4.6E-12	1.6E-07	1.7E-06	1.4E-11	1.8E-06	R
Indeno(1,2,3-cd)pyrene	6.7E+00	8.4E-08	5.2E-07	1.8E-11	6.2E-08	6.6E-07	5.7E-12	7.2E-07	
PCB-1254	6.1E-01	7.7E-09	5.1E-08	1.7E-12	1.5E-08	1.3E-07	3.3E-12	1.4E-07	
Organics Pathway Total					1.3E-06	1.4E-05	1.2E-10	1.5E-05	
Pathway Total - Chemicals					1.7E-06	1.5E-05	1.7E-09	1.6E-05	
Outlets D, E, and F and Criggy's Pond									
Antimony	5.9E+02	7.5E-06	3.6E-07	1.6E-09					
Arsenic	2.1E+01	2.6E-07	3.8E-07	5.7E-11	4.0E-07	6.0E-07	8.6E-10	1.0E-06	
Chromium	1.2E+02	1.6E-06	7.5E-08	3.4E-10					
Chromium, hexavalent	1.1E+01	1.4E-07	6.6E-09	3.0E-11			1.3E-09	1.3E-09	
Manganese	3.4E+03	4.3E-05	2.0E-06	9.2E-09					
Inorganics Pathway Total					4.0E-07	6.0E-07	2.1E-09	1.0E-06	
Pathway Total - Chemicals					4.0E-07	6.0E-07	2.1E-09	1.0E-06	
National Guard/Managed Recreational - National Guard									
Off-AOC									
Arsenic	2.1E+01	2.8E-07	2.5E-07	1.3E-10	4.1E-07	3.9E-07	2.0E-09	8.0E-07	
Chromium	1.5E+01	1.9E-07	5.6E-09	9.1E-11					
Inorganics Pathway Total					4.1E-07	3.9E-07	2.0E-09	8.0E-07	
Pathway Total - Chemicals					4.1E-07	3.9E-07	2.0E-09	8.0E-07	
Outlet C and Charlie's Pond									
Arsenic	2.5E+01	3.3E-07	2.9E-07	1.6E-10	4.9E-07	4.6E-07	2.4E-09	9.5E-07	
Chromium	1.6E+01	2.1E-07	6.3E-09	1.0E-10					
Manganese	2.4E+03	3.1E-05	9.1E-07	1.5E-08					
Inorganics Pathway Total					4.9E-07	4.6E-07	2.4E-09	9.5E-07	
1,2-Dichloroethene	1.0E-02	1.3E-10	3.9E-11	6.3E-14					
2,6-Dinitrotoluene	1.3E-01	1.8E-09	5.2E-09	8.4E-13	1.2E-09	3.5E-09		4.7E-09	
Benz(a)anthracene	7.7E-02	1.0E-09	3.9E-09	4.8E-13	7.3E-10	4.9E-09	1.5E-13	5.6E-09	
Benzo(a)pyrene	8.4E-02	1.1E-09	4.2E-09	5.3E-13	8.0E-09	5.3E-08	1.6E-12	6.1E-08	
Benzo(b)fluoranthene	1.8E-01	2.3E-09	9.1E-09	1.1E-12	1.7E-09	1.1E-08	3.5E-13	1.3E-08	
Indeno(1,2,3-cd)pyrene	7.6E-02	9.9E-10	3.8E-09	4.8E-13	7.2E-10	4.8E-09	1.5E-13	5.5E-09	
PCB-1254	8.7E-01	1.1E-08	4.7E-08	5.5E-12	2.3E-08	1.2E-07	1.1E-11	1.4E-07	
Organics Pathway Total					3.5E-08	2.0E-07	1.3E-11	2.3E-07	
Pathway Total - Chemicals					5.2E-07	6.5E-07	2.4E-09	1.2E-06	
Outlets A and B									
Antimony	5.2E+00	6.8E-08	2.0E-09	3.3E-11					
Arsenic	1.8E+01	2.3E-07	2.0E-07	1.1E-10	3.4E-07	3.2E-07	1.7E-09	6.7E-07	
Cadmium	1.5E+01	2.0E-07	5.8E-09	9.4E-11			5.9E-10	5.9E-10	
Chromium	6.2E+01	8.0E-07	2.4E-08	3.9E-10					
Chromium, hexavalent	5.4E+00	7.0E-08	2.1E-09	3.4E-11			1.4E-09	1.4E-09	
Thallium	9.0E-01	1.2E-08	3.5E-10	5.6E-12					
Zinc	1.0E+03	1.3E-05	3.9E-07	6.3E-09					

Table 6-11b. Sediment Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Inorganics Pathway Total					3.4E-07	3.2E-07	3.7E-09	6.7E-07	
1,2-Dichloroethene	7.6E-03	9.9E-11	2.9E-11	4.8E-14					
2,4-Dinitrotoluene	2.0E+00	2.6E-08	7.7E-08	1.3E-11	1.8E-08	5.3E-08		7.0E-08	
Benz(a)anthracene	9.2E+00	1.2E-07	4.6E-07	5.8E-11	8.8E-08	5.8E-07	1.8E-11	6.7E-07	
Benzo(a)pyrene	9.5E+00	1.2E-07	4.8E-07	6.0E-11	9.0E-07	6.0E-06	1.8E-10	6.9E-06	R
Benzo(b)fluoranthene	1.2E+01	1.6E-07	6.0E-07	7.5E-11	1.1E-07	7.6E-07	2.3E-11	8.8E-07	
Benzo(k)fluoranthene	5.4E+00	7.0E-08	2.7E-07	3.4E-11	5.1E-09	3.4E-08	1.0E-12	3.9E-08	
Chrysene	9.4E+00	1.2E-07	4.7E-07	5.9E-11	9.0E-10	6.0E-09	1.8E-13	6.9E-09	
Dibenz(a,h)anthracene	1.7E+00	2.2E-08	8.6E-08	1.1E-11	1.6E-07	1.1E-06	3.3E-11	1.2E-06	R
Indeno(1,2,3-cd)pyrene	6.7E+00	8.7E-08	3.4E-07	4.2E-11	6.4E-08	4.2E-07	1.3E-11	4.9E-07	
PCB-1254	6.1E-01	8.0E-09	3.3E-08	3.8E-12	1.6E-08	8.3E-08	7.7E-12	9.9E-08	
Organics Pathway Total					1.4E-06	9.0E-06	2.8E-10	1.0E-05	
Pathway Total - Chemicals					1.7E-06	9.4E-06	3.9E-09	1.1E-05	
Outlets D, E, and F and Criggy's Pond									
Antimony	5.9E+02	7.8E-06	2.3E-07	3.7E-09					
Arsenic	2.1E+01	2.7E-07	2.4E-07	1.3E-10	4.1E-07	3.9E-07	2.0E-09	8.0E-07	
Chromium	1.2E+02	1.6E-06	4.8E-08	7.8E-10					
Chromium, hexavalent	1.1E+01	1.4E-07	4.3E-09	6.9E-11			2.9E-09	2.9E-09	
Manganese	3.4E+03	4.4E-05	1.3E-06	2.1E-08					
Inorganics Pathway Total					4.1E-07	3.9E-07	4.9E-09	8.0E-07	
Pathway Total - Chemicals					4.1E-07	3.9E-07	4.9E-09	8.0E-07	
Open Recreational – Recreator									
Off-AOC									
Arsenic	2.1E+01	1.1E-07	3.2E-07	2.4E-11	1.7E-07	5.0E-07	3.6E-10	6.7E-07	
Chromium	1.5E+01	7.6E-08	7.3E-09	1.6E-11					
Inorganics Pathway Total					1.7E-07	5.0E-07	3.6E-10	6.7E-07	
Pathway Total - Chemicals					1.7E-07	5.0E-07	3.6E-10	6.7E-07	
Outlet C and Charlie's Pond									
Arsenic	2.5E+01	1.3E-07	3.8E-07	2.8E-11	2.0E-07	5.9E-07	4.3E-10	7.9E-07	
Chromium	1.6E+01	8.5E-08	8.1E-09	1.8E-11					
Manganese	2.4E+03	1.2E-05	1.2E-06	2.7E-09					
Inorganics Pathway Total					2.0E-07	5.9E-07	4.3E-10	7.9E-07	
1,2-Dichloroethene	1.0E-02	5.2E-11	5.0E-11	1.1E-14					
2,6-Dinitrotoluene	1.3E-01	7.0E-10	6.7E-09	1.5E-13	4.8E-10	4.6E-09		5.1E-09	
Benz(a)anthracene	7.7E-02	4.0E-10	5.0E-09	8.7E-14	2.9E-10	6.3E-09	2.7E-14	6.6E-09	
Benzo(a)pyrene	8.4E-02	4.4E-10	5.5E-09	9.5E-14	3.2E-09	6.9E-08	3.0E-13	7.2E-08	
Benzo(b)fluoranthene	1.8E-01	9.4E-10	1.2E-08	2.0E-13	6.9E-10	1.5E-08	6.3E-14	1.5E-08	
Indeno(1,2,3-cd)pyrene	7.6E-02	4.0E-10	5.0E-09	8.6E-14	2.9E-10	6.2E-09	2.7E-14	6.5E-09	
PCB-1254	8.7E-01	4.6E-09	6.1E-08	9.9E-13	9.1E-09	1.5E-07	2.0E-12	1.6E-07	
Organics Pathway Total					1.4E-08	2.5E-07	2.4E-12	2.7E-07	
Pathway Total - Chemicals					2.1E-07	8.5E-07	4.3E-10	1.1E-06	
Outlets A and B									
Antimony	5.2E+00	2.7E-08	2.6E-09	5.9E-12					

Table 6-11b. Sediment Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Arsenic	1.8E+01	9.2E-08	2.6E-07	2.0E-11	1.4E-07	4.2E-07	3.0E-10	5.5E-07	
Cadmium	1.5E+01	7.9E-08	7.5E-09	1.7E-11			1.1E-10	1.1E-10	
Chromium	6.2E+01	3.2E-07	3.1E-08	7.0E-11					
Chromium, hexavalent	5.4E+00	2.8E-08	2.7E-09	6.1E-12			2.6E-10	2.6E-10	
Thallium	9.0E-01	4.7E-09	4.5E-10	1.0E-12					
Zinc	1.0E+03	5.2E-06	5.0E-07	1.1E-09					
Inorganics Pathway Total					1.4E-07	4.2E-07	6.6E-10	5.5E-07	
1,2-Dichloroethene	7.6E-03	4.0E-11	3.8E-11	8.6E-15					
2,4-Dinitrotoluene	2.0E+00	1.0E-08	1.0E-07	2.3E-12	7.1E-09	6.8E-08		7.5E-08	
Benz(a)anthracene	9.2E+00	4.8E-08	6.0E-07	1.0E-11	3.5E-08	7.6E-07	3.2E-12	7.9E-07	
Benzo(a)pyrene	9.5E+00	5.0E-08	6.2E-07	1.1E-11	3.6E-07	7.8E-06	3.3E-11	8.2E-06	R
Benzo(b)fluoranthene	1.2E+01	6.3E-08	7.8E-07	1.4E-11	4.6E-08	9.9E-07	4.2E-12	1.0E-06	R
Benzo(k)fluoranthene	5.4E+00	2.8E-08	3.5E-07	6.1E-12	2.1E-09	4.4E-08	1.9E-13	4.6E-08	
Chrysene	9.4E+00	4.9E-08	6.1E-07	1.1E-11	3.6E-10	7.7E-09	3.3E-14	8.1E-09	
Dibenz(a,h)anthracene	1.7E+00	8.9E-09	1.1E-07	1.9E-12	6.5E-08	1.4E-06	6.0E-12	1.5E-06	R
Indeno(1,2,3-cd)pyrene	6.7E+00	3.5E-08	4.4E-07	7.6E-12	2.6E-08	5.5E-07	2.4E-12	5.8E-07	
PCB-1254	6.1E-01	3.2E-09	4.3E-08	6.9E-13	6.4E-09	1.1E-07	1.4E-12	1.1E-07	
Organics Pathway Total					5.5E-07	1.2E-05	5.1E-11	1.2E-05	
Pathway Total - Chemicals					6.9E-07	1.2E-05	7.1E-10	1.3E-05	
Outlets D, E, and F and Criggy's Pond									
Antimony	5.9E+02	3.1E-06	3.0E-07	6.7E-10					
Arsenic	2.1E+01	1.1E-07	3.2E-07	2.4E-11	1.7E-07	5.0E-07	3.6E-10	6.6E-07	
Chromium	1.2E+02	6.5E-07	6.2E-08	1.4E-10					
Chromium, hexavalent	1.1E+01	5.8E-08	5.5E-09	1.2E-11			5.2E-10	5.2E-10	
Manganese	3.4E+03	1.8E-05	1.7E-06	3.8E-09					
Inorganics Pathway Total					1.7E-07	5.0E-07	8.8E-10	6.7E-07	
Pathway Total - Chemicals					1.7E-07	5.0E-07	8.8E-10	6.7E-07	
Open Residential - Resident Farmer (Adult)									
Off-AOC									
Arsenic	2.1E+01	1.2E-05	8.5E-06	2.7E-09	1.9E-05	1.3E-05	4.0E-08	3.2E-05	R
Chromium	1.5E+01	8.5E-06	1.9E-07	1.8E-09					
Inorganics Pathway Total					1.9E-05	1.3E-05	4.0E-08	3.2E-05	
Pathway Total - Chemicals					1.9E-05	1.3E-05	4.0E-08	3.2E-05	
Outlet C and Charlie's Pond									
Arsenic	2.5E+01	1.5E-05	1.0E-05	3.2E-09	2.2E-05	1.6E-05	4.8E-08	3.8E-05	R
Chromium	1.6E+01	9.5E-06	2.2E-07	2.1E-09					
Manganese	2.4E+03	1.4E-03	3.1E-05	3.0E-07					
Inorganics Pathway Total					2.2E-05	1.6E-05	4.8E-08	3.8E-05	
1,2-Dichloroethene	1.0E-02	5.9E-09	1.3E-09	1.3E-12					
2,6-Dinitrotoluene	1.3E-01	7.9E-08	1.8E-07	1.7E-11	5.4E-08	1.2E-07		1.8E-07	
Benz(a)anthracene	7.7E-02	4.5E-08	1.3E-07	9.8E-12	3.3E-08	1.7E-07	3.0E-12	2.0E-07	
Benzo(a)pyrene	8.4E-02	4.9E-08	1.5E-07	1.1E-11	3.6E-07	1.8E-06	3.3E-11	2.2E-06	R
Benzo(b)fluoranthene	1.8E-01	1.1E-07	3.1E-07	2.3E-11	7.7E-08	3.9E-07	7.1E-12	4.7E-07	

Table 6-11b. Sediment Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Indeno(1,2,3-cd)pyrene	7.6E-02	4.5E-08	1.3E-07	9.7E-12	3.3E-08	1.7E-07	3.0E-12	2.0E-07	
PCB-1254	8.7E-01	5.1E-07	1.6E-06	1.1E-10	1.0E-06	4.1E-06	2.2E-10	5.1E-06	R
Organics Pathway Total					1.6E-06	6.8E-06	2.7E-10	8.3E-06	
Pathway Total - Chemicals					2.4E-05	2.3E-05	4.8E-08	4.6E-05	
Outlets A and B									
Antimony	5.2E+00	3.1E-06	7.0E-08	6.6E-10					
Arsenic	1.8E+01	1.0E-05	7.0E-06	2.2E-09	1.5E-05	1.1E-05	3.4E-08	2.7E-05	R
Cadmium	1.5E+01	8.8E-06	2.0E-07	1.9E-09			1.2E-08	1.2E-08	
Chromium	6.2E+01	3.6E-05	8.3E-07	7.8E-09					
Chromium, hexavalent	5.4E+00	3.2E-06	7.2E-08	6.9E-10			2.9E-08	2.9E-08	
Thallium	9.0E-01	5.3E-07	1.2E-08	1.1E-10					
Zinc	1.0E+03	5.9E-04	1.3E-05	1.3E-07					
Inorganics Pathway Total					1.5E-05	1.1E-05	7.4E-08	2.7E-05	
1,2-Dichloroethene	7.6E-03	4.5E-09	1.0E-09	9.7E-13					
2,4-Dinitrotoluene	2.0E+00	1.2E-06	2.7E-06	2.5E-10	8.0E-07	1.8E-06		2.6E-06	R
Benz(a)anthracene	9.2E+00	5.4E-06	1.6E-05	1.2E-09	3.9E-06	2.0E-05	3.6E-10	2.4E-05	R
Benzo(a)pyrene	9.5E+00	5.6E-06	1.7E-05	1.2E-09	4.1E-05	2.1E-04	3.7E-09	2.5E-04	R
Benzo(b)fluoranthene	1.2E+01	7.0E-06	2.1E-05	1.5E-09	5.1E-06	2.6E-05	4.7E-10	3.1E-05	R
Benzo(k)fluoranthene	5.4E+00	3.2E-06	9.4E-06	6.9E-10	2.3E-07	1.2E-06	2.1E-11	1.4E-06	R
Chrysene	9.4E+00	5.5E-06	1.6E-05	1.2E-09	4.0E-08	2.1E-07	3.7E-12	2.5E-07	
Dibenz(a,h)anthracene	1.7E+00	1.0E-06	3.0E-06	2.2E-10	7.3E-06	3.7E-05	6.7E-10	4.5E-05	R
Indeno(1,2,3-cd)pyrene	6.7E+00	3.9E-06	1.2E-05	8.5E-10	2.9E-06	1.5E-05	2.6E-10	1.8E-05	R
PCB-1254	6.1E-01	3.6E-07	1.1E-06	7.8E-11	7.2E-07	2.9E-06	1.6E-10	3.6E-06	R
Organics Pathway Total					6.2E-05	3.1E-04	5.7E-09	3.7E-04	
Pathway Total - Chemicals					7.7E-05	3.2E-04	8.0E-08	4.0E-04	
Outlets D, E, and F and Criggy's Pond									
Antimony	5.9E+02	3.5E-04	8.0E-06	7.6E-08					
Arsenic	2.1E+01	1.2E-05	8.4E-06	2.7E-09	1.8E-05	1.3E-05	4.0E-08	3.2E-05	R
Chromium	1.2E+02	7.3E-05	1.7E-06	1.6E-08					
Chromium, hexavalent	1.1E+01	6.5E-06	1.5E-07	1.4E-09			5.9E-08	5.9E-08	
Manganese	3.4E+03	2.0E-03	4.5E-05	4.3E-07					
Inorganics Pathway Total					1.8E-05	1.3E-05	9.9E-08	3.2E-05	
Pathway Total - Chemicals					1.8E-05	1.3E-05	9.9E-08	3.2E-05	
Open Residential - Resident Farmer (Child)									
Off-AOC									
Arsenic	2.1E+01	2.3E-05	1.5E-06	1.3E-09	3.5E-05	2.4E-06	1.9E-08	3.7E-05	R
Chromium	1.5E+01	1.6E-05	3.5E-08	8.6E-10					
Inorganics Pathway Total					3.5E-05	2.4E-06	1.9E-08	3.7E-05	
Pathway Total - Chemicals					3.5E-05	2.4E-06	1.9E-08	3.7E-05	
Outlet C and Charlie's Pond									
Arsenic	2.5E+01	2.7E-05	1.8E-06	1.5E-09	4.1E-05	2.8E-06	2.2E-08	4.4E-05	R
Chromium	1.6E+01	1.8E-05	3.9E-08	9.6E-10					
Manganese	2.4E+03	2.6E-03	5.7E-06	1.4E-07					

Table 6-11b. Sediment Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Inorganics Pathway Total					4.1E-05	2.8E-06	2.2E-08	4.4E-05	
1,2-Dichloroethene	1.0E-02	1.1E-08	2.4E-10	5.9E-13					
2,6-Dinitrotoluene	1.3E-01	1.5E-07	3.2E-08	8.0E-12	1.0E-07	2.2E-08		1.2E-07	
Benz(a)anthracene	7.7E-02	8.4E-08	2.4E-08	4.6E-12	6.2E-08	3.0E-08	1.4E-12	9.2E-08	
Benzo(a)pyrene	8.4E-02	9.2E-08	2.6E-08	5.0E-12	6.7E-07	3.3E-07	1.5E-11	1.0E-06	R
Benzo(b)fluoranthene	1.8E-01	2.0E-07	5.6E-08	1.1E-11	1.4E-07	7.1E-08	3.3E-12	2.2E-07	
Indeno(1,2,3-cd)pyrene	7.6E-02	8.3E-08	2.4E-08	4.5E-12	6.1E-08	3.0E-08	1.4E-12	9.1E-08	
PCB-1254	8.7E-01	9.5E-07	2.9E-07	5.2E-11	1.9E-06	7.3E-07	1.0E-10	2.6E-06	R
Organics Pathway Total					2.9E-06	1.2E-06	1.2E-10	4.2E-06	
Pathway Total - Chemicals					4.4E-05	4.1E-06	2.2E-08	4.8E-05	
Outlets A and B									
Antimony	5.2E+00	5.7E-06	1.3E-08	3.1E-10					
Arsenic	1.8E+01	1.9E-05	1.3E-06	1.0E-09	2.9E-05	2.0E-06	1.6E-08	3.1E-05	R
Cadmium	1.5E+01	1.6E-05	3.6E-08	8.9E-10			5.6E-09	5.6E-09	
Chromium	6.2E+01	6.8E-05	1.5E-07	3.7E-09					
Chromium, hexavalent	5.4E+00	5.9E-06	1.3E-08	3.2E-10			1.3E-08	1.3E-08	
Thallium	9.0E-01	9.8E-07	2.2E-09	5.3E-11					
Zinc	1.0E+03	1.1E-03	2.4E-06	5.9E-08					
Inorganics Pathway Total					2.9E-05	2.0E-06	3.5E-08	3.1E-05	
1,2-Dichloroethene	7.6E-03	8.3E-09	1.8E-10	4.5E-13					
2,4-Dinitrotoluene	2.0E+00	2.2E-06	4.8E-07	1.2E-10	1.5E-06	3.3E-07		1.8E-06	R
Benz(a)anthracene	9.2E+00	1.0E-05	2.9E-06	5.5E-10	7.4E-06	3.6E-06	1.7E-10	1.1E-05	R
Benzo(a)pyrene	9.5E+00	1.0E-05	3.0E-06	5.6E-10	7.6E-05	3.7E-05	1.7E-09	1.1E-04	R
Benzo(b)fluoranthene	1.2E+01	1.3E-05	3.8E-06	7.1E-10	9.6E-06	4.7E-06	2.2E-10	1.4E-05	R
Benzo(k)fluoranthene	5.4E+00	5.9E-06	1.7E-06	3.2E-10	4.3E-07	2.1E-07	9.9E-12	6.5E-07	
Chrysene	9.4E+00	1.0E-05	2.9E-06	5.6E-10	7.5E-08	3.7E-08	1.7E-12	1.1E-07	
Dibenz(a,h)anthracene	1.7E+00	1.9E-06	5.3E-07	1.0E-10	1.4E-05	6.7E-06	3.1E-10	2.0E-05	R
Indeno(1,2,3-cd)pyrene	6.7E+00	7.3E-06	2.1E-06	4.0E-10	5.4E-06	2.6E-06	1.2E-10	8.0E-06	R
PCB-1254	6.1E-01	6.7E-07	2.1E-07	3.6E-11	1.3E-06	5.1E-07	7.2E-11	1.9E-06	R
Organics Pathway Total					1.2E-04	5.6E-05	2.7E-09	1.7E-04	
Pathway Total - Chemicals					1.4E-04	5.8E-05	3.7E-08	2.0E-04	
Outlets D, E, and F and Criggy's Pond									
Antimony	5.9E+02	6.5E-04	1.4E-06	3.5E-08					
Arsenic	2.1E+01	2.3E-05	1.5E-06	1.2E-09	3.5E-05	2.4E-06	1.9E-08	3.7E-05	R
Chromium	1.2E+02	1.4E-04	3.0E-07	7.4E-09					
Chromium, hexavalent	1.1E+01	1.2E-05	2.7E-08	6.5E-10			2.7E-08	2.7E-08	
Manganese	3.4E+03	3.7E-03	8.1E-06	2.0E-07					
Inorganics Pathway Total					3.5E-05	2.4E-06	4.6E-08	3.7E-05	
Pathway Total - Chemicals					3.5E-05	2.4E-06	4.6E-08	3.7E-05	

[a] COPCs are identified as chemicals of concern (COCs) if the total HI across all pathways is > 1 (H) or if the total ILCR is > 1E-06 (R).
AOC = area of concern.
COPC = chemical of potential concern.
EPC = exposure point concentration.
HQ = hazard quotient.

Table 6-12. Total Hazards/Risks and Chemicals of Concern for Sediment

Receptor	Noncarcinogens		Carcinogens	
	HI	COCs	ILCR	COCs
Off-AOC				
Child Trespasser	0.01		9E-07	
Hunter/Trapper	0.005		1E-06	Arsenic
National Guard	0.005		8E-07	
Recreator	0.003		7E-07	
On-Site Resident Farmer (Adult)	0.2		34E-05	Arsenic
On-Site Resident Farmer (child)	1.0		4E-05	Arsenic
Outlet C and Charlie's Pond				
Child Trespasser	0.07		2E-06	Arsenic
Hunter/Trapper	0.02		2E-06	Arsenic
National Guard	0.02		1E-06	
Recreator	0.02		1E-06	
On-Site Resident Farmer (Adult)	0.7		5E-05	Arsenic, Benzo(a)pyrene, PCB-1254
On-Site Resident Farmer (child)	2.7	Arsenic	5E-05	Arsenic, Benzo(a)pyrene, PCB-1254
Outlets A and B				
Child Trespasser	0.05		2E-05	Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene
Hunter/Trapper	0.02		2E-05	Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene
National Guard	0.01		1E-05	Benzo(a)pyrene, Dibenz(a,h)anthracene
Recreator	0.01		1E-05	Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene
On-Site Resident Farmer (Adult)	0.4		4E-04	Arsenic, 2,4-Dinitrotoluene, Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenz(a,h)anthracene, Indeno(1,2,3-cd)pyrene, PCB-1254
On-Site Resident Farmer (child)	1.9		2E-04	Arsenic, 2,4-Dinitrotoluene, Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenz(a,h)anthracene, Indeno(1,2,3-cd)pyrene, PCB-1254

Table 6-12. Total Hazards/Risks and Chemicals of Concern for Sediment (continued)

Receptor	Noncarcinogens		Carcinogens	
	HI	COCs	ILCR	COCs
Outlets D, E, and F and Criggy's Pond				
Child Trespasser	0.2		9E-07	
Hunter/Trapper	0.07		1E-06	
National Guard	0.08		8E-07	
Recreator	0.04		7E-07	
On-Site Resident Farmer (Adult)	2.7	Antimony	3E-05	Arsenic
On-Site Resident Farmer (child)	21	Antimony, Manganese	4E-05	Arsenic

AOC = area of concern.
COC = chemical of concern.
HI = hazard index.
ILCR = Incremental Lifetime Cancer Risk.

6.5.2.3 Soil

Risks were evaluated for seven EUs for surface and subsurface soils based on historical use and geographic proximity as described in Section 4.1.2. The soil EUs are

- Buildings CB-3 and CB-801;
- Buildings CB-4/4A and CA-6/6A;
- Buildings CB-13 and CB-10;
- Buildings CB-14, CB-17, and CA-15;
- Water Tower;
- Change Houses (CB-12, CB-23, CB-8, and CB-22); and
- Perimeter Area.

Surface soil – direct contact

Risk and hazard results for direct contact with COPCs in surface soil are presented in Tables 6-13(a and b) and summarized in Table 6-14 below for the seven soil EUs. Risks are presented for direct contact with surface soil by eight receptors: Child Trespasser, Hunter/Trapper, Security Guard/Maintenance Worker, National Guard, Recreator, Industrial Worker, and On-Site Residential Farmer (adult and child). Direct contact includes incidental ingestion of soil, inhalation of VOCs and particulates (i.e., dust), and dermal contact with soil.

Manganese is identified as a COC for the National Guard scenario at Buildings CB-3 and CB-801; Buildings CB-4/4A and CA-6/6A; Buildings CB-13 and CB-10; Buildings CB-14, CB-17, and CA-15; Change Houses (CB-12, CB-23, CB-8, CB-22); and the Perimeter Area with HQs of 3 to 6. Manganese is naturally present in soils in the Ravenna area. A discussion of background concentrations and their potential impact on the result of the risk assessment is provided in the uncertainty analysis (Section 6.6.4).

Arsenic is identified as a COC for the National Guard, Security Guard/Maintenance Worker, Industrial Worker, and On-Site Resident Farmer (adult and child) scenarios at Buildings CB-3 and CB-801; Buildings CB-4/4A and CA-6/6A; Buildings CB-13 and CB-10; Buildings CB-14, CB-17, and CA-15; Change Houses (CB-12, CB-23, CB-8, CB-22); and the Perimeter Area. Arsenic is also naturally present in soils in the Ravenna area. A discussion of background concentrations and their potential impact on the result of the risk assessment is provided in the uncertainty analysis (Section 6.6.4).

Table 6-13a. Surface Soil Hazards - Direct Contact

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Child Trespasser									
CB-13 and CB-10									
Antimony	1.3E+00	6.4E-08	6.3E-09	6.9E-12	1.6E-04	1.0E-04		2.6E-04	
Arsenic	1.1E+01	5.6E-07	1.7E-06	6.1E-11	1.9E-03	5.8E-03		7.7E-03	
Cadmium	6.5E+00	3.3E-07	3.2E-08	3.6E-11	3.3E-04	1.6E-04		4.9E-04	
Chromium	3.5E+01	1.8E-06	1.7E-07	1.9E-10	1.2E-06	9.0E-06		1.0E-05	
Manganese	1.3E+03	6.6E-05	6.5E-06	7.2E-09	1.4E-03	3.5E-03	5.0E-04	5.5E-03	
Thallium	4.9E-01	2.5E-08	2.4E-09	2.7E-12	3.1E-04	3.0E-05		3.4E-04	
Inorganics Pathway Total					4.1E-03	9.6E-03	5.0E-04	1.4E-02	
1,2-Dichloroethene	7.2E-03	3.6E-10	3.6E-10	3.9E-14	4.0E-08	4.0E-08		8.0E-08	
2,4,6-Trinitrotoluene	2.5E+01	1.3E-06	1.3E-05	1.4E-10	2.6E-03	2.5E-02		2.8E-02	
2,4-Dinitrotoluene	1.5E+00	7.5E-08	7.4E-07	8.2E-12	3.8E-05	3.7E-04		4.1E-04	
2,6-Dinitrotoluene	6.0E-01	3.0E-08	3.0E-07	3.3E-12	3.0E-05	3.0E-04		3.3E-04	
Heptachlor	1.7E-02	8.6E-10	8.4E-09	9.3E-14	1.7E-06	1.7E-05		1.8E-05	
PCB-1254	1.7E+00	8.6E-08	1.2E-06	9.3E-12	4.3E-03	7.4E-02		7.8E-02	
RDX	3.7E+00	1.9E-07	1.8E-06	2.0E-11	6.2E-05	6.1E-04		6.7E-04	
Organics Pathway Total					7.0E-03	1.0E-01		1.1E-01	
Pathway Total - Chemicals					1.1E-02	1.1E-01	5.0E-04	1.2E-01	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	1.1E-06	3.2E-06	1.2E-10	3.6E-03	1.1E-02		1.5E-02	
Barium	1.4E+02	6.9E-06	6.7E-07	7.4E-10	9.8E-05	1.4E-04	5.2E-06	2.4E-04	
Cadmium	2.1E+00	1.1E-07	1.0E-08	1.1E-11	1.1E-04	5.1E-05		1.6E-04	
Chromium	2.8E+01	1.4E-06	1.4E-07	1.5E-10	9.3E-07	7.0E-06		8.0E-06	
Cyanide	1.1E+00	5.6E-08	5.5E-09	6.1E-12	2.8E-06	5.9E-07		3.4E-06	
Manganese	1.2E+03	6.0E-05	5.9E-06	6.5E-09	1.3E-03	3.2E-03	4.5E-04	4.9E-03	
Nickel	3.2E+01	1.6E-06	1.6E-07	1.7E-10	8.1E-05	2.0E-04		2.8E-04	
Thallium	9.1E-01	4.6E-08	4.5E-09	5.0E-12	5.8E-04	5.7E-05		6.3E-04	
Vanadium	3.5E+01	1.8E-06	1.7E-07	1.9E-10	2.5E-04	9.5E-04		1.2E-03	
Inorganics Pathway Total					6.0E-03	1.6E-02	4.6E-04	2.2E-02	
1,2-Dichloroethene	3.1E-03	1.6E-10	1.5E-10	1.7E-14	1.7E-08	1.7E-08		3.5E-08	
2,4,6-Trinitrotoluene	4.5E+00	2.3E-07	2.2E-06	2.5E-11	4.6E-04	4.5E-03		4.9E-03	
2,4-Dinitrotoluene	5.3E-01	2.7E-08	2.6E-07	2.9E-12	1.3E-05	1.3E-04		1.4E-04	
PCB-1254	4.7E+00	2.4E-07	3.3E-06	2.6E-11	1.2E-02	2.0E-01		2.2E-01	
RDX	2.9E+01	1.4E-06	1.4E-05	1.6E-10	4.8E-04	4.7E-03		5.2E-03	
Organics Pathway Total					1.3E-02	2.1E-01		2.3E-01	
Pathway Total - Chemicals					1.9E-02	2.3E-01	4.6E-04	2.5E-01	
CB-3/CB-801									
Antimony	1.1E+02	5.6E-06	5.4E-07	6.0E-10	1.4E-02	9.1E-03		2.3E-02	
Arsenic	1.3E+01	6.5E-07	1.9E-06	7.1E-11	2.2E-03	6.7E-03		8.9E-03	
Cadmium	6.3E+00	3.2E-07	3.1E-08	3.4E-11	3.2E-04	1.6E-04		4.7E-04	
Chromium	4.4E+01	2.2E-06	2.2E-07	2.4E-10	1.5E-06	1.1E-05		1.3E-05	
Manganese	1.3E+03	6.4E-05	6.3E-06	6.9E-09	1.4E-03	3.4E-03	4.8E-04	5.3E-03	
Thallium	6.0E-01	3.0E-08	3.0E-09	3.3E-12	3.8E-04	3.7E-05		4.2E-04	
Inorganics Pathway Total					1.8E-02	1.9E-02	4.8E-04	3.8E-02	
1,2-Dichloroethene	7.1E-03	3.6E-10	3.5E-10	3.9E-14	4.0E-08	3.9E-08		8.0E-08	
2,4-Dinitrotoluene	1.3E-01	6.6E-09	6.5E-08	7.2E-13	3.3E-06	3.2E-05		3.6E-05	
Dieldrin	3.3E-02	1.7E-09	1.7E-08	1.8E-13	3.4E-05	3.3E-04		3.7E-04	
PCB-1254	4.3E+00	2.2E-07	3.0E-06	2.4E-11	1.1E-02	1.9E-01		2.0E-01	
Organics Pathway Total					1.1E-02	1.9E-01		2.0E-01	
Pathway Total - Chemicals					2.9E-02	2.1E-01	4.8E-04	2.4E-01	
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	5.5E-07	1.6E-06	6.0E-11	1.8E-03	5.7E-03		7.5E-03	
Barium	1.4E+02	7.0E-06	6.9E-07	7.6E-10	1.0E-04	1.4E-04	5.3E-06	2.5E-04	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Cadmium	1.8E+00	9.2E-08	9.0E-09	9.9E-12	9.2E-05	4.5E-05		1.4E-04	
Chromium	2.5E+01	1.3E-06	1.2E-07	1.4E-10	8.4E-07	6.3E-06		7.2E-06	
Cyanide	5.5E-01	2.8E-08	2.7E-09	3.0E-12	1.4E-06	2.9E-07		1.7E-06	
Manganese	7.0E+02	3.6E-05	3.5E-06	3.8E-09	7.7E-04	1.9E-03	2.7E-04	2.9E-03	
Mercury	3.4E-01	1.7E-08	1.7E-09	1.9E-12	5.8E-05	8.1E-05		1.4E-04	
Thallium	5.4E-01	2.7E-08	2.7E-09	2.9E-12	3.4E-04	3.3E-05		3.7E-04	
Vanadium	1.9E+01	9.7E-07	9.5E-08	1.0E-10	1.4E-04	5.2E-04		6.6E-04	
Inorganics Pathway Total					3.3E-03	8.4E-03	2.7E-04	1.2E-02	
1,2-Dichloroethene	1.2E-02	6.2E-10	6.0E-10	6.7E-14	6.8E-08	6.7E-08		1.4E-07	
1,3-Dinitrobenzene	5.9E+00	3.0E-07	2.9E-06	3.2E-11	3.0E-03	2.9E-02		3.2E-02	
2,4,6-Trinitrotoluene	3.0E+02	1.5E-05	1.5E-04	1.6E-09	3.0E-02	3.0E-01		3.3E-01	
2,4-Dinitrotoluene	2.3E-01	1.2E-08	1.1E-07	1.3E-12	5.8E-06	5.7E-05		6.3E-05	
2,6-Dinitrotoluene	8.6E-01	4.4E-08	4.3E-07	4.7E-12	4.4E-05	4.3E-04		4.7E-04	
Dieldrin	9.8E-02	5.0E-09	4.9E-08	5.4E-13	1.0E-04	9.8E-04		1.1E-03	
Endrin aldehyde	4.4E+00	2.2E-07	2.2E-06	2.4E-11	7.4E-04	7.3E-03		8.0E-03	
Heptachlor	7.2E-02	3.6E-09	3.6E-08	3.9E-13	7.3E-06	7.1E-05		7.9E-05	
Heptachlor epoxide	3.1E-02	1.6E-09	1.5E-08	1.7E-13	1.2E-04	1.2E-03		1.3E-03	
PCB-1254	1.1E+03	5.6E-05	7.6E-04	6.0E-09	2.8E+00	4.8E+01		5.1E+01	H
RDX	1.0E+02	5.1E-06	5.0E-05	5.5E-10	1.7E-03	1.7E-02		1.8E-02	
alpha-Chlordane	7.8E-02	4.0E-09	1.5E-08	4.3E-13	7.9E-06	3.9E-05	2.1E-09	4.7E-05	
gamma-Chlordane	8.9E-01	4.5E-08	1.8E-07	4.9E-12	9.0E-05	4.4E-04	2.4E-08	5.3E-04	
Organics Pathway Total					2.8E+00	4.8E+01	2.7E-08	5.1E+01	
Pathway Total - Chemicals					2.8E+00	4.8E+01	2.7E-04	5.1E+01	
Change Houses (CB-12, -23, -8, -22)									
Antimony	2.3E+00	1.1E-07	1.1E-08	1.2E-11	2.9E-04	1.9E-04		4.7E-04	
Arsenic	1.2E+01	6.2E-07	1.8E-06	6.7E-11	2.1E-03	6.4E-03		8.4E-03	
Cadmium	3.3E+00	1.7E-07	1.6E-08	1.8E-11	1.7E-04	8.2E-05		2.5E-04	
Chromium	1.5E+01	7.6E-07	7.5E-08	8.3E-11	5.1E-07	3.8E-06		4.3E-06	
Manganese	8.3E+02	4.2E-05	4.1E-06	4.6E-09	9.2E-04	2.2E-03	3.2E-04	3.5E-03	
Thallium	4.3E-01	2.2E-08	2.1E-09	2.4E-12	2.7E-04	2.7E-05		3.0E-04	
Inorganics Pathway Total					3.7E-03	8.9E-03	3.2E-04	1.3E-02	
PCB-1254	1.1E-01	5.6E-09	7.6E-08	6.0E-13	2.8E-04	4.8E-03		5.1E-03	
Organics Pathway Total					2.8E-04	4.8E-03		5.1E-03	
Pathway Total - Chemicals					4.0E-03	1.4E-02	3.2E-04	1.8E-02	
Perimeter Area									
Arsenic	1.3E+01	6.4E-07	1.9E-06	6.9E-11	2.1E-03	6.6E-03		8.7E-03	
Chromium	1.7E+01	8.5E-07	8.3E-08	9.2E-11	5.7E-07	4.3E-06		4.8E-06	
Cyanide	5.6E-01	2.8E-08	2.8E-09	3.1E-12	1.4E-06	2.9E-07		1.7E-06	
Manganese	1.4E+03	7.1E-05	7.0E-06	7.7E-09	1.6E-03	3.8E-03	5.4E-04	5.9E-03	
Thallium	6.4E-01	3.3E-08	3.2E-09	3.5E-12	4.1E-04	4.0E-05		4.5E-04	
Inorganics Pathway Total					4.1E-03	1.0E-02	5.4E-04	1.5E-02	
1,2-Dichloroethene	4.1E-03	2.1E-10	2.0E-10	2.3E-14	2.3E-08	2.3E-08		4.6E-08	
Organics Pathway Total					2.3E-08	2.3E-08		4.6E-08	
Pathway Total - Chemicals					4.1E-03	1.0E-02	5.4E-04	1.5E-02	
Water Tower									
Chromium	2.5E+02	1.3E-05	1.2E-06	1.4E-09	8.5E-06	6.4E-05		7.2E-05	
Thallium	6.4E-01	3.3E-08	3.2E-09	3.5E-12	4.1E-04	4.0E-05		4.5E-04	
Inorganics Pathway Total					4.2E-04	1.0E-04		5.2E-04	
Pathway Total - Chemicals					4.2E-04	1.0E-04		5.2E-04	
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Hunter/Trapper									
CB-13 and CB-10									
Antimony	1.3E+00	3.7E-08	1.8E-09	8.0E-12	9.3E-05	3.0E-05		1.2E-04	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Arsenic	1.1E+01	3.3E-07	4.7E-07	7.1E-11	1.1E-03	1.6E-03		2.7E-03	
Cadmium	6.5E+00	1.9E-07	9.1E-09	4.1E-11	1.9E-04	4.6E-05		2.4E-04	
Chromium	3.5E+01	1.0E-06	4.9E-08	2.2E-10	6.9E-07	2.5E-06		3.2E-06	
Manganese	1.3E+03	3.8E-05	1.8E-06	8.3E-09	8.4E-04	1.0E-03	5.8E-04	2.4E-03	
Thallium	4.9E-01	1.4E-08	6.8E-10	3.1E-12	1.8E-04	8.6E-06		1.9E-04	
Inorganics Pathway Total					2.4E-03	2.7E-03	5.8E-04	5.7E-03	
1,2-Dichloroethene	7.2E-03	2.1E-10	1.0E-10	4.6E-14	2.3E-08	1.1E-08		3.5E-08	
2,4,6-Trinitrotoluene	2.5E+01	7.4E-07	3.5E-06	1.6E-10	1.5E-03	7.1E-03		8.6E-03	
2,4-Dinitrotoluene	1.5E+00	4.4E-08	2.1E-07	9.4E-12	2.2E-05	1.0E-04		1.3E-04	
2,6-Dinitrotoluene	6.0E-01	1.8E-08	8.4E-08	3.8E-12	1.8E-05	8.4E-05		1.0E-04	
Heptachlor	1.7E-02	5.0E-10	2.4E-09	1.1E-13	9.9E-07	4.7E-06		5.7E-06	
PCB-1254	1.7E+00	5.0E-08	3.3E-07	1.1E-11	2.5E-03	2.1E-02		2.3E-02	
RDX	3.7E+00	1.1E-07	5.2E-07	2.3E-11	3.6E-05	1.7E-04		2.1E-04	
Organics Pathway Total					4.1E-03	2.8E-02		3.2E-02	
Pathway Total - Chemicals					6.4E-03	3.1E-02	5.8E-04	3.8E-02	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	6.3E-07	9.0E-07	1.4E-10	2.1E-03	3.2E-03		5.3E-03	
Barium	1.4E+02	4.0E-06	1.9E-07	8.6E-10	5.7E-05	3.9E-05	6.0E-06	1.0E-04	
Cadmium	2.1E+00	6.1E-08	2.9E-09	1.3E-11	6.1E-05	1.5E-05		7.5E-05	
Chromium	2.8E+01	8.1E-07	3.9E-08	1.8E-10	5.4E-07	2.0E-06		2.5E-06	
Cyanide	1.1E+00	3.3E-08	1.6E-09	7.0E-12	1.6E-06	1.7E-07		1.8E-06	
Manganese	1.2E+03	3.5E-05	1.7E-06	7.5E-09	7.5E-04	9.0E-04	5.2E-04	2.2E-03	
Nickel	3.2E+01	9.3E-07	4.5E-08	2.0E-10	4.7E-05	5.6E-05		1.0E-04	
Thallium	9.1E-01	2.7E-08	1.3E-09	5.8E-12	3.3E-04	1.6E-05		3.5E-04	
Vanadium	3.5E+01	1.0E-06	4.9E-08	2.2E-10	1.5E-04	2.7E-04		4.2E-04	
Inorganics Pathway Total					3.5E-03	4.5E-03	5.3E-04	8.5E-03	
1,2-Dichloroethene	3.1E-03	9.1E-11	4.4E-11	2.0E-14	1.0E-08	4.8E-09		1.5E-08	
2,4,6-Trinitrotoluene	4.5E+00	1.3E-07	6.3E-07	2.9E-11	2.6E-04	1.3E-03		1.5E-03	
2,4-Dinitrotoluene	5.3E-01	1.5E-08	7.4E-08	3.3E-12	7.7E-06	3.7E-05		4.5E-05	
PCB-1254	4.7E+00	1.4E-07	9.2E-07	3.0E-11	6.9E-03	5.8E-02		6.5E-02	
RDX	2.9E+01	8.4E-07	4.0E-06	1.8E-10	2.8E-04	1.3E-03		1.6E-03	
Organics Pathway Total					7.4E-03	6.0E-02		6.8E-02	
Pathway Total - Chemicals					1.1E-02	6.5E-02	5.3E-04	7.6E-02	
CB-3/CB-801									
Antimony	1.1E+02	3.2E-06	1.5E-07	7.0E-10	8.1E-03	2.6E-03		1.1E-02	
Arsenic	1.3E+01	3.8E-07	5.4E-07	8.2E-11	1.3E-03	1.9E-03		3.2E-03	
Cadmium	6.3E+00	1.8E-07	8.8E-09	4.0E-11	1.8E-04	4.4E-05		2.3E-04	
Chromium	4.4E+01	1.3E-06	6.2E-08	2.8E-10	8.6E-07	3.2E-06		4.0E-06	
Manganese	1.3E+03	3.7E-05	1.8E-06	8.0E-09	8.0E-04	9.6E-04	5.6E-04	2.3E-03	
Thallium	6.0E-01	1.8E-08	8.4E-10	3.8E-12	2.2E-04	1.1E-05		2.3E-04	
Inorganics Pathway Total					1.1E-02	5.5E-03	5.6E-04	1.7E-02	
1,2-Dichloroethene	7.1E-03	2.1E-10	1.0E-10	4.5E-14	2.3E-08	1.1E-08		3.4E-08	
2,4-Dinitrotoluene	1.3E-01	3.8E-09	1.8E-08	8.3E-13	1.9E-06	9.2E-06		1.1E-05	
Dieldrin	3.3E-02	9.8E-10	4.7E-09	2.1E-13	2.0E-05	9.4E-05		1.1E-04	
PCB-1254	4.3E+00	1.3E-07	8.5E-07	2.7E-11	6.3E-03	5.3E-02		5.9E-02	
Organics Pathway Total					6.3E-03	5.3E-02		5.9E-02	
Pathway Total - Chemicals					1.7E-02	5.8E-02	5.6E-04	7.6E-02	
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	3.2E-07	4.6E-07	6.9E-11	1.1E-03	1.6E-03		2.7E-03	
Barium	1.4E+02	4.1E-06	2.0E-07	8.8E-10	5.8E-05	4.0E-05	6.2E-06	1.0E-04	
Cadmium	1.8E+00	5.3E-08	2.5E-09	1.2E-11	5.3E-05	1.3E-05		6.6E-05	
Chromium	2.5E+01	7.3E-07	3.5E-08	1.6E-10	4.9E-07	1.8E-06		2.3E-06	
Cyanide	5.5E-01	1.6E-08	7.8E-10	3.5E-12	8.1E-07	8.3E-08		9.0E-07	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Manganese	7.0E+02	2.1E-05	9.8E-07	4.5E-09	4.5E-04	5.4E-04	3.1E-04	1.3E-03	
Mercury	3.4E-01	1.0E-08	4.8E-10	2.2E-12	3.3E-05	2.3E-05		5.6E-05	
Thallium	5.4E-01	1.6E-08	7.5E-10	3.4E-12	2.0E-04	9.4E-06		2.1E-04	
Vanadium	1.9E+01	5.6E-07	2.7E-08	1.2E-10	8.0E-05	1.5E-04		2.3E-04	
Inorganics Pathway Total					1.9E-03	2.4E-03	3.2E-04	4.6E-03	
1,2-Dichloroethene	1.2E-02	3.6E-10	1.7E-10	7.7E-14	4.0E-08	1.9E-08		5.9E-08	
1,3-Dinitrobenzene	5.9E+00	1.7E-07	8.3E-07	3.7E-11	1.7E-03	8.3E-03		1.0E-02	
2,4,6-Trinitrotoluene	3.0E+02	8.7E-06	4.2E-05	1.9E-09	1.7E-02	8.4E-02		1.0E-01	
2,4-Dinitrotoluene	2.3E-01	6.8E-09	3.2E-08	1.5E-12	3.4E-06	1.6E-05		2.0E-05	
2,6-Dinitrotoluene	8.6E-01	2.5E-08	1.2E-07	5.5E-12	2.5E-05	1.2E-04		1.5E-04	
Dieldrin	9.8E-02	2.9E-09	1.4E-08	6.3E-13	5.8E-05	2.8E-04		3.3E-04	
Endrin aldehyde	4.4E+00	1.3E-07	6.2E-07	2.8E-11	4.3E-04	2.1E-03		2.5E-03	
Heptachlor	7.2E-02	2.1E-09	1.0E-08	4.6E-13	4.2E-06	2.0E-05		2.4E-05	
Heptachlor epoxide	3.1E-02	9.1E-10	4.4E-09	2.0E-13	7.0E-05	3.4E-04		4.1E-04	
PCB-1254	1.1E+03	3.2E-05	2.2E-04	7.0E-09	1.6E+00	1.4E+01		1.5E+01	H
RDX	1.0E+02	2.9E-06	1.4E-05	6.4E-10	9.8E-04	4.7E-03		5.7E-03	
alpha-Chlordane	7.8E-02	2.3E-09	4.4E-09	5.0E-13	4.6E-06	1.1E-05	2.5E-09	1.6E-05	
gamma-Chlordane	8.9E-01	2.6E-08	5.0E-08	5.6E-12	5.2E-05	1.2E-04	2.8E-08	1.8E-04	
Organics Pathway Total					1.6E+00	1.4E+01	3.1E-08	1.5E+01	
Pathway Total - Chemicals					1.6E+00	1.4E+01	3.2E-04	1.5E+01	
Change Houses (CB-12, -23, -8, -22)									
Antimony	2.3E+00	6.6E-08	3.2E-09	1.4E-11	1.7E-04	5.3E-05		2.2E-04	
Arsenic	1.2E+01	3.6E-07	5.1E-07	7.7E-11	1.2E-03	1.8E-03		3.0E-03	
Cadmium	3.3E+00	9.6E-08	4.6E-09	2.1E-11	9.6E-05	2.3E-05		1.2E-04	
Chromium	1.5E+01	4.4E-07	2.1E-08	9.6E-11	2.9E-07	1.1E-06		1.4E-06	
Manganese	8.3E+02	2.4E-05	1.2E-06	5.3E-09	5.3E-04	6.3E-04	3.7E-04	1.5E-03	
Thallium	4.3E-01	1.3E-08	6.1E-10	2.7E-12	1.6E-04	7.6E-06		1.7E-04	
Inorganics Pathway Total					2.1E-03	2.5E-03	3.7E-04	5.0E-03	
PCB-1254	1.1E-01	3.2E-09	2.2E-08	7.0E-13	1.6E-04	1.4E-03		1.5E-03	
Organics Pathway Total					1.6E-04	1.4E-03		1.5E-03	
Pathway Total - Chemicals					2.3E-03	3.9E-03	3.7E-04	6.5E-03	
Perimeter Area									
Arsenic	1.3E+01	3.7E-07	5.3E-07	8.0E-11	1.2E-03	1.9E-03		3.1E-03	
Chromium	1.7E+01	4.9E-07	2.4E-08	1.1E-10	3.3E-07	1.2E-06		1.5E-06	
Cyanide	5.6E-01	1.6E-08	7.8E-10	3.5E-12	8.2E-07	8.3E-08		9.0E-07	
Manganese	1.4E+03	4.1E-05	2.0E-06	8.9E-09	9.0E-04	1.1E-03	6.3E-04	2.6E-03	
Thallium	6.4E-01	1.9E-08	9.0E-10	4.1E-12	2.4E-04	1.1E-05		2.5E-04	
Inorganics Pathway Total					2.4E-03	2.9E-03	6.3E-04	5.9E-03	
1,2-Dichloroethene	4.1E-03	1.2E-10	5.8E-11	2.6E-14	1.3E-08	6.4E-09		2.0E-08	
Organics Pathway Total					1.3E-08	6.4E-09		2.0E-08	
Pathway Total - Chemicals					2.4E-03	2.9E-03	6.3E-04	5.9E-03	
Water Tower									
Chromium	2.5E+02	7.4E-06	3.5E-07	1.6E-09	4.9E-06	1.8E-05		2.3E-05	
Thallium	6.4E-01	1.9E-08	9.1E-10	4.1E-12	2.4E-04	1.1E-05		2.5E-04	
Inorganics Pathway Total					2.4E-04	2.9E-05		2.7E-04	
Pathway Total - Chemicals					2.4E-04	2.9E-05		2.7E-04	
Maintained Industrial/Managed Recreational - Security Guard/Maintenance Worker									
CB-13 and CB-10									
Antimony	1.3E+00	5.1E-08	2.9E-08	1.1E-11	1.3E-04	4.8E-04		6.0E-04	
Arsenic	1.1E+01	4.5E-07	7.5E-06	9.8E-11	1.5E-03	2.6E-02		2.8E-02	
Cadmium	6.5E+00	2.6E-07	1.5E-07	5.7E-11	2.6E-04	7.3E-04		1.0E-03	
Chromium	3.5E+01	1.4E-06	8.0E-07	3.1E-10	9.6E-07	4.1E-05		4.2E-05	
Manganese	1.3E+03	5.3E-05	3.0E-05	1.2E-08	1.2E-03	1.6E-02	8.1E-04	1.8E-02	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Thallium	4.9E-01	2.0E-08	1.1E-08	4.3E-12	2.5E-04	1.4E-04		3.9E-04	
Inorganics Pathway Total					3.3E-03	4.4E-02	8.1E-04	4.8E-02	
1,2-Dichloroethene	7.2E-03	2.9E-10	1.6E-09	6.3E-14	3.2E-08	1.8E-07		2.1E-07	
2,4,6-Trinitrotoluene	2.5E+01	1.0E-06	5.7E-05	2.2E-10	2.1E-03	1.1E-01		1.2E-01	
2,4-Dinitrotoluene	1.5E+00	6.1E-08	3.4E-06	1.3E-11	3.0E-05	1.7E-03		1.7E-03	
2,6-Dinitrotoluene	6.0E-01	2.4E-08	1.4E-06	5.3E-12	2.4E-05	1.4E-03		1.4E-03	
Heptachlor	1.7E-02	6.9E-10	3.8E-08	1.5E-13	1.4E-06	7.6E-05		7.8E-05	
PCB-1254	1.7E+00	6.9E-08	5.4E-06	1.5E-11	3.5E-03	3.4E-01		3.4E-01	
RDX	3.7E+00	1.5E-07	8.3E-06	3.3E-11	5.0E-05	2.8E-03		2.8E-03	
Organics Pathway Total					5.6E-03	4.6E-01		4.6E-01	
Pathway Total - Chemicals					8.9E-03	5.0E-01	8.1E-04	5.1E-01	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	8.7E-07	1.5E-05	1.9E-10	2.9E-03	5.1E-02		5.4E-02	
Barium	1.4E+02	5.5E-06	3.1E-06	1.2E-09	7.9E-05	6.2E-04	8.3E-06	7.1E-04	
Cadmium	2.1E+00	8.5E-08	4.7E-08	1.8E-11	8.5E-05	2.3E-04		3.2E-04	
Chromium	2.8E+01	1.1E-06	6.2E-07	2.4E-10	7.5E-07	3.2E-05		3.3E-05	
Cyanide	1.1E+00	4.5E-08	2.5E-08	9.8E-12	2.3E-06	2.7E-06		4.9E-06	
Manganese	1.2E+03	4.8E-05	2.7E-05	1.0E-08	1.0E-03	1.4E-02	7.3E-04	1.6E-02	
Nickel	3.2E+01	1.3E-06	7.2E-07	2.8E-10	6.5E-05	9.0E-04		9.6E-04	
Thallium	9.1E-01	3.7E-08	2.1E-08	8.0E-12	4.6E-04	2.6E-04		7.2E-04	
Vanadium	3.5E+01	1.4E-06	7.9E-07	3.1E-10	2.0E-04	4.3E-03		4.5E-03	
Inorganics Pathway Total					4.9E-03	7.2E-02	7.4E-04	7.7E-02	
1,2-Dichloroethene	3.1E-03	1.3E-10	7.0E-10	2.7E-14	1.4E-08	7.8E-08		9.2E-08	
2,4,6-Trinitrotoluene	4.5E+00	1.8E-07	1.0E-05	4.0E-11	3.7E-04	2.0E-02		2.1E-02	
2,4-Dinitrotoluene	5.3E-01	2.1E-08	1.2E-06	4.6E-12	1.1E-05	5.9E-04		6.0E-04	
PCB-1254	4.7E+00	1.9E-07	1.5E-05	4.1E-11	9.6E-03	9.3E-01		9.4E-01	
RDX	2.9E+01	1.2E-06	6.5E-05	2.5E-10	3.9E-04	2.2E-02		2.2E-02	
Organics Pathway Total					1.0E-02	9.7E-01		9.8E-01	
Pathway Total - Chemicals					1.5E-02	1.0E+00	7.4E-04	1.1E+00	
CB-3/CB-801									
Antimony	1.1E+02	4.5E-06	2.5E-06	9.7E-10	1.1E-02	4.1E-02		5.3E-02	
Arsenic	1.3E+01	5.3E-07	8.7E-06	1.1E-10	1.8E-03	3.1E-02		3.2E-02	
Cadmium	6.3E+00	2.6E-07	1.4E-07	5.5E-11	2.6E-04	7.1E-04		9.7E-04	
Chromium	4.4E+01	1.8E-06	9.9E-07	3.9E-10	1.2E-06	5.1E-05		5.2E-05	
Manganese	1.3E+03	5.1E-05	2.9E-05	1.1E-08	1.1E-03	1.5E-02	7.8E-04	1.7E-02	
Thallium	6.0E-01	2.4E-08	1.4E-08	5.3E-12	3.1E-04	1.7E-04		4.8E-04	
Inorganics Pathway Total					1.5E-02	8.8E-02	7.8E-04	1.0E-01	
1,2-Dichloroethene	7.1E-03	2.9E-10	1.6E-09	6.3E-14	3.2E-08	1.8E-07		2.1E-07	
2,4-Dinitrotoluene	1.3E-01	5.3E-09	2.9E-07	1.2E-12	2.7E-06	1.5E-04		1.5E-04	
Dieldrin	3.3E-02	1.4E-09	7.5E-08	2.9E-13	2.7E-05	1.5E-03		1.5E-03	
PCB-1254	4.3E+00	1.8E-07	1.4E-05	3.8E-11	8.8E-03	8.5E-01		8.6E-01	
Organics Pathway Total					8.8E-03	8.5E-01		8.6E-01	
Pathway Total - Chemicals					2.3E-02	9.4E-01	7.8E-04	9.6E-01	
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	4.4E-07	7.4E-06	9.6E-11	1.5E-03	2.6E-02		2.7E-02	
Barium	1.4E+02	5.7E-06	3.1E-06	1.2E-09	8.1E-05	6.4E-04	8.6E-06	7.3E-04	
Cadmium	1.8E+00	7.4E-08	4.1E-08	1.6E-11	7.4E-05	2.0E-04		2.8E-04	
Chromium	2.5E+01	1.0E-06	5.6E-07	2.2E-10	6.8E-07	2.9E-05		3.0E-05	
Cyanide	5.5E-01	2.3E-08	1.3E-08	4.9E-12	1.1E-06	1.3E-06		2.5E-06	
Manganese	7.0E+02	2.9E-05	1.6E-05	6.2E-09	6.2E-04	8.6E-03	4.3E-04	9.7E-03	
Mercury	3.4E-01	1.4E-08	7.7E-09	3.0E-12	4.6E-05	3.7E-04		4.1E-04	
Thallium	5.4E-01	2.2E-08	1.2E-08	4.7E-12	2.7E-04	1.5E-04		4.2E-04	
Vanadium	1.9E+01	7.8E-07	4.3E-07	1.7E-10	1.1E-04	2.4E-03		2.5E-03	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Inorganics Pathway Total					2.7E-03	3.8E-02	4.4E-04	4.1E-02	
1,2-Dichloroethene	1.2E-02	4.9E-10	2.7E-09	1.1E-13	5.5E-08	3.0E-07		3.6E-07	
1,3-Dinitrobenzene	5.9E+00	2.4E-07	1.3E-05	5.2E-11	2.4E-03	1.3E-01		1.4E-01	
2,4,6-Trinitrotoluene	3.0E+02	1.2E-05	6.7E-04	2.6E-09	2.4E-02	1.3E+00		1.4E+00	H
2,4-Dinitrotoluene	2.3E-01	9.4E-09	5.2E-07	2.0E-12	4.7E-06	2.6E-04		2.6E-04	
2,6-Dinitrotoluene	8.6E-01	3.5E-08	1.9E-06	7.6E-12	3.5E-05	1.9E-03		2.0E-03	
Dieldrin	9.8E-02	4.0E-09	2.2E-07	8.7E-13	8.0E-05	4.5E-03		4.5E-03	
Endrin aldehyde	4.4E+00	1.8E-07	9.9E-06	3.9E-11	6.0E-04	3.3E-02		3.4E-02	
Heptachlor	7.2E-02	2.9E-09	1.6E-07	6.3E-13	5.9E-06	3.2E-04		3.3E-04	
Heptachlor epoxide	3.1E-02	1.3E-09	7.0E-08	2.7E-13	9.7E-05	5.4E-03		5.5E-03	
PCB-1254	1.1E+03	4.5E-05	3.5E-03	9.7E-09	2.2E+00	2.2E+02		2.2E+02	H
RDX	1.0E+02	4.1E-06	2.3E-04	8.8E-10	1.4E-03	7.5E-02		7.7E-02	
alpha-Chlordane	7.8E-02	3.2E-09	7.1E-08	6.9E-13	6.4E-06	1.8E-04	3.4E-09	1.8E-04	
gamma-Chlordane	8.9E-01	3.6E-08	8.0E-07	7.8E-12	7.2E-05	2.0E-03	3.9E-08	2.1E-03	
Organics Pathway Total					2.3E+00	2.2E+02	4.3E-08	2.2E+02	
Pathway Total - Chemicals					2.3E+00	2.2E+02	4.4E-04	2.2E+02	
Change Houses (CB-12, -23, -8, -22)									
Antimony	2.3E+00	9.2E-08	5.1E-08	2.0E-11	2.3E-04	8.5E-04		1.1E-03	
Arsenic	1.2E+01	5.0E-07	8.2E-06	1.1E-10	1.7E-03	2.9E-02		3.1E-02	
Cadmium	3.3E+00	1.3E-07	7.4E-08	2.9E-11	1.3E-04	3.7E-04		5.1E-04	
Chromium	1.5E+01	6.1E-07	3.4E-07	1.3E-10	4.1E-07	1.7E-05		1.8E-05	
Manganese	8.3E+02	3.4E-05	1.9E-05	7.3E-09	7.4E-04	1.0E-02	5.1E-04	1.1E-02	
Thallium	4.3E-01	1.8E-08	9.8E-09	3.8E-12	2.2E-04	1.2E-04		3.4E-04	
Inorganics Pathway Total					3.0E-03	4.0E-02	5.1E-04	4.4E-02	
PCB-1254	1.1E-01	4.5E-09	3.5E-07	9.7E-13	2.2E-04	2.2E-02		2.2E-02	
Organics Pathway Total					2.2E-04	2.2E-02		2.2E-02	
Pathway Total - Chemicals					3.2E-03	6.2E-02	5.1E-04	6.6E-02	
Perimeter Area									
Arsenic	1.3E+01	5.1E-07	8.5E-06	1.1E-10	1.7E-03	3.0E-02		3.2E-02	
Chromium	1.7E+01	6.8E-07	3.8E-07	1.5E-10	4.6E-07	1.9E-05		2.0E-05	
Cyanide	5.6E-01	2.3E-08	1.3E-08	4.9E-12	1.1E-06	1.3E-06		2.5E-06	
Manganese	1.4E+03	5.7E-05	3.2E-05	1.2E-08	1.2E-03	1.7E-02	8.7E-04	1.9E-02	
Thallium	6.4E-01	2.6E-08	1.5E-08	5.7E-12	3.3E-04	1.8E-04		5.1E-04	
Inorganics Pathway Total					3.3E-03	4.7E-02	8.7E-04	5.1E-02	
1,2-Dichloroethene	4.1E-03	1.7E-10	9.3E-10	3.6E-14	1.9E-08	1.0E-07		1.2E-07	
Organics Pathway Total					1.9E-08	1.0E-07		1.2E-07	
Pathway Total - Chemicals					3.3E-03	4.7E-02	8.7E-04	5.1E-02	
Water Tower									
Chromium	2.5E+02	1.0E-05	5.7E-06	2.2E-09	6.8E-06	2.9E-04		3.0E-04	
Thallium	6.4E-01	2.6E-08	1.5E-08	5.7E-12	3.3E-04	1.8E-04		5.1E-04	
Inorganics Pathway Total					3.4E-04	4.7E-04		8.1E-04	
Pathway Total - Chemicals					3.4E-04	4.7E-04		8.1E-04	
National Guard/Managed Recreational - National Guard									
CB-13 and CB-10									
Antimony	1.3E+00	3.0E-07	8.8E-09	7.9E-08	7.4E-04	1.5E-04		8.9E-04	
Arsenic	1.1E+01	2.6E-06	2.3E-06	7.0E-07	8.7E-03	8.2E-03		1.7E-02	
Cadmium	6.5E+00	1.5E-06	4.5E-08	4.1E-07	1.5E-03	2.3E-04		1.7E-03	
Chromium	3.5E+01	8.3E-06	2.5E-07	2.2E-06	5.5E-06	1.3E-05		1.8E-05	
Manganese	1.3E+03	3.1E-04	9.1E-06	8.2E-05	6.7E-03	5.0E-03	5.7E+00	5.7E+00	H
Thallium	4.9E-01	1.1E-07	3.4E-09	3.0E-08	1.4E-03	4.2E-05		1.5E-03	
Inorganics Pathway Total					1.9E-02	1.4E-02	5.7E+00	5.8E+00	
1,2-Dichloroethene	7.2E-03	1.7E-09	5.0E-10	4.5E-10	1.9E-07	5.6E-08		2.4E-07	
2,4,6-Trinitrotoluene	2.5E+01	5.9E-06	1.8E-05	1.6E-06	1.2E-02	3.5E-02		4.7E-02	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
2,4-Dinitrotoluene	1.5E+00	3.5E-07	1.0E-06	9.3E-08	1.7E-04	5.2E-04		6.9E-04	
2,6-Dinitrotoluene	6.0E-01	1.4E-07	4.2E-07	3.8E-08	1.4E-04	4.2E-04		5.6E-04	
Heptachlor	1.7E-02	4.0E-09	1.2E-08	1.1E-09	7.9E-06	2.4E-05		3.1E-05	
PCB-1254	1.7E+00	4.0E-07	1.7E-06	1.1E-07	2.0E-02	1.0E-01		1.2E-01	
RDX	3.7E+00	8.7E-07	2.6E-06	2.3E-07	2.9E-04	8.6E-04		1.1E-03	
Organics Pathway Total					3.2E-02	1.4E-01		1.7E-01	
Pathway Total - Chemicals					5.2E-02	1.5E-01	5.7E+00	5.9E+00	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	5.0E-06	4.5E-06	1.3E-06	1.7E-02	1.6E-02		3.2E-02	
Barium	1.4E+02	3.2E-05	9.4E-07	8.5E-06	4.5E-04	1.9E-04	5.9E-02	6.0E-02	
Cadmium	2.1E+00	4.9E-07	1.4E-08	1.3E-07	4.9E-04	7.2E-05		5.6E-04	
Chromium	2.8E+01	6.5E-06	1.9E-07	1.7E-06	4.3E-06	9.9E-06		1.4E-05	
Cyanide	1.1E+00	2.6E-07	7.7E-09	6.9E-08	1.3E-05	8.2E-07		1.4E-05	
Manganese	1.2E+03	2.8E-04	8.2E-06	7.4E-05	6.0E-03	4.5E-03	5.2E+00	5.2E+00	H
Nickel	3.2E+01	7.5E-06	2.2E-07	2.0E-06	3.7E-04	2.8E-04		6.5E-04	
Thallium	9.1E-01	2.1E-07	6.4E-09	5.7E-08	2.7E-03	7.9E-05		2.8E-03	
Vanadium	3.5E+01	8.2E-06	2.4E-07	2.2E-06	1.2E-03	1.3E-03		2.5E-03	
Inorganics Pathway Total					2.8E-02	2.2E-02	5.2E+00	5.3E+00	
1,2-Dichloroethene	3.1E-03	7.3E-10	2.2E-10	1.9E-10	8.1E-08	2.4E-08		1.0E-07	
2,4,6-Trinitrotoluene	4.5E+00	1.1E-06	3.1E-06	2.8E-07	2.1E-03	6.3E-03		8.4E-03	
2,4-Dinitrotoluene	5.3E-01	1.2E-07	3.7E-07	3.3E-08	6.2E-05	1.8E-04		2.4E-04	
PCB-1254	4.7E+00	1.1E-06	4.6E-06	2.9E-07	5.5E-02	2.9E-01		3.4E-01	
RDX	2.9E+01	6.7E-06	2.0E-05	1.8E-06	2.2E-03	6.6E-03		8.9E-03	
Organics Pathway Total					6.0E-02	3.0E-01		3.6E-01	
Pathway Total - Chemicals					8.8E-02	3.2E-01	5.2E+00	5.6E+00	
CB-3/CB-801									
Antimony	1.1E+02	2.6E-05	7.7E-07	6.9E-06	6.4E-02	1.3E-02		7.7E-02	
Arsenic	1.3E+01	3.0E-06	2.7E-06	8.1E-07	1.0E-02	9.5E-03		2.0E-02	
Cadmium	6.3E+00	1.5E-06	4.4E-08	3.9E-07	1.5E-03	2.2E-04		1.7E-03	
Chromium	4.4E+01	1.0E-05	3.1E-07	2.7E-06	6.9E-06	1.6E-05		2.3E-05	
Manganese	1.3E+03	3.0E-04	8.8E-06	7.9E-05	6.4E-03	4.8E-03	5.5E+00	5.5E+00	H
Thallium	6.0E-01	1.4E-07	4.2E-09	3.8E-08	1.8E-03	5.2E-05		1.8E-03	
Inorganics Pathway Total					8.4E-02	2.7E-02	5.5E+00	5.6E+00	
1,2-Dichloroethene	7.1E-03	1.7E-09	5.0E-10	4.5E-10	1.9E-07	5.5E-08		2.4E-07	
2,4-Dinitrotoluene	1.3E-01	3.1E-08	9.1E-08	8.2E-09	1.5E-05	4.5E-05		6.1E-05	
Dieldrin	3.3E-02	7.8E-09	2.3E-08	2.1E-09	1.6E-04	4.7E-04		6.2E-04	
PCB-1254	4.3E+00	1.0E-06	4.2E-06	2.7E-07	5.0E-02	2.6E-01		3.1E-01	
Organics Pathway Total					5.1E-02	2.6E-01		3.1E-01	
Pathway Total - Chemicals					1.3E-01	2.9E-01	5.5E+00	5.9E+00	
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	2.6E-06	2.3E-06	6.8E-07	8.5E-03	8.0E-03		1.7E-02	
Barium	1.4E+02	3.3E-05	9.7E-07	8.7E-06	4.7E-04	2.0E-04	6.1E-02	6.1E-02	
Cadmium	1.8E+00	4.3E-07	1.3E-08	1.1E-07	4.3E-04	6.3E-05		4.9E-04	
Chromium	2.5E+01	5.8E-06	1.7E-07	1.6E-06	3.9E-06	8.9E-06		1.3E-05	
Cyanide	5.5E-01	1.3E-07	3.9E-09	3.5E-08	6.5E-06	4.1E-07		6.9E-06	
Manganese	7.0E+02	1.6E-04	4.9E-06	4.4E-05	3.6E-03	2.7E-03	3.1E+00	3.1E+00	H
Mercury	3.4E-01	8.0E-08	2.4E-09	2.1E-08	2.7E-04	1.1E-04		3.8E-04	
Thallium	5.4E-01	1.3E-07	3.7E-09	3.3E-08	1.6E-03	4.7E-05		1.6E-03	
Vanadium	1.9E+01	4.5E-06	1.3E-07	1.2E-06	6.4E-04	7.3E-04		1.4E-03	
Inorganics Pathway Total					1.5E-02	1.2E-02	3.1E+00	3.2E+00	
1,2-Dichloroethene	1.2E-02	2.8E-09	8.5E-10	7.6E-10	3.2E-07	9.4E-08		4.1E-07	
1,3-Dinitrobenzene	5.9E+00	1.4E-06	4.1E-06	3.7E-07	1.4E-02	4.1E-02		5.5E-02	
2,4,6-Trinitrotoluene	3.0E+02	7.0E-05	2.1E-04	1.9E-05	1.4E-01	4.1E-01		5.5E-01	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
2,4-Dinitrotoluene	2.3E-01	5.4E-08	1.6E-07	1.4E-08	2.7E-05	8.0E-05		1.1E-04	
2,6-Dinitrotoluene	8.6E-01	2.0E-07	6.0E-07	5.4E-08	2.0E-04	6.0E-04		8.0E-04	
Dieldrin	9.8E-02	2.3E-08	6.9E-08	6.2E-09	4.6E-04	1.4E-03		1.8E-03	
Endrin aldehyde	4.4E+00	1.0E-06	3.1E-06	2.8E-07	3.4E-03	1.0E-02		1.4E-02	
Heptachlor	7.2E-02	1.7E-08	5.0E-08	4.5E-09	3.4E-05	1.0E-04		1.3E-04	
Heptachlor epoxide	3.1E-02	7.3E-09	2.2E-08	1.9E-09	5.6E-04	1.7E-03		2.2E-03	
PCB-1254	1.1E+03	2.6E-04	1.1E-03	6.9E-05	1.3E+01	6.7E+01		8.0E+01	H
RDX	1.0E+02	2.4E-05	7.0E-05	6.3E-06	7.8E-03	2.3E-02		3.1E-02	
alpha-Chlordane	7.8E-02	1.8E-08	2.2E-08	4.9E-09	3.7E-05	5.4E-05	2.4E-05	1.2E-04	
gamma-Chlordane	8.9E-01	2.1E-07	2.5E-07	5.6E-08	4.2E-04	6.2E-04	2.8E-04	1.3E-03	
Organics Pathway Total					1.3E+01	6.8E+01	3.0E-04	8.1E+01	
Pathway Total - Chemicals					1.3E+01	6.8E+01	3.1E+00	8.4E+01	
Change Houses (CB-12, -23, -8, -22)									
Antimony	2.3E+00	5.3E-07	1.6E-08	1.4E-07	1.3E-03	2.6E-04		1.6E-03	
Arsenic	1.2E+01	2.9E-06	2.5E-06	7.6E-07	9.5E-03	8.9E-03		1.8E-02	
Cadmium	3.3E+00	7.7E-07	2.3E-08	2.1E-07	7.7E-04	1.1E-04		8.9E-04	
Chromium	1.5E+01	3.5E-06	1.1E-07	9.4E-07	2.4E-06	5.4E-06		7.7E-06	
Manganese	8.3E+02	1.9E-04	5.8E-06	5.2E-05	4.2E-03	3.1E-03	3.6E+00	3.6E+00	H
Thallium	4.3E-01	1.0E-07	3.0E-09	2.7E-08	1.3E-03	3.8E-05		1.3E-03	
Inorganics Pathway Total					1.7E-02	1.2E-02	3.6E+00	3.7E+00	
PCB-1254	1.1E-01	2.6E-08	1.1E-07	6.9E-09	1.3E-03	6.7E-03		8.0E-03	
Organics Pathway Total					1.3E-03	6.7E-03		8.0E-03	
Pathway Total - Chemicals					1.8E-02	1.9E-02	3.6E+00	3.7E+00	
Perimeter Area									
Arsenic	1.3E+01	2.9E-06	2.6E-06	7.9E-07	9.8E-03	9.2E-03		1.9E-02	
Chromium	1.7E+01	3.9E-06	1.2E-07	1.1E-06	2.6E-06	6.0E-06		8.6E-06	
Cyanide	5.6E-01	1.3E-07	3.9E-09	3.5E-08	6.5E-06	4.1E-07		6.9E-06	
Manganese	1.4E+03	3.3E-04	9.8E-06	8.8E-05	7.2E-03	5.3E-03	6.2E+00	6.2E+00	H
Thallium	6.4E-01	1.5E-07	4.5E-09	4.0E-08	1.9E-03	5.6E-05		1.9E-03	
Inorganics Pathway Total					1.9E-02	1.5E-02	6.2E+00	6.2E+00	
1,2-Dichloroethene	4.1E-03	9.6E-10	2.9E-10	2.6E-10	1.1E-07	3.2E-08		1.4E-07	
Organics Pathway Total					1.1E-07	3.2E-08		1.4E-07	
Pathway Total - Chemicals					1.9E-02	1.5E-02	6.2E+00	6.2E+00	
Water Tower									
Chromium	2.5E+02	5.9E-05	1.7E-06	1.6E-05	3.9E-05	9.0E-05		1.3E-04	
Thallium	6.4E-01	1.5E-07	4.5E-09	4.0E-08	1.9E-03	5.6E-05		1.9E-03	
Inorganics Pathway Total					1.9E-03	1.5E-04		2.1E-03	
Pathway Total - Chemicals					1.9E-03	1.5E-04		2.1E-03	
Open Industrial - Industrial Worker									
CB-13 and CB-10									
Antimony	1.3E+00	1.2E-06	8.1E-09	2.7E-10	3.1E-03	1.4E-04		3.2E-03	
Arsenic	1.1E+01	1.1E-05	2.2E-06	2.4E-09	3.6E-02	7.6E-03		4.4E-02	
Cadmium	6.5E+00	6.3E-06	4.2E-08	1.4E-09	6.3E-03	2.1E-04		6.6E-03	
Chromium	3.5E+01	3.4E-05	2.3E-07	7.5E-09	2.3E-05	1.2E-05		3.5E-05	
Manganese	1.3E+03	1.3E-03	8.5E-06	2.8E-07	2.8E-02	4.6E-03	1.9E-02	5.2E-02	
Thallium	4.9E-01	4.8E-07	3.1E-09	1.0E-10	6.0E-03	3.9E-05		6.0E-03	
Inorganics Pathway Total					7.9E-02	1.3E-02	1.9E-02	1.1E-01	
1,2-Dichloroethene	7.2E-03	7.0E-09	4.6E-10	1.5E-12	7.8E-07	5.1E-08		8.3E-07	
2,4,6-Trinitrotoluene	2.5E+01	2.5E-05	1.6E-05	5.3E-09	4.9E-02	3.3E-02		8.2E-02	
2,4-Dinitrotoluene	1.5E+00	1.5E-06	9.6E-07	3.1E-10	7.3E-04	4.8E-04		1.2E-03	
2,6-Dinitrotoluene	6.0E-01	5.9E-07	3.9E-07	1.3E-10	5.9E-04	3.9E-04		9.7E-04	
Heptachlor	1.7E-02	1.7E-08	1.1E-08	3.6E-12	3.3E-05	2.2E-05		5.5E-05	
PCB-1254	1.7E+00	1.7E-06	1.5E-06	3.6E-10	8.3E-02	9.6E-02		1.8E-01	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
RDX	3.7E+00	3.6E-06	2.4E-06	7.8E-10	1.2E-03	7.9E-04		2.0E-03	
Organics Pathway Total					1.4E-01	1.3E-01		2.7E-01	
Pathway Total - Chemicals					2.1E-01	1.4E-01	1.9E-02	3.8E-01	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	2.1E-05	4.1E-06	4.5E-09	7.0E-02	1.5E-02		8.4E-02	
Barium	1.4E+02	1.3E-04	8.7E-07	2.9E-08	1.9E-03	1.8E-04	2.0E-04	2.3E-03	
Cadmium	2.1E+00	2.0E-06	1.3E-08	4.4E-10	2.0E-03	6.7E-05		2.1E-03	
Chromium	2.8E+01	2.7E-05	1.8E-07	5.8E-09	1.8E-05	9.1E-06		2.7E-05	
Cyanide	1.1E+00	1.1E-06	7.2E-09	2.3E-10	5.4E-05	7.6E-07		5.5E-05	
Manganese	1.2E+03	1.2E-03	7.6E-06	2.5E-07	2.5E-02	4.1E-03	1.7E-02	4.7E-02	
Nickel	3.2E+01	3.1E-05	2.1E-07	6.7E-09	1.6E-03	2.6E-04		1.8E-03	
Thallium	9.1E-01	8.9E-07	5.9E-09	1.9E-10	1.1E-02	7.4E-05		1.1E-02	
Vanadium	3.5E+01	3.4E-05	2.3E-07	7.4E-09	4.9E-03	1.2E-03		6.1E-03	
Inorganics Pathway Total					1.2E-01	2.1E-02	1.8E-02	1.5E-01	
1,2-Dichloroethene	3.1E-03	3.0E-09	2.0E-10	6.6E-13	3.4E-07	2.2E-08		3.6E-07	
2,4,6-Trinitrotoluene	4.5E+00	4.4E-06	2.9E-06	9.5E-10	8.8E-03	5.8E-03		1.5E-02	
2,4-Dinitrotoluene	5.3E-01	5.1E-07	3.4E-07	1.1E-10	2.6E-04	1.7E-04		4.3E-04	
PCB-1254	4.7E+00	4.6E-06	4.2E-06	1.0E-09	2.3E-01	2.7E-01		5.0E-01	
RDX	2.9E+01	2.8E-05	1.8E-05	6.0E-09	9.3E-03	6.1E-03		1.5E-02	
Organics Pathway Total					2.5E-01	2.8E-01		5.3E-01	
Pathway Total - Chemicals					3.6E-01	3.0E-01	1.8E-02	6.8E-01	
CB-3/CB-801									
Antimony	1.1E+02	1.1E-04	7.1E-07	2.3E-08	2.7E-01	1.2E-02		2.8E-01	
Arsenic	1.3E+01	1.3E-05	2.5E-06	2.7E-09	4.2E-02	8.8E-03		5.1E-02	
Cadmium	6.3E+00	6.1E-06	4.1E-08	1.3E-09	6.1E-03	2.0E-04		6.3E-03	
Chromium	4.4E+01	4.3E-05	2.8E-07	9.3E-09	2.9E-05	1.5E-05		4.3E-05	
Manganese	1.3E+03	1.2E-03	8.1E-06	2.7E-07	2.7E-02	4.4E-03	1.9E-02	5.0E-02	
Thallium	6.0E-01	5.9E-07	3.9E-09	1.3E-10	7.3E-03	4.9E-05		7.4E-03	
Inorganics Pathway Total					3.5E-01	2.5E-02	1.9E-02	3.9E-01	
1,2-Dichloroethene	7.1E-03	7.0E-09	4.6E-10	1.5E-12	7.8E-07	5.1E-08		8.3E-07	
2,4-Dinitrotoluene	1.3E-01	1.3E-07	8.4E-08	2.8E-11	6.4E-05	4.2E-05		1.1E-04	
Dieldrin	3.3E-02	3.3E-08	2.2E-08	7.1E-12	6.5E-04	4.3E-04		1.1E-03	
PCB-1254	4.3E+00	4.2E-06	3.9E-06	9.1E-10	2.1E-01	2.4E-01		4.5E-01	
Organics Pathway Total					2.1E-01	2.4E-01		4.5E-01	
Pathway Total - Chemicals					5.6E-01	2.7E-01	1.9E-02	8.5E-01	
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	1.1E-05	2.1E-06	2.3E-09	3.6E-02	7.4E-03		4.3E-02	
Barium	1.4E+02	1.4E-04	9.0E-07	2.9E-08	1.9E-03	1.8E-04	2.1E-04	2.3E-03	
Cadmium	1.8E+00	1.8E-06	1.2E-08	3.8E-10	1.8E-03	5.8E-05		1.8E-03	
Chromium	2.5E+01	2.4E-05	1.6E-07	5.3E-09	1.6E-05	8.2E-06		2.4E-05	
Cyanide	5.5E-01	5.4E-07	3.6E-09	1.2E-10	2.7E-05	3.8E-07		2.7E-05	
Manganese	7.0E+02	6.9E-04	4.5E-06	1.5E-07	1.5E-02	2.5E-03	1.0E-02	2.8E-02	
Mercury	3.4E-01	3.3E-07	2.2E-09	7.2E-11	1.1E-03	1.1E-04		1.2E-03	
Thallium	5.4E-01	5.2E-07	3.5E-09	1.1E-10	6.5E-03	4.3E-05		6.6E-03	
Vanadium	1.9E+01	1.9E-05	1.2E-07	4.0E-09	2.7E-03	6.8E-04		3.3E-03	
Inorganics Pathway Total					6.5E-02	1.1E-02	1.1E-02	8.6E-02	
1,2-Dichloroethene	1.2E-02	1.2E-08	7.8E-10	2.6E-12	1.3E-06	8.7E-08		1.4E-06	
1,3-Dinitrobenzene	5.9E+00	5.8E-06	3.8E-06	1.2E-09	5.8E-02	3.8E-02		9.6E-02	
2,4,6-Trinitrotoluene	3.0E+02	2.9E-04	1.9E-04	6.3E-08	5.8E-01	3.8E-01		9.7E-01	
2,4-Dinitrotoluene	2.3E-01	2.3E-07	1.5E-07	4.9E-11	1.1E-04	7.4E-05		1.9E-04	
2,6-Dinitrotoluene	8.6E-01	8.4E-07	5.6E-07	1.8E-10	8.4E-04	5.6E-04		1.4E-03	
Dieldrin	9.8E-02	9.6E-08	6.4E-08	2.1E-11	1.9E-03	1.3E-03		3.2E-03	
Endrin aldehyde	4.4E+00	4.3E-06	2.8E-06	9.3E-10	1.4E-02	9.5E-03		2.4E-02	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Heptachlor	7.2E-02	7.0E-08	4.6E-08	1.5E-11	1.4E-04	9.3E-05		2.3E-04	
Heptachlor epoxide	3.1E-02	3.0E-08	2.0E-08	6.6E-12	2.3E-03	1.5E-03		3.9E-03	
PCB-1254	1.1E+03	1.1E-03	9.9E-04	2.3E-07	5.4E+01	6.2E+01		1.2E+02	H
RDX	1.0E+02	9.8E-05	6.5E-05	2.1E-08	3.3E-02	2.2E-02		5.4E-02	
alpha-Chlordane	7.8E-02	7.6E-08	2.0E-08	1.7E-11	1.5E-04	5.0E-05	8.3E-08	2.0E-04	
gamma-Chlordane	8.9E-01	8.7E-07	2.3E-07	1.9E-10	1.7E-03	5.7E-04	9.4E-07	2.3E-03	
Organics Pathway Total					5.5E+01	6.3E+01	1.0E-06	1.2E+02	
Pathway Total - Chemicals					5.5E+01	6.3E+01	1.1E-02	1.2E+02	
Change Houses (CB-12, -23, -8, -22)									
Antimony	2.3E+00	2.2E-06	1.5E-08	4.8E-10	5.5E-03	2.4E-04		5.8E-03	
Arsenic	1.2E+01	1.2E-05	2.4E-06	2.6E-09	4.0E-02	8.3E-03		4.8E-02	
Cadmium	3.3E+00	3.2E-06	2.1E-08	7.0E-10	3.2E-03	1.1E-04		3.3E-03	
Chromium	1.5E+01	1.5E-05	9.7E-08	3.2E-09	9.8E-06	5.0E-06		1.5E-05	
Manganese	8.3E+02	8.1E-04	5.4E-06	1.8E-07	1.8E-02	2.9E-03	1.2E-02	3.3E-02	
Thallium	4.3E-01	4.2E-07	2.8E-09	9.2E-11	5.3E-03	3.5E-05		5.3E-03	
Inorganics Pathway Total					7.1E-02	1.2E-02	1.2E-02	9.5E-02	
PCB-1254	1.1E-01	1.1E-07	9.9E-08	2.3E-11	5.4E-03	6.2E-03		1.2E-02	
Organics Pathway Total					5.4E-03	6.2E-03		1.2E-02	
Pathway Total - Chemicals					7.7E-02	1.8E-02	1.2E-02	1.1E-01	
Perimeter Area									
Arsenic	1.3E+01	1.2E-05	2.4E-06	2.7E-09	4.1E-02	8.5E-03		4.9E-02	
Chromium	1.7E+01	1.6E-05	1.1E-07	3.6E-09	1.1E-05	5.6E-06		1.7E-05	
Cyanide	5.6E-01	5.4E-07	3.6E-09	1.2E-10	2.7E-05	3.8E-07		2.8E-05	
Manganese	1.4E+03	1.4E-03	9.1E-06	3.0E-07	3.0E-02	4.9E-03	2.1E-02	5.6E-02	
Thallium	6.4E-01	6.3E-07	4.1E-09	1.4E-10	7.9E-03	5.2E-05		7.9E-03	
Inorganics Pathway Total					7.9E-02	1.4E-02	2.1E-02	1.1E-01	
1,2-Dichloroethene	4.1E-03	4.0E-09	2.6E-10	8.7E-13	4.5E-07	2.9E-08		4.8E-07	
Organics Pathway Total					4.5E-07	2.9E-08		4.8E-07	
Pathway Total - Chemicals					7.9E-02	1.4E-02	2.1E-02	1.1E-01	
Water Tower									
Chromium	2.5E+02	2.5E-04	1.6E-06	5.3E-08	1.6E-04	8.3E-05		2.5E-04	
Thallium	6.4E-01	6.3E-07	4.2E-09	1.4E-10	7.9E-03	5.2E-05		7.9E-03	
Inorganics Pathway Total					8.1E-03	1.3E-04		8.2E-03	
Pathway Total - Chemicals					8.1E-03	1.3E-04		8.2E-03	
Open Recreational - Recreator									
CB-13 and CB-10									
Antimony	1.3E+00	1.5E-08	1.5E-09	3.3E-12	3.9E-05	2.5E-05		6.3E-05	
Arsenic	1.1E+01	1.4E-07	3.9E-07	2.9E-11	4.5E-04	1.4E-03		1.8E-03	
Cadmium	6.5E+00	7.9E-08	7.6E-09	1.7E-11	7.9E-05	3.8E-05		1.2E-04	
Chromium	3.5E+01	4.3E-07	4.1E-08	9.3E-11	2.9E-07	2.1E-06		2.4E-06	
Manganese	1.3E+03	1.6E-05	1.5E-06	3.5E-09	3.5E-04	8.3E-04	2.4E-04	1.4E-03	
Thallium	4.9E-01	6.0E-09	5.7E-10	1.3E-12	7.4E-05	7.1E-06		8.2E-05	
Inorganics Pathway Total					9.9E-04	2.3E-03	2.4E-04	3.5E-03	
1,2-Dichloroethene	7.2E-03	8.8E-11	8.4E-11	1.9E-14	9.7E-09	9.3E-09		1.9E-08	
2,4,6-Trinitrotoluene	2.5E+01	3.1E-07	3.0E-06	6.7E-11	6.2E-04	5.9E-03		6.5E-03	
2,4-Dinitrotoluene	1.5E+00	1.8E-08	1.7E-07	3.9E-12	9.1E-06	8.7E-05		9.6E-05	
2,6-Dinitrotoluene	6.0E-01	7.3E-09	7.0E-08	1.6E-12	7.3E-06	7.0E-05		7.8E-05	
Heptachlor	1.7E-02	2.1E-10	2.0E-09	4.5E-14	4.1E-07	4.0E-06		4.4E-06	
PCB-1254	1.7E+00	2.1E-08	2.8E-07	4.5E-12	1.0E-03	1.7E-02		1.8E-02	
RDX	3.7E+00	4.5E-08	4.3E-07	9.8E-12	1.5E-05	1.4E-04		1.6E-04	
Organics Pathway Total					1.7E-03	2.4E-02		2.5E-02	
Pathway Total - Chemicals					2.7E-03	2.6E-02	2.4E-04	2.9E-02	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	2.6E-07	7.5E-07	5.7E-11	8.7E-04	2.6E-03		3.5E-03	
Barium	1.4E+02	1.7E-06	1.6E-07	3.6E-10	2.4E-05	3.2E-05	2.5E-06	5.8E-05	
Cadmium	2.1E+00	2.5E-08	2.4E-09	5.5E-12	2.5E-05	1.2E-05		3.7E-05	
Chromium	2.8E+01	3.4E-07	3.2E-08	7.3E-11	2.2E-07	1.7E-06		1.9E-06	
Cyanide	1.1E+00	1.4E-08	1.3E-09	2.9E-12	6.8E-07	1.4E-07		8.2E-07	
Manganese	1.2E+03	1.4E-05	1.4E-06	3.1E-09	3.1E-04	7.5E-04	2.2E-04	1.3E-03	
Nickel	3.2E+01	3.9E-07	3.7E-08	8.4E-11	1.9E-05	4.7E-05		6.6E-05	
Thallium	9.1E-01	1.1E-08	1.1E-09	2.4E-12	1.4E-04	1.3E-05		1.5E-04	
Vanadium	3.5E+01	4.3E-07	4.1E-08	9.3E-11	6.1E-05	2.3E-04		2.9E-04	
Inorganics Pathway Total					1.5E-03	3.7E-03	2.2E-04	5.4E-03	
1,2-Dichloroethene	3.1E-03	3.8E-11	3.6E-11	8.2E-15	4.2E-09	4.0E-09		8.2E-09	
2,4,6-Trinitrotoluene	4.5E+00	5.5E-08	5.3E-07	1.2E-11	1.1E-04	1.1E-03		1.2E-03	
2,4-Dinitrotoluene	5.3E-01	6.4E-09	6.2E-08	1.4E-12	3.2E-06	3.1E-05		3.4E-05	
PCB-1254	4.7E+00	5.7E-08	7.7E-07	1.2E-11	2.9E-03	4.8E-02		5.1E-02	
RDX	2.9E+01	3.5E-07	3.3E-06	7.6E-11	1.2E-04	1.1E-03		1.2E-03	
Organics Pathway Total					3.1E-03	5.0E-02		5.3E-02	
Pathway Total - Chemicals					4.6E-03	5.4E-02	2.2E-04	5.9E-02	
CB-3/CB-801									
Antimony	1.1E+02	1.3E-06	1.3E-07	2.9E-10	3.4E-03	2.1E-03		5.5E-03	
Arsenic	1.3E+01	1.6E-07	4.5E-07	3.4E-11	5.3E-04	1.6E-03		2.1E-03	
Cadmium	6.3E+00	7.7E-08	7.4E-09	1.7E-11	7.7E-05	3.7E-05		1.1E-04	
Chromium	4.4E+01	5.4E-07	5.1E-08	1.2E-10	3.6E-07	2.6E-06		3.0E-06	
Manganese	1.3E+03	1.5E-05	1.5E-06	3.3E-09	3.4E-04	8.0E-04	2.3E-04	1.4E-03	
Thallium	6.0E-01	7.3E-09	7.0E-10	1.6E-12	9.2E-05	8.8E-06		1.0E-04	
Inorganics Pathway Total					4.4E-03	4.6E-03	2.3E-04	9.2E-03	
1,2-Dichloroethene	7.1E-03	8.7E-11	8.4E-11	1.9E-14	9.7E-09	9.3E-09		1.9E-08	
2,4-Dinitrotoluene	1.3E-01	1.6E-09	1.5E-08	3.5E-13	8.0E-07	7.6E-06		8.4E-06	
Dieldrin	3.3E-02	4.1E-10	3.9E-09	8.8E-14	8.2E-06	7.8E-05		8.6E-05	
PCB-1254	4.3E+00	5.3E-08	7.1E-07	1.1E-11	2.6E-03	4.4E-02		4.7E-02	
Organics Pathway Total					2.6E-03	4.4E-02		4.7E-02	
Pathway Total - Chemicals					7.0E-03	4.9E-02	2.3E-04	5.6E-02	
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	1.3E-07	3.8E-07	2.9E-11	4.4E-04	1.3E-03		1.8E-03	
Barium	1.4E+02	1.7E-06	1.6E-07	3.7E-10	2.4E-05	3.3E-05	2.6E-06	6.0E-05	
Cadmium	1.8E+00	2.2E-08	2.1E-09	4.8E-12	2.2E-05	1.1E-05		3.3E-05	
Chromium	2.5E+01	3.0E-07	2.9E-08	6.6E-11	2.0E-07	1.5E-06		1.7E-06	
Cyanide	5.5E-01	6.8E-09	6.5E-10	1.5E-12	3.4E-07	6.9E-08		4.1E-07	
Manganese	7.0E+02	8.6E-06	8.2E-07	1.9E-09	1.9E-04	4.5E-04	1.3E-04	7.6E-04	
Mercury	3.4E-01	4.2E-09	4.0E-10	9.1E-13	1.4E-05	1.9E-05		3.3E-05	
Thallium	5.4E-01	6.5E-09	6.3E-10	1.4E-12	8.2E-05	7.8E-06		9.0E-05	
Vanadium	1.9E+01	2.3E-07	2.2E-08	5.0E-11	3.3E-05	1.2E-04		1.6E-04	
Inorganics Pathway Total					8.1E-04	2.0E-03	1.3E-04	2.9E-03	
1,2-Dichloroethene	1.2E-02	1.5E-10	1.4E-10	3.2E-14	1.6E-08	1.6E-08		3.2E-08	
1,3-Dinitrobenzene	5.9E+00	7.2E-08	6.9E-07	1.6E-11	7.2E-04	6.9E-03		7.6E-03	
2,4,6-Trinitrotoluene	3.0E+02	3.6E-06	3.5E-05	7.9E-10	7.3E-03	7.0E-02		7.7E-02	
2,4-Dinitrotoluene	2.3E-01	2.8E-09	2.7E-08	6.1E-13	1.4E-06	1.3E-05		1.5E-05	
2,6-Dinitrotoluene	8.6E-01	1.1E-08	1.0E-07	2.3E-12	1.1E-05	1.0E-04		1.1E-04	
Dieldrin	9.8E-02	1.2E-09	1.2E-08	2.6E-13	2.4E-05	2.3E-04		2.5E-04	
Endrin aldehyde	4.4E+00	5.4E-08	5.2E-07	1.2E-11	1.8E-04	1.7E-03		1.9E-03	
Heptachlor	7.2E-02	8.8E-10	8.4E-09	1.9E-13	1.8E-06	1.7E-05		1.9E-05	
Heptachlor epoxide	3.1E-02	3.8E-10	3.6E-09	8.2E-14	2.9E-05	2.8E-04		3.1E-04	
PCB-1254	1.1E+03	1.3E-05	1.8E-04	2.9E-09	6.7E-01	1.1E+01		1.2E+01	H

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
RDX	1.0E+02	1.2E-06	1.2E-05	2.7E-10	4.1E-04	3.9E-03		4.3E-03	
alpha-Chlordane	7.8E-02	9.5E-10	3.7E-09	2.1E-13	1.9E-06	9.1E-06	1.0E-09	1.1E-05	
gamma-Chlordane	8.9E-01	1.1E-08	4.2E-08	2.4E-12	2.2E-05	1.0E-04	1.2E-08	1.3E-04	
Organics Pathway Total					6.8E-01	1.1E+01	1.3E-08	1.2E+01	
Pathway Total - Chemicals					6.8E-01	1.1E+01	1.3E-04	1.2E+01	
Change Houses (CB-12, -23, -8, -22)									
Antimony	2.3E+00	2.8E-08	2.6E-09	6.0E-12	6.9E-05	4.4E-05		1.1E-04	
Arsenic	1.2E+01	1.5E-07	4.3E-07	3.2E-11	5.0E-04	1.5E-03		2.0E-03	
Cadmium	3.3E+00	4.0E-08	3.8E-09	8.7E-12	4.0E-05	1.9E-05		5.9E-05	
Chromium	1.5E+01	1.8E-07	1.8E-08	4.0E-11	1.2E-07	9.1E-07		1.0E-06	
Manganese	8.3E+02	1.0E-05	9.7E-07	2.2E-09	2.2E-04	5.3E-04	1.5E-04	9.0E-04	
Thallium	4.3E-01	5.3E-09	5.1E-10	1.1E-12	6.6E-05	6.3E-06		7.2E-05	
Inorganics Pathway Total					8.9E-04	2.1E-03	1.5E-04	3.1E-03	
PCB-1254	1.1E-01	1.3E-09	1.8E-08	2.9E-13	6.7E-05	1.1E-03		1.2E-03	
Organics Pathway Total					6.7E-05	1.1E-03		1.2E-03	
Pathway Total - Chemicals					9.6E-04	3.2E-03	1.5E-04	4.3E-03	
Perimeter Area									
Arsenic	1.3E+01	1.5E-07	4.4E-07	3.3E-11	5.1E-04	1.5E-03		2.1E-03	
Chromium	1.7E+01	2.1E-07	2.0E-08	4.4E-11	1.4E-07	1.0E-06		1.1E-06	
Cyanide	5.6E-01	6.8E-09	6.5E-10	1.5E-12	3.4E-07	6.9E-08		4.1E-07	
Manganese	1.4E+03	1.7E-05	1.6E-06	3.7E-09	3.7E-04	9.0E-04	2.6E-04	1.5E-03	
Thallium	6.4E-01	7.9E-09	7.5E-10	1.7E-12	9.8E-05	9.4E-06		1.1E-04	
Inorganics Pathway Total					9.8E-04	2.5E-03	2.6E-04	3.7E-03	
1,2-Dichloroethene	4.1E-03	5.0E-11	4.8E-11	1.1E-14	5.6E-09	5.3E-09		1.1E-08	
Organics Pathway Total					5.6E-09	5.3E-09		1.1E-08	
Pathway Total - Chemicals					9.8E-04	2.5E-03	2.6E-04	3.7E-03	
Water Tower									
Chromium	2.5E+02	3.1E-06	2.9E-07	6.6E-10	2.0E-06	1.5E-05		1.7E-05	
Thallium	6.4E-01	7.9E-09	7.6E-10	1.7E-12	9.9E-05	9.4E-06		1.1E-04	
Inorganics Pathway Total					1.0E-04	2.4E-05		1.3E-04	
Pathway Total - Chemicals					1.0E-04	2.4E-05		1.3E-04	
Open Residential - Resident Farmer (Adult)									
CB-13 and CB-10									
Antimony	1.3E+00	1.7E-06	3.9E-08	3.7E-10	4.3E-03	6.6E-04		5.0E-03	
Arsenic	1.1E+01	1.5E-05	1.0E-05	3.3E-09	5.1E-02	3.7E-02		8.7E-02	
Cadmium	6.5E+00	8.9E-06	2.0E-07	1.9E-09	8.9E-03	1.0E-03		9.9E-03	
Chromium	3.5E+01	4.8E-05	1.1E-06	1.0E-08	3.2E-05	5.6E-05		8.9E-05	
Manganese	1.3E+03	1.8E-03	4.1E-05	3.9E-07	3.9E-02	2.2E-02	2.7E-02	8.8E-02	
Thallium	4.9E-01	6.7E-07	1.5E-08	1.4E-10	8.3E-03	1.9E-04		8.5E-03	
Inorganics Pathway Total					1.1E-01	6.1E-02	2.7E-02	2.0E-01	
1,2-Dichloroethene	7.2E-03	9.8E-09	2.2E-09	2.1E-12	1.1E-06	2.5E-07		1.3E-06	
2,4,6-Trinitrotoluene	2.5E+01	3.5E-05	7.9E-05	7.5E-09	6.9E-02	1.6E-01		2.3E-01	
2,4-Dinitrotoluene	1.5E+00	2.0E-06	4.6E-06	4.4E-10	1.0E-03	2.3E-03		3.3E-03	
2,6-Dinitrotoluene	6.0E-01	8.2E-07	1.9E-06	1.8E-10	8.2E-04	1.9E-03		2.7E-03	
Heptachlor	1.7E-02	2.3E-08	5.3E-08	5.0E-12	4.6E-05	1.1E-04		1.5E-04	
PCB-1254	1.7E+00	2.3E-06	7.4E-06	5.0E-10	1.2E-01	4.6E-01		5.8E-01	
RDX	3.7E+00	5.1E-06	1.2E-05	1.1E-09	1.7E-03	3.8E-03		5.5E-03	
Organics Pathway Total					1.9E-01	6.3E-01		8.2E-01	
Pathway Total - Chemicals					3.0E-01	6.9E-01	2.7E-02	1.0E+00	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	2.9E-05	2.0E-05	6.4E-09	9.8E-02	7.0E-02		1.7E-01	
Barium	1.4E+02	1.9E-04	4.2E-06	4.0E-08	2.6E-03	8.6E-04	2.8E-04	3.8E-03	
Cadmium	2.1E+00	2.8E-06	6.5E-08	6.1E-10	2.8E-03	3.2E-04		3.2E-03	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Chromium	2.8E+01	3.8E-05	8.6E-07	8.2E-09	2.5E-05	4.4E-05		6.9E-05	
Cyanide	1.1E+00	1.5E-06	3.5E-08	3.3E-10	7.6E-05	3.7E-06		8.0E-05	
Manganese	1.2E+03	1.6E-03	3.7E-05	3.5E-07	3.5E-02	2.0E-02	2.4E-02	8.0E-02	
Nickel	3.2E+01	4.4E-05	9.9E-07	9.4E-09	2.2E-03	1.2E-03		3.4E-03	
Thallium	9.1E-01	1.2E-06	2.8E-08	2.7E-10	1.6E-02	3.6E-04		1.6E-02	
Vanadium	3.5E+01	4.8E-05	1.1E-06	1.0E-08	6.8E-03	6.0E-03		1.3E-02	
Inorganics Pathway Total					1.6E-01	9.9E-02	2.5E-02	2.9E-01	
1,2-Dichloroethene	3.1E-03	4.2E-09	9.7E-10	9.2E-13	4.7E-07	1.1E-07		5.8E-07	
2,4,6-Trinitrotoluene	4.5E+00	6.2E-06	1.4E-05	1.3E-09	1.2E-02	2.8E-02		4.0E-02	
2,4-Dinitrotoluene	5.3E-01	7.2E-07	1.6E-06	1.6E-10	3.6E-04	8.2E-04		1.2E-03	
PCB-1254	4.7E+00	6.4E-06	2.1E-05	1.4E-09	3.2E-01	1.3E+00		1.6E+00	H
RDX	2.9E+01	3.9E-05	8.9E-05	8.5E-09	1.3E-02	3.0E-02		4.3E-02	
Organics Pathway Total					3.5E-01	1.3E+00		1.7E+00	
Pathway Total - Chemicals					5.1E-01	1.4E+00	2.5E-02	2.0E+00	
CB-3/CB-801									
Antimony	1.1E+02	1.5E-04	3.4E-06	3.3E-08	3.8E-01	5.7E-02		4.3E-01	
Arsenic	1.3E+01	1.8E-05	1.2E-05	3.8E-09	5.9E-02	4.2E-02		1.0E-01	
Cadmium	6.3E+00	8.6E-06	2.0E-07	1.9E-09	8.6E-03	9.8E-04		9.6E-03	
Chromium	4.4E+01	6.0E-05	1.4E-06	1.3E-08	4.0E-05	7.0E-05		1.1E-04	
Manganese	1.3E+03	1.7E-03	3.9E-05	3.7E-07	3.8E-02	2.1E-02	2.6E-02	8.5E-02	
Thallium	6.0E-01	8.2E-07	1.9E-08	1.8E-10	1.0E-02	2.3E-04		1.1E-02	
Inorganics Pathway Total					4.9E-01	1.2E-01	2.6E-02	6.4E-01	
1,2-Dichloroethene	7.1E-03	9.8E-09	2.2E-09	2.1E-12	1.1E-06	2.5E-07		1.3E-06	
2,4-Dinitrotoluene	1.3E-01	1.8E-07	4.1E-07	3.9E-11	8.9E-05	2.0E-04		2.9E-04	
Dieldrin	3.3E-02	4.6E-08	1.0E-07	9.9E-12	9.1E-04	2.1E-03		3.0E-03	
PCB-1254	4.3E+00	5.9E-06	1.9E-05	1.3E-09	2.9E-01	1.2E+00		1.5E+00	H
Organics Pathway Total					3.0E-01	1.2E+00		1.5E+00	
Pathway Total - Chemicals					7.9E-01	1.3E+00	2.6E-02	2.1E+00	
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	1.5E-05	1.0E-05	3.2E-09	5.0E-02	3.6E-02		8.6E-02	
Barium	1.4E+02	1.9E-04	4.3E-06	4.1E-08	2.7E-03	8.9E-04	2.9E-04	3.9E-03	
Cadmium	1.8E+00	2.5E-06	5.7E-08	5.4E-10	2.5E-03	2.8E-04		2.8E-03	
Chromium	2.5E+01	3.4E-05	7.8E-07	7.4E-09	2.3E-05	4.0E-05		6.3E-05	
Cyanide	5.5E-01	7.6E-07	1.7E-08	1.6E-10	3.8E-05	1.8E-06		4.0E-05	
Manganese	7.0E+02	9.6E-04	2.2E-05	2.1E-07	2.1E-02	1.2E-02	1.5E-02	4.7E-02	
Mercury	3.4E-01	4.7E-07	1.1E-08	1.0E-10	1.6E-03	5.1E-04		2.1E-03	
Thallium	5.4E-01	7.3E-07	1.7E-08	1.6E-10	9.2E-03	2.1E-04		9.4E-03	
Vanadium	1.9E+01	2.6E-05	5.9E-07	5.7E-09	3.7E-03	3.3E-03		7.0E-03	
Inorganics Pathway Total					9.0E-02	5.3E-02	1.5E-02	1.6E-01	
1,2-Dichloroethene	1.2E-02	1.7E-08	3.8E-09	3.6E-12	1.8E-06	4.2E-07		2.3E-06	
1,3-Dinitrobenzene	5.9E+00	8.1E-06	1.8E-05	1.7E-09	8.1E-02	1.8E-01		2.6E-01	
2,4,6-Trinitrotoluene	3.0E+02	4.1E-04	9.3E-04	8.8E-08	8.1E-01	1.9E+00		2.7E+00	H
2,4-Dinitrotoluene	2.3E-01	3.2E-07	7.2E-07	6.8E-11	1.6E-04	3.6E-04		5.2E-04	
2,6-Dinitrotoluene	8.6E-01	1.2E-06	2.7E-06	2.6E-10	1.2E-03	2.7E-03		3.9E-03	
Dieldrin	9.8E-02	1.3E-07	3.1E-07	2.9E-11	2.7E-03	6.2E-03		8.8E-03	
Endrin aldehyde	4.4E+00	6.0E-06	1.4E-05	1.3E-09	2.0E-02	4.6E-02		6.6E-02	
Heptachlor	7.2E-02	9.8E-08	2.2E-07	2.1E-11	2.0E-04	4.5E-04		6.5E-04	
Heptachlor epoxide	3.1E-02	4.2E-08	9.7E-08	9.2E-12	3.3E-03	7.4E-03		1.1E-02	
PCB-1254	1.1E+03	1.5E-03	4.8E-03	3.3E-07	7.5E+01	3.0E+02		3.8E+02	H
RDX	1.0E+02	1.4E-04	3.1E-04	3.0E-08	4.6E-02	1.0E-01		1.5E-01	
alpha-Chlordane	7.8E-02	1.1E-07	9.7E-08	2.3E-11	2.1E-04	2.4E-04	1.2E-07	4.6E-04	
gamma-Chlordane	8.9E-01	1.2E-06	1.1E-06	2.6E-10	2.4E-03	2.8E-03	1.3E-06	5.2E-03	
Organics Pathway Total					7.6E+01	3.0E+02	1.4E-06	3.8E+02	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Pathway Total - Chemicals					7.6E+01	3.0E+02	1.5E-02	3.8E+02	
Change Houses (CB-12, -23, -8, -22)									
Antimony	2.3E+00	3.1E-06	7.0E-08	6.7E-10	7.7E-03	1.2E-03		8.9E-03	
Arsenic	1.2E+01	1.7E-05	1.1E-05	3.6E-09	5.6E-02	4.0E-02		9.6E-02	
Cadmium	3.3E+00	4.5E-06	1.0E-07	9.7E-10	4.5E-03	5.1E-04		5.0E-03	
Chromium	1.5E+01	2.1E-05	4.7E-07	4.5E-09	1.4E-05	2.4E-05		3.8E-05	
Manganese	8.3E+02	1.1E-03	2.6E-05	2.5E-07	2.5E-02	1.4E-02	1.7E-02	5.6E-02	
Thallium	4.3E-01	5.9E-07	1.4E-08	1.3E-10	7.4E-03	1.7E-04		7.6E-03	
Inorganics Pathway Total					1.0E-01	5.6E-02	1.7E-02	1.7E-01	
PCB-1254	1.1E-01	1.5E-07	4.8E-07	3.3E-11	7.5E-03	3.0E-02		3.8E-02	
Organics Pathway Total					7.5E-03	3.0E-02		3.8E-02	
Pathway Total - Chemicals					1.1E-01	8.6E-02	1.7E-02	2.1E-01	
Perimeter Area									
Arsenic	1.3E+01	1.7E-05	1.2E-05	3.7E-09	5.7E-02	4.1E-02		9.9E-02	
Chromium	1.7E+01	2.3E-05	5.2E-07	5.0E-09	1.5E-05	2.7E-05		4.2E-05	
Cyanide	5.6E-01	7.6E-07	1.7E-08	1.6E-10	3.8E-05	1.8E-06		4.0E-05	
Manganese	1.4E+03	1.9E-03	4.4E-05	4.2E-07	4.2E-02	2.4E-02	2.9E-02	9.5E-02	
Thallium	6.4E-01	8.8E-07	2.0E-08	1.9E-10	1.1E-02	2.5E-04		1.1E-02	
Inorganics Pathway Total					1.1E-01	6.5E-02	2.9E-02	2.0E-01	
1,2-Dichloroethene	4.1E-03	5.6E-09	1.3E-09	1.2E-12	6.2E-07	1.4E-07		7.7E-07	
Organics Pathway Total					6.2E-07	1.4E-07		7.7E-07	
Pathway Total - Chemicals					1.1E-01	6.5E-02	2.9E-02	2.0E-01	
Water Tower									
Chromium	2.5E+02	3.4E-04	7.8E-06	7.4E-08	2.3E-04	4.0E-04		6.3E-04	
Thallium	6.4E-01	8.8E-07	2.0E-08	1.9E-10	1.1E-02	2.5E-04		1.1E-02	
Inorganics Pathway Total					1.1E-02	6.5E-04		1.2E-02	
Pathway Total - Chemicals					1.1E-02	6.5E-04		1.2E-02	
Open Residential - Resident Farmer (Child)									
CB-13 and CB-10									
Antimony	1.3E+00	1.6E-05	3.5E-08	8.7E-10	4.0E-02	5.9E-04		4.1E-02	
Arsenic	1.1E+01	1.4E-04	9.4E-06	7.7E-09	4.7E-01	3.3E-02		5.1E-01	
Cadmium	6.5E+00	8.3E-05	1.8E-07	4.5E-09	8.3E-02	9.1E-04		8.4E-02	
Chromium	3.5E+01	4.5E-04	9.9E-07	2.4E-08	3.0E-04	5.1E-05		3.5E-04	
Manganese	1.3E+03	1.7E-02	3.7E-05	9.1E-07	3.6E-01	2.0E-02	6.3E-02	4.5E-01	
Thallium	4.9E-01	6.2E-06	1.4E-08	3.4E-10	7.8E-02	1.7E-04		7.8E-02	
Inorganics Pathway Total					1.0E+00	5.5E-02	6.3E-02	1.2E+00	
1,2-Dichloroethene	7.2E-03	9.2E-08	2.0E-09	5.0E-12	1.0E-05	2.2E-07		1.0E-05	
2,4,6-Trinitrotoluene	2.5E+01	3.2E-04	7.1E-05	1.7E-08	6.5E-01	1.4E-01		7.9E-01	
2,4-Dinitrotoluene	1.5E+00	1.9E-05	4.2E-06	1.0E-09	9.5E-03	2.1E-03		1.2E-02	
2,6-Dinitrotoluene	6.0E-01	7.7E-06	1.7E-06	4.2E-10	7.7E-03	1.7E-03		9.4E-03	
Heptachlor	1.7E-02	2.2E-07	4.7E-08	1.2E-11	4.3E-04	9.5E-05		5.3E-04	
PCB-1254	1.7E+00	2.2E-05	6.7E-06	1.2E-09	1.1E+00	4.2E-01		1.5E+00	H
RDX	3.7E+00	4.7E-05	1.0E-05	2.6E-09	1.6E-02	3.5E-03		1.9E-02	
Organics Pathway Total					1.8E+00	5.7E-01		2.3E+00	
Pathway Total - Chemicals					2.8E+00	6.2E-01	6.3E-02	3.5E+00	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	2.7E-04	1.8E-05	1.5E-08	9.1E-01	6.3E-02		9.8E-01	
Barium	1.4E+02	1.7E-03	3.8E-06	9.4E-08	2.5E-02	7.8E-04	6.5E-04	2.6E-02	
Cadmium	2.1E+00	2.7E-05	5.8E-08	1.4E-09	2.7E-02	2.9E-04		2.7E-02	
Chromium	2.8E+01	3.5E-04	7.8E-07	1.9E-08	2.4E-04	4.0E-05		2.7E-04	
Cyanide	1.1E+00	1.4E-05	3.1E-08	7.7E-10	7.1E-04	3.3E-06		7.1E-04	
Manganese	1.2E+03	1.5E-02	3.3E-05	8.2E-07	3.3E-01	1.8E-02	5.7E-02	4.0E-01	
Nickel	3.2E+01	4.1E-04	8.9E-07	2.2E-08	2.0E-02	1.1E-03		2.1E-02	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Thallium	9.1E-01	1.2E-05	2.6E-08	6.3E-10	1.5E-01	3.2E-04		1.5E-01	
Vanadium	3.5E+01	4.5E-04	9.8E-07	2.4E-08	6.4E-02	5.4E-03		6.9E-02	
Inorganics Pathway Total					1.5E+00	8.9E-02	5.8E-02	1.7E+00	
1,2-Dichloroethene	3.1E-03	4.0E-08	8.7E-10	2.1E-12	4.4E-06	9.7E-08		4.5E-06	
2,4,6-Trinitrotoluene	4.5E+00	5.8E-05	1.3E-05	3.1E-09	1.2E-01	2.5E-02		1.4E-01	
2,4-Dinitrotoluene	5.3E-01	6.7E-06	1.5E-06	3.6E-10	3.4E-03	7.4E-04		4.1E-03	
PCB-1254	4.7E+00	6.0E-05	1.9E-05	3.3E-09	3.0E+00	1.2E+00		4.2E+00	H
RDX	2.9E+01	3.6E-04	8.0E-05	2.0E-08	1.2E-01	2.7E-02		1.5E-01	
Organics Pathway Total					3.2E+00	1.2E+00		4.5E+00	
Pathway Total - Chemicals					4.8E+00	1.3E+00	5.8E-02	6.1E+00	
CB-3/CB-801									
Antimony	1.1E+02	1.4E-03	3.1E-06	7.6E-08	3.5E+00	5.1E-02		3.6E+00	H
Arsenic	1.3E+01	1.6E-04	1.1E-05	8.9E-09	5.5E-01	3.8E-02		5.9E-01	
Cadmium	6.3E+00	8.0E-05	1.8E-07	4.3E-09	8.0E-02	8.8E-04		8.1E-02	
Chromium	4.4E+01	5.6E-04	1.2E-06	3.0E-08	3.7E-04	6.3E-05		4.4E-04	
Manganese	1.3E+03	1.6E-02	3.5E-05	8.7E-07	3.5E-01	1.9E-02	6.1E-02	4.3E-01	
Thallium	6.0E-01	7.7E-06	1.7E-08	4.2E-10	9.6E-02	2.1E-04		9.6E-02	
Inorganics Pathway Total					4.6E+00	1.1E-01	6.1E-02	4.8E+00	
1,2-Dichloroethene	7.1E-03	9.1E-08	2.0E-09	4.9E-12	1.0E-05	2.2E-07		1.0E-05	
2,4-Dinitrotoluene	1.3E-01	1.7E-06	3.7E-07	9.0E-11	8.3E-04	1.8E-04		1.0E-03	
Dieldrin	3.3E-02	4.3E-07	9.4E-08	2.3E-11	8.5E-03	1.9E-03		1.0E-02	
PCB-1254	4.3E+00	5.5E-05	1.7E-05	3.0E-09	2.7E+00	1.1E+00		3.8E+00	H
Organics Pathway Total					2.8E+00	1.1E+00		3.8E+00	
Pathway Total - Chemicals					7.3E+00	1.2E+00	6.1E-02	8.6E+00	
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	1.4E-04	9.2E-06	7.5E-09	4.6E-01	3.2E-02		5.0E-01	
Barium	1.4E+02	1.8E-03	3.9E-06	9.6E-08	2.5E-02	8.0E-04	6.7E-04	2.7E-02	
Cadmium	1.8E+00	2.3E-05	5.1E-08	1.3E-09	2.3E-02	2.5E-04		2.3E-02	
Chromium	2.5E+01	3.2E-04	7.0E-07	1.7E-08	2.1E-04	3.6E-05		2.5E-04	
Cyanide	5.5E-01	7.1E-06	1.6E-08	3.8E-10	3.5E-04	1.7E-06		3.6E-04	
Manganese	7.0E+02	9.0E-03	2.0E-05	4.8E-07	1.9E-01	1.1E-02	3.4E-02	2.4E-01	
Mercury	3.4E-01	4.4E-06	9.6E-09	2.4E-10	1.5E-02	4.6E-04		1.5E-02	
Thallium	5.4E-01	6.8E-06	1.5E-08	3.7E-10	8.6E-02	1.9E-04		8.6E-02	
Vanadium	1.9E+01	2.4E-04	5.4E-07	1.3E-08	3.5E-02	2.9E-03		3.8E-02	
Inorganics Pathway Total					8.4E-01	4.8E-02	3.5E-02	9.3E-01	
1,2-Dichloroethene	1.2E-02	1.6E-07	3.4E-09	8.4E-12	1.7E-05	3.8E-07		1.8E-05	
1,3-Dinitrobenzene	5.9E+00	7.5E-05	1.7E-05	4.1E-09	7.5E-01	1.7E-01		9.2E-01	
2,4,6-Trinitrotoluene	3.0E+02	3.8E-03	8.4E-04	2.1E-07	7.6E+00	1.7E+00		9.3E+00	H
2,4-Dinitrotoluene	2.3E-01	2.9E-06	6.5E-07	1.6E-10	1.5E-03	3.2E-04		1.8E-03	
2,6-Dinitrotoluene	8.6E-01	1.1E-05	2.4E-06	6.0E-10	1.1E-02	2.4E-03		1.3E-02	
Dieldrin	9.8E-02	1.3E-06	2.8E-07	6.8E-11	2.5E-02	5.5E-03		3.1E-02	
Endrin aldehyde	4.4E+00	5.6E-05	1.2E-05	3.0E-09	1.9E-01	4.1E-02		2.3E-01	
Heptachlor	7.2E-02	9.2E-07	2.0E-07	5.0E-11	1.8E-03	4.0E-04		2.2E-03	
Heptachlor epoxide	3.1E-02	4.0E-07	8.7E-08	2.1E-11	3.0E-02	6.7E-03		3.7E-02	
PCB-1254	1.1E+03	1.4E-02	4.3E-03	7.6E-07	7.0E+02	2.7E+02		9.7E+02	H
RDX	1.0E+02	1.3E-03	2.8E-04	6.9E-08	4.3E-01	9.4E-02		5.2E-01	
alpha-Chlordane	7.8E-02	1.0E-06	8.8E-08	5.4E-11	2.0E-03	2.2E-04	2.7E-07	2.2E-03	
gamma-Chlordane	8.9E-01	1.1E-05	1.0E-06	6.1E-10	2.3E-02	2.5E-03	3.1E-06	2.5E-02	
Organics Pathway Total					7.1E+02	2.7E+02	3.3E-06	9.8E+02	
Pathway Total - Chemicals					7.1E+02	2.7E+02	3.5E-02	9.9E+02	
Change Houses (CB-12, -23, -8, -22)									
Antimony	2.3E+00	2.9E-05	6.3E-08	1.6E-09	7.2E-02	1.1E-03		7.3E-02	
Arsenic	1.2E+01	1.6E-04	1.0E-05	8.4E-09	5.2E-01	3.6E-02		5.5E-01	

Table 6-13a. Surface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Cadmium	3.3E+00	4.2E-05	9.2E-08	2.3E-09	4.2E-02	4.6E-04		4.2E-02	
Chromium	1.5E+01	1.9E-04	4.2E-07	1.0E-08	1.3E-04	2.2E-05		1.5E-04	
Manganese	8.3E+02	1.1E-02	2.3E-05	5.7E-07	2.3E-01	1.3E-02	4.0E-02	2.8E-01	
Thallium	4.3E-01	5.5E-06	1.2E-08	3.0E-10	6.9E-02	1.5E-04		6.9E-02	
Inorganics Pathway Total					9.3E-01	5.0E-02	4.0E-02	1.0E+00	
PCB-1254	1.1E-01	1.4E-06	4.3E-07	7.6E-11	7.0E-02	2.7E-02		9.7E-02	
Organics Pathway Total					7.0E-02	2.7E-02		9.7E-02	
Pathway Total - Chemicals					1.0E+00	7.7E-02	4.0E-02	1.1E+00	
Perimeter Area									
Arsenic	1.3E+01	1.6E-04	1.1E-05	8.7E-09	5.3E-01	3.7E-02		5.7E-01	
Chromium	1.7E+01	2.1E-04	4.7E-07	1.2E-08	1.4E-04	2.4E-05		1.7E-04	
Cyanide	5.6E-01	7.1E-06	1.6E-08	3.8E-10	3.6E-04	1.7E-06		3.6E-04	
Manganese	1.4E+03	1.8E-02	4.0E-05	9.7E-07	3.9E-01	2.2E-02	6.8E-02	4.8E-01	
Thallium	6.4E-01	8.2E-06	1.8E-08	4.4E-10	1.0E-01	2.3E-04		1.0E-01	
Inorganics Pathway Total					1.0E+00	5.9E-02	6.8E-02	1.2E+00	
1,2-Dichloroethene	4.1E-03	5.2E-08	1.2E-09	2.8E-12	5.8E-06	1.3E-07		6.0E-06	
Organics Pathway Total					5.8E-06	1.3E-07		6.0E-06	
Pathway Total - Chemicals					1.0E+00	5.9E-02	6.8E-02	1.2E+00	
Water Tower									
Chromium	2.5E+02	3.2E-03	7.0E-06	1.7E-07	2.1E-03	3.6E-04		2.5E-03	
Thallium	6.4E-01	8.2E-06	1.8E-08	4.5E-10	1.0E-01	2.3E-04		1.0E-01	
Inorganics Pathway Total					1.1E-01	5.9E-04		1.1E-01	
Pathway Total - Chemicals					1.1E-01	5.9E-04		1.1E-01	

[a] COPCs are identified as chemicals of concern (COCs) if the total HI across all pathways is > 1 (H) or if the total ILCR is > 1E-06 (R).
COPC = chemical of potential concern.
EPC = exposure point concentration.
HI = hazard index.
HQ = hazard quotient.
ILCR = Incremental Lifetime Cancer Risk.

Table 6-13b. Surface Soil Risks - Direct Contact

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Child Trespasser									
CB-13 and CB-10									
Arsenic	1.1E+01	8.1E-08	2.4E-07	8.7E-12	1.2E-07	3.7E-07	1.3E-10	4.9E-07	
Cadmium	6.5E+00	4.7E-08	4.6E-09	5.1E-12			3.2E-11	3.2E-11	
Inorganics Pathway Total					1.2E-07	3.7E-07	1.6E-10	4.9E-07	
2,4,6-Trinitrotoluene	2.5E+01	1.8E-07	1.8E-06	2.0E-11	5.5E-09	5.4E-08		5.9E-08	
2,4-Dinitrotoluene	1.5E+00	1.1E-08	1.1E-07	1.2E-12	7.3E-09	7.2E-08		7.9E-08	
2,6-Dinitrotoluene	6.0E-01	4.3E-09	4.3E-08	4.7E-13	3.0E-09	2.9E-08		3.2E-08	
Benz(a)anthracene	4.1E-01	3.0E-09	3.8E-08	3.2E-13	2.2E-09	4.8E-08	1.0E-13	5.0E-08	
Benzo(a)pyrene	3.7E-01	2.7E-09	3.4E-08	2.9E-13	2.0E-08	4.3E-07	9.0E-13	4.5E-07	
Benzo(b)fluoranthene	4.5E-01	3.3E-09	4.2E-08	3.5E-13	2.4E-09	5.2E-08	1.1E-13	5.5E-08	
Heptachlor	1.7E-02	1.2E-10	1.2E-09	1.3E-14	5.5E-10	5.4E-09	6.0E-14	5.9E-09	
Indeno(1,2,3-cd)pyrene	2.2E-01	1.6E-09	2.0E-08	1.7E-13	1.2E-09	2.5E-08	5.3E-14	2.7E-08	
PCB-1254	1.7E+00	1.2E-08	1.7E-07	1.3E-12	2.5E-08	4.2E-07	2.7E-12	4.5E-07	
RDX	3.7E+00	2.7E-08	2.6E-07	2.9E-12	2.9E-09	2.9E-08		3.2E-08	
Organics Pathway Total					6.9E-08	1.2E-06	3.9E-12	1.2E-06	
Pathway Total - Chemicals					1.9E-07	1.5E-06	1.7E-10	1.7E-06	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	1.6E-07	4.6E-07	1.7E-11	2.3E-07	7.2E-07	2.5E-10	9.5E-07	
Cadmium	2.1E+00	1.5E-08	1.5E-09	1.6E-12			1.0E-11	1.0E-11	
Inorganics Pathway Total					2.3E-07	7.2E-07	2.6E-10	9.5E-07	
2,4,6-Trinitrotoluene	4.5E+00	3.3E-08	3.2E-07	3.5E-12	9.8E-10	9.6E-09		1.1E-08	
2,4-Dinitrotoluene	5.3E-01	3.8E-09	3.7E-08	4.1E-13	2.6E-09	2.5E-08		2.8E-08	
4,4'-DDE	2.0E-01	1.4E-09	1.4E-08	1.6E-13	4.9E-10	4.8E-09		5.3E-09	
Benz(a)anthracene	6.4E-01	4.6E-09	5.9E-08	5.0E-13	3.4E-09	7.4E-08	1.6E-13	7.8E-08	
Benzo(a)pyrene	8.2E-01	6.0E-09	7.6E-08	6.4E-13	4.3E-08	9.5E-07	2.0E-12	1.0E-06	
Benzo(b)fluoranthene	1.1E+00	8.0E-09	1.0E-07	8.6E-13	5.8E-09	1.3E-07	2.7E-13	1.3E-07	
Dibenz(a,h)anthracene	1.8E-01	1.3E-09	1.7E-08	1.4E-13	9.5E-09	2.1E-07	4.4E-13	2.2E-07	
Indeno(1,2,3-cd)pyrene	6.4E-01	4.6E-09	5.9E-08	5.0E-13	3.4E-09	7.4E-08	1.6E-13	7.8E-08	
PCB-1254	4.7E+00	3.4E-08	4.7E-07	3.7E-12	6.8E-08	1.2E-06	7.4E-12	1.2E-06	R
RDX	2.9E+01	2.1E-07	2.0E-06	2.2E-11	2.3E-08	2.2E-07		2.5E-07	
Organics Pathway Total					1.6E-07	2.9E-06	1.0E-11	3.0E-06	
Pathway Total - Chemicals					3.9E-07	3.6E-06	2.7E-10	4.0E-06	
CB-3/CB-801									
Arsenic	1.3E+01	9.3E-08	2.7E-07	1.0E-11	1.4E-07	4.3E-07	1.5E-10	5.7E-07	
Cadmium	6.3E+00	4.6E-08	4.5E-09	4.9E-12			3.1E-11	3.1E-11	
Inorganics Pathway Total					1.4E-07	4.3E-07	1.8E-10	5.7E-07	
2,4-Dinitrotoluene	1.3E-01	9.5E-10	9.2E-09	1.0E-13	6.4E-10	6.3E-09		6.9E-09	
Benz(a)anthracene	1.4E+01	1.0E-07	1.3E-06	1.1E-11	7.4E-08	1.6E-06	3.4E-12	1.7E-06	R
Benzo(a)pyrene	1.3E+01	9.4E-08	1.2E-06	1.0E-11	6.9E-07	1.5E-05	3.2E-11	1.6E-05	R
Benzo(b)fluoranthene	1.5E+01	1.1E-07	1.4E-06	1.2E-11	7.9E-08	1.7E-06	3.6E-12	1.8E-06	R
Benzo(k)fluoranthene	5.7E+00	4.1E-08	5.3E-07	4.5E-12	3.0E-09	6.6E-08	1.4E-13	6.9E-08	
Carbazole	2.6E+00	1.9E-08	1.9E-07	2.1E-12	3.8E-10	3.7E-09		4.1E-09	
Chrysene	1.5E+01	1.1E-07	1.4E-06	1.2E-11	7.9E-10	1.7E-08	3.6E-14	1.8E-08	
Dibenz(a,h)anthracene	1.2E+00	8.3E-09	1.1E-07	9.0E-13	6.1E-08	1.3E-06	2.8E-12	1.4E-06	R
Dieldrin	3.3E-02	2.4E-10	2.4E-09	2.6E-14	3.9E-09	3.8E-08	4.2E-13	4.2E-08	
Indeno(1,2,3-cd)pyrene	8.7E+00	6.3E-08	8.0E-07	6.8E-12	4.6E-08	1.0E-06	2.1E-12	1.1E-06	R
PCB-1254	4.3E+00	3.1E-08	4.3E-07	3.4E-12	6.2E-08	1.1E-06	6.7E-12	1.1E-06	R
beta-BHC	1.9E-01	1.4E-09	1.3E-08	1.5E-13	2.4E-09	2.4E-08	2.7E-13	2.6E-08	
Organics Pathway Total					1.0E-06	2.2E-05	5.1E-11	2.3E-05	
Pathway Total - Chemicals					1.2E-06	2.2E-05	2.3E-10	2.4E-05	

Table 6-13b. Surface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	7.9E-08	2.3E-07	8.5E-12	1.2E-07	3.7E-07	1.3E-10	4.8E-07	
Cadmium	1.8E+00	1.3E-08	1.3E-09	1.4E-12			8.9E-12	8.9E-12	
Inorganics Pathway Total					1.2E-07	3.7E-07	1.4E-10	4.8E-07	
2,4,6-Trinitrotoluene	3.0E+02	2.2E-06	2.1E-05	2.3E-10	6.5E-08	6.3E-07		7.0E-07	
2,4-Dinitrotoluene	2.3E-01	1.7E-09	1.6E-08	1.8E-13	1.1E-09	1.1E-08		1.2E-08	
2,6-Dinitrotoluene	8.6E-01	6.2E-09	6.1E-08	6.7E-13	4.2E-09	4.1E-08		4.6E-08	
4,4'-DDE	1.2E+00	8.6E-09	8.5E-08	9.4E-13	2.9E-09	2.9E-08		3.2E-08	
Benz(a)anthracene	6.4E-01	4.6E-09	5.9E-08	5.0E-13	3.4E-09	7.4E-08	1.6E-13	7.8E-08	
Benzo(a)pyrene	6.1E-01	4.4E-09	5.6E-08	4.8E-13	3.2E-08	7.1E-07	1.5E-12	7.4E-07	
Benzo(b)fluoranthene	6.6E-01	4.8E-09	6.1E-08	5.2E-13	3.5E-09	7.7E-08	1.6E-13	8.0E-08	
Dibenz(a,h)anthracene	9.6E-02	7.0E-10	8.8E-09	7.5E-14	5.1E-09	1.1E-07	2.3E-13	1.2E-07	
Dieldrin	9.8E-02	7.1E-10	7.0E-09	7.7E-14	1.1E-08	1.1E-07	1.2E-12	1.2E-07	
Heptachlor	7.2E-02	5.2E-10	5.1E-09	5.6E-14	2.3E-09	2.3E-08	2.6E-13	2.5E-08	
Heptachlor epoxide	3.1E-02	2.2E-10	2.2E-09	2.4E-14	2.0E-09	2.0E-08	2.2E-13	2.2E-08	
Indeno(1,2,3-cd)pyrene	5.5E-01	4.0E-09	5.1E-08	4.3E-13	2.9E-09	6.4E-08	1.3E-13	6.7E-08	
PCB-1254	1.1E+03	8.0E-06	1.1E-04	8.6E-10	1.6E-05	2.7E-04	1.7E-09	2.9E-04	R
RDX	1.0E+02	7.3E-07	7.1E-06	7.9E-11	8.0E-08	7.8E-07		8.6E-07	
alpha-Chlordane	7.8E-02	5.7E-10	2.2E-09	6.1E-14	2.0E-10	9.7E-10	2.1E-14	1.2E-09	
gamma-Chlordane	8.9E-01	6.4E-09	2.5E-08	7.0E-13	2.3E-09	1.1E-08	2.4E-13	1.3E-08	
Organics Pathway Total					1.6E-05	2.8E-04	1.7E-09	2.9E-04	
Pathway Total - Chemicals					1.6E-05	2.8E-04	1.9E-09	2.9E-04	
Change Houses (CB-12, -23, -8, -22)									
Arsenic	1.2E+01	8.8E-08	2.6E-07	9.5E-12	1.3E-07	4.1E-07	1.4E-10	5.4E-07	
Cadmium	3.3E+00	2.4E-08	2.3E-09	2.6E-12			1.6E-11	1.6E-11	
Inorganics Pathway Total					1.3E-07	4.1E-07	1.6E-10	5.4E-07	
Benz(a)anthracene	7.2E-02	5.2E-10	6.6E-09	5.7E-14	3.8E-10	8.4E-09	1.8E-14	8.7E-09	
Benzo(a)pyrene	9.2E-02	6.7E-10	8.5E-09	7.2E-14	4.9E-09	1.1E-07	2.2E-13	1.1E-07	
Benzo(b)fluoranthene	1.5E-01	1.1E-09	1.4E-08	1.2E-13	7.9E-10	1.7E-08	3.6E-14	1.8E-08	
Indeno(1,2,3-cd)pyrene	7.5E-02	5.4E-10	6.9E-09	5.9E-14	4.0E-10	8.7E-09	1.8E-14	9.1E-09	
PCB-1254	1.1E-01	8.0E-10	1.1E-08	8.6E-14	1.6E-09	2.7E-08	1.7E-13	2.9E-08	
Organics Pathway Total					8.0E-09	1.7E-07	4.7E-13	1.8E-07	
Pathway Total - Chemicals					1.4E-07	5.8E-07	1.6E-10	7.2E-07	
Perimeter Area									
Arsenic	1.3E+01	9.1E-08	2.7E-07	9.8E-12	1.4E-07	4.2E-07	1.5E-10	5.6E-07	
Inorganics Pathway Total					1.4E-07	4.2E-07	1.5E-10	5.6E-07	
Pathway Total - Chemicals					1.4E-07	4.2E-07	1.5E-10	5.6E-07	
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Hunter/Trapper									
CB-13 and CB-10									
Arsenic	1.1E+01	1.4E-07	2.0E-07	3.0E-11	2.1E-07	3.2E-07	4.6E-10	5.3E-07	
Cadmium	6.5E+00	8.2E-08	3.9E-09	1.8E-11			1.1E-10	1.1E-10	
Inorganics Pathway Total					2.1E-07	3.2E-07	5.7E-10	5.3E-07	
2,4,6-Trinitrotoluene	2.5E+01	3.2E-07	1.5E-06	6.9E-11	9.5E-09	4.6E-08		5.5E-08	
2,4-Dinitrotoluene	1.5E+00	1.9E-08	9.0E-08	4.0E-12	1.3E-08	6.1E-08		7.4E-08	
2,6-Dinitrotoluene	6.0E-01	7.5E-09	3.6E-08	1.6E-12	5.1E-09	2.5E-08		3.0E-08	
Benz(a)anthracene	4.1E-01	5.2E-09	3.2E-08	1.1E-12	3.8E-09	4.0E-08	3.5E-13	4.4E-08	
Benzo(a)pyrene	3.7E-01	4.7E-09	2.9E-08	1.0E-12	3.4E-08	3.6E-07	3.1E-12	4.0E-07	
Benzo(b)fluoranthene	4.5E-01	5.7E-09	3.5E-08	1.2E-12	4.2E-09	4.5E-08	3.8E-13	4.9E-08	
Heptachlor	1.7E-02	2.1E-10	1.0E-09	4.6E-14	9.6E-10	4.6E-09	2.1E-13	5.5E-09	
Indeno(1,2,3-cd)pyrene	2.2E-01	2.8E-09	1.7E-08	6.0E-13	2.0E-09	2.2E-08	1.9E-13	2.4E-08	
PCB-1254	1.7E+00	2.1E-08	1.4E-07	4.6E-12	4.3E-08	3.6E-07	9.3E-12	4.0E-07	
RDX	3.7E+00	4.6E-08	2.2E-07	1.0E-11	5.1E-09	2.4E-08		3.0E-08	

Table 6-13b. Surface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Organics Pathway Total					1.2E-07	9.9E-07	1.4E-11	1.1E-06	
Pathway Total - Chemicals					3.3E-07	1.3E-06	5.8E-10	1.6E-06	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	2.7E-07	3.9E-07	5.8E-11	4.0E-07	6.1E-07	8.8E-10	1.0E-06	R
Cadmium	2.1E+00	2.6E-08	1.2E-09	5.6E-12			3.6E-11	3.6E-11	
Inorganics Pathway Total					4.0E-07	6.1E-07	9.1E-10	1.0E-06	
2,4,6-Trinitrotoluene	4.5E+00	5.7E-08	2.7E-07	1.2E-11	1.7E-09	8.1E-09		9.8E-09	
2,4-Dinitrotoluene	5.3E-01	6.6E-09	3.2E-08	1.4E-12	4.5E-09	2.2E-08		2.6E-08	
4,4'-DDE	2.0E-01	2.5E-09	1.2E-08	5.4E-13	8.6E-10	4.1E-09		5.0E-09	
Benz(a)anthracene	6.4E-01	8.1E-09	5.0E-08	1.7E-12	5.9E-09	6.3E-08	5.4E-13	6.9E-08	
Benzo(a)pyrene	8.2E-01	1.0E-08	6.4E-08	2.2E-12	7.5E-08	8.1E-07	6.9E-12	8.9E-07	
Benzo(b)fluoranthene	1.1E+00	1.4E-08	8.6E-08	3.0E-12	1.0E-08	1.1E-07	9.3E-13	1.2E-07	
Dibenz(a,h)anthracene	1.8E-01	2.3E-09	1.4E-08	4.9E-13	1.7E-08	1.8E-07	1.5E-12	1.9E-07	
Indeno(1,2,3-cd)pyrene	6.4E-01	8.1E-09	5.0E-08	1.7E-12	5.9E-09	6.3E-08	5.4E-13	6.9E-08	
PCB-1254	4.7E+00	5.9E-08	4.0E-07	1.3E-11	1.2E-07	9.9E-07	2.6E-11	1.1E-06	R
RDX	2.9E+01	3.6E-07	1.7E-06	7.8E-11	3.9E-08	1.9E-07		2.3E-07	
Organics Pathway Total					2.8E-07	2.4E-06	3.6E-11	2.7E-06	
Pathway Total - Chemicals					6.8E-07	3.0E-06	9.5E-10	3.7E-06	
CB-3/CB-801									
Arsenic	1.3E+01	1.6E-07	2.3E-07	3.5E-11	2.4E-07	3.7E-07	5.3E-10	6.1E-07	
Cadmium	6.3E+00	7.9E-08	3.8E-09	1.7E-11			1.1E-10	1.1E-10	
Inorganics Pathway Total					2.4E-07	3.7E-07	6.4E-10	6.1E-07	
2,4-Dinitrotoluene	1.3E-01	1.6E-09	7.9E-09	3.6E-13	1.1E-09	5.3E-09		6.5E-09	
Benz(a)anthracene	1.4E+01	1.8E-07	1.1E-06	3.8E-11	1.3E-07	1.4E-06	1.2E-11	1.5E-06	R
Benzo(a)pyrene	1.3E+01	1.6E-07	1.0E-06	3.5E-11	1.2E-06	1.3E-05	1.1E-10	1.4E-05	R
Benzo(b)fluoranthene	1.5E+01	1.9E-07	1.2E-06	4.1E-11	1.4E-07	1.5E-06	1.3E-11	1.6E-06	R
Benzo(k)fluoranthene	5.7E+00	7.2E-08	4.5E-07	1.6E-11	5.2E-09	5.6E-08	4.8E-13	6.1E-08	
Carbazole	2.6E+00	3.3E-08	1.6E-07	7.2E-12	6.6E-10	3.2E-09		3.8E-09	
Chrysene	1.5E+01	1.9E-07	1.2E-06	4.1E-11	1.4E-09	1.5E-08	1.3E-13	1.6E-08	
Dibenz(a,h)anthracene	1.2E+00	1.4E-08	9.0E-08	3.1E-12	1.1E-07	1.1E-06	9.7E-12	1.2E-06	R
Dieldrin	3.3E-02	4.2E-10	2.0E-09	9.1E-14	6.7E-09	3.2E-08	1.5E-12	3.9E-08	
Indeno(1,2,3-cd)pyrene	8.7E+00	1.1E-07	6.8E-07	2.4E-11	8.0E-08	8.6E-07	7.3E-12	9.4E-07	
PCB-1254	4.3E+00	5.4E-08	3.6E-07	1.2E-11	1.1E-07	9.1E-07	2.3E-11	1.0E-06	R
beta-BHC	1.9E-01	2.4E-09	1.1E-08	5.1E-13	4.2E-09	2.0E-08	9.5E-13	2.5E-08	
Organics Pathway Total					1.8E-06	1.9E-05	1.8E-10	2.0E-05	
Pathway Total - Chemicals					2.0E-06	1.9E-05	8.1E-10	2.1E-05	
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	1.4E-07	2.0E-07	3.0E-11	2.1E-07	3.1E-07	4.5E-10	5.2E-07	
Cadmium	1.8E+00	2.3E-08	1.1E-09	4.9E-12			3.1E-11	3.1E-11	
Inorganics Pathway Total					2.1E-07	3.1E-07	4.8E-10	5.2E-07	
2,4,6-Trinitrotoluene	3.0E+02	3.7E-06	1.8E-05	8.1E-10	1.1E-07	5.4E-07		6.5E-07	
2,4-Dinitrotoluene	2.3E-01	2.9E-09	1.4E-08	6.3E-13	2.0E-09	9.4E-09		1.1E-08	
2,6-Dinitrotoluene	8.6E-01	1.1E-08	5.2E-08	2.3E-12	7.4E-09	3.5E-08		4.3E-08	
4,4'-DDE	1.2E+00	1.5E-08	7.2E-08	3.3E-12	5.1E-09	2.4E-08		3.0E-08	
Benz(a)anthracene	6.4E-01	8.1E-09	5.0E-08	1.7E-12	5.9E-09	6.3E-08	5.4E-13	6.9E-08	
Benzo(a)pyrene	6.1E-01	7.7E-09	4.8E-08	1.7E-12	5.6E-08	6.0E-07	5.1E-12	6.6E-07	
Benzo(b)fluoranthene	6.6E-01	8.3E-09	5.2E-08	1.8E-12	6.1E-09	6.5E-08	5.6E-13	7.1E-08	
Dibenz(a,h)anthracene	9.6E-02	1.2E-09	7.5E-09	2.6E-13	8.8E-09	9.5E-08	8.1E-13	1.0E-07	
Dieldrin	9.8E-02	1.2E-09	5.9E-09	2.7E-13	2.0E-08	9.5E-08	4.3E-12	1.1E-07	
Heptachlor	7.2E-02	9.0E-10	4.3E-09	2.0E-13	4.1E-09	1.9E-08	8.9E-13	2.4E-08	
Heptachlor epoxide	3.1E-02	3.9E-10	1.9E-09	8.4E-14	3.5E-09	1.7E-08	7.7E-13	2.1E-08	
Indeno(1,2,3-cd)pyrene	5.5E-01	6.9E-09	4.3E-08	1.5E-12	5.1E-09	5.4E-08	4.7E-13	5.9E-08	
PCB-1254	1.1E+03	1.4E-05	9.3E-05	3.0E-09	2.8E-05	2.3E-04	6.0E-09	2.6E-04	R

Table 6-13b. Surface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
RDX	1.0E+02	1.3E-06	6.0E-06	2.7E-10	1.4E-07	6.6E-07		8.0E-07	
alpha-Chlordane	7.8E-02	9.8E-10	1.9E-09	2.1E-13	3.4E-10	8.2E-10	7.4E-14	1.2E-09	
gamma-Chlordane	8.9E-01	1.1E-08	2.1E-08	2.4E-12	3.9E-09	9.4E-09	8.5E-13	1.3E-08	
Organics Pathway Total					2.8E-05	2.3E-04	6.0E-09	2.6E-04	
Pathway Total - Chemicals					2.8E-05	2.3E-04	6.5E-09	2.6E-04	
Change Houses (CB-12, -23, -8, -22)									
Arsenic	1.2E+01	1.5E-07	2.2E-07	3.3E-11	2.3E-07	3.5E-07	5.0E-10	5.8E-07	
Cadmium	3.3E+00	4.1E-08	2.0E-09	8.9E-12			5.6E-11	5.6E-11	
Inorganics Pathway Total					2.3E-07	3.5E-07	5.5E-10	5.8E-07	
Benz(a)anthracene	7.2E-02	9.1E-10	5.6E-09	2.0E-13	6.6E-10	7.1E-09	6.1E-14	7.8E-09	
Benzo(a)pyrene	9.2E-02	1.2E-09	7.2E-09	2.5E-13	8.4E-09	9.1E-08	7.8E-13	9.9E-08	
Benzo(b)fluoranthene	1.5E-01	1.9E-09	1.2E-08	4.1E-13	1.4E-09	1.5E-08	1.3E-13	1.6E-08	
Indeno(1,2,3-cd)pyrene	7.5E-02	9.4E-10	5.9E-09	2.0E-13	6.9E-10	7.4E-09	6.3E-14	8.1E-09	
PCB-1254	1.1E-01	1.4E-09	9.3E-09	3.0E-13	2.8E-09	2.3E-08	6.0E-13	2.6E-08	
Organics Pathway Total					1.4E-08	1.4E-07	1.6E-12	1.6E-07	
Pathway Total - Chemicals					2.4E-07	4.9E-07	5.6E-10	7.3E-07	
Perimeter Area									
Arsenic	1.3E+01	1.6E-07	2.3E-07	3.4E-11	2.4E-07	3.6E-07	5.1E-10	6.0E-07	
Inorganics Pathway Total					2.4E-07	3.6E-07	5.1E-10	6.0E-07	
Pathway Total - Chemicals					2.4E-07	3.6E-07	5.1E-10	6.0E-07	
Maintained Industrial/Managed Recreational - Security Guard/Maintenance Worker									
CB-13 and CB-10									
Arsenic	1.1E+01	1.6E-07	2.7E-06	3.5E-11	2.4E-07	4.2E-06	5.3E-10	4.5E-06	R
Cadmium	6.5E+00	9.4E-08	5.2E-08	2.0E-11			1.3E-10	1.3E-10	
Inorganics Pathway Total					2.4E-07	4.2E-06	6.6E-10	4.5E-06	
2,4,6-Trinitrotoluene	2.5E+01	3.7E-07	2.0E-05	8.0E-11	1.1E-08	6.1E-07		6.2E-07	
2,4-Dinitrotoluene	1.5E+00	2.2E-08	1.2E-06	4.7E-12	1.5E-08	8.2E-07		8.3E-07	
2,6-Dinitrotoluene	6.0E-01	8.7E-09	4.8E-07	1.9E-12	5.9E-09	3.3E-07		3.4E-07	
Benz(a)anthracene	4.1E-01	6.0E-09	4.3E-07	1.3E-12	4.4E-09	5.4E-07	4.0E-13	5.5E-07	
Benzo(a)pyrene	3.7E-01	5.4E-09	3.9E-07	1.2E-12	3.9E-08	4.9E-06	3.6E-12	4.9E-06	R
Benzo(b)fluoranthene	4.5E-01	6.6E-09	4.7E-07	1.4E-12	4.8E-09	6.0E-07	4.4E-13	6.0E-07	
Heptachlor	1.7E-02	2.5E-10	1.4E-08	5.3E-14	1.1E-09	6.1E-08	2.4E-13	6.2E-08	
Indeno(1,2,3-cd)pyrene	2.2E-01	3.2E-09	2.3E-07	6.9E-13	2.3E-09	2.9E-07	2.1E-13	2.9E-07	
PCB-1254	1.7E+00	2.5E-08	1.9E-06	5.4E-12	5.0E-08	4.8E-06	1.1E-11	4.9E-06	R
RDX	3.7E+00	5.4E-08	3.0E-06	1.2E-11	5.9E-09	3.3E-07		3.3E-07	
Organics Pathway Total					1.4E-07	1.3E-05	1.6E-11	1.3E-05	
Pathway Total - Chemicals					3.8E-07	1.8E-05	6.7E-10	1.8E-05	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	3.1E-07	5.2E-06	6.8E-11	4.7E-07	8.2E-06	1.0E-09	8.7E-06	R
Cadmium	2.1E+00	3.0E-08	1.7E-08	6.5E-12			4.1E-11	4.1E-11	
Inorganics Pathway Total					4.7E-07	8.2E-06	1.1E-09	8.7E-06	
2,4,6-Trinitrotoluene	4.5E+00	6.6E-08	3.6E-06	1.4E-11	2.0E-09	1.1E-07		1.1E-07	
2,4-Dinitrotoluene	5.3E-01	7.7E-09	4.2E-07	1.7E-12	5.2E-09	2.9E-07		2.9E-07	
4,4'-DDE	2.0E-01	2.9E-09	1.6E-07	6.3E-13	9.9E-10	5.5E-08		5.6E-08	
Benz(a)anthracene	6.4E-01	9.3E-09	6.7E-07	2.0E-12	6.8E-09	8.5E-07	6.3E-13	8.5E-07	
Benzo(a)pyrene	8.2E-01	1.2E-08	8.6E-07	2.6E-12	8.7E-08	1.1E-05	8.0E-12	1.1E-05	R
Benzo(b)fluoranthene	1.1E+00	1.6E-08	1.2E-06	3.5E-12	1.2E-08	1.5E-06	1.1E-12	1.5E-06	R
Dibenz(a,h)anthracene	1.8E-01	2.6E-09	1.9E-07	5.7E-13	1.9E-08	2.4E-06	1.8E-12	2.4E-06	R
Indeno(1,2,3-cd)pyrene	6.4E-01	9.3E-09	6.7E-07	2.0E-12	6.8E-09	8.5E-07	6.3E-13	8.5E-07	
PCB-1254	4.7E+00	6.8E-08	5.3E-06	1.5E-11	1.4E-07	1.3E-05	3.0E-11	1.3E-05	R
RDX	2.9E+01	4.2E-07	2.3E-05	9.0E-11	4.6E-08	2.5E-06		2.6E-06	R
Organics Pathway Total					3.2E-07	3.3E-05	4.2E-11	3.3E-05	
Pathway Total - Chemicals					7.9E-07	4.1E-05	1.1E-09	4.2E-05	

Table 6-13b. Surface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
CB-3/CB-801									
Arsenic	1.3E+01	1.9E-07	3.1E-06	4.1E-11	2.8E-07	4.9E-06	6.1E-10	5.2E-06	R
Cadmium	6.3E+00	9.1E-08	5.1E-08	2.0E-11			1.2E-10	1.2E-10	
Inorganics Pathway Total					2.8E-07	4.9E-06	7.4E-10	5.2E-06	
2,4-Dinitrotoluene	1.3E-01	1.9E-09	1.1E-07	4.1E-13	1.3E-09	7.2E-08		7.3E-08	
Benz(a)anthracene	1.4E+01	2.0E-07	1.5E-05	4.4E-11	1.5E-07	1.8E-05	1.4E-11	1.9E-05	R
Benzo(a)pyrene	1.3E+01	1.9E-07	1.4E-05	4.1E-11	1.4E-06	1.7E-04	1.3E-10	1.7E-04	R
Benzo(b)fluoranthene	1.5E+01	2.2E-07	1.6E-05	4.7E-11	1.6E-07	2.0E-05	1.5E-11	2.0E-05	R
Benzo(k)fluoranthene	5.7E+00	8.3E-08	6.0E-06	1.8E-11	6.1E-09	7.5E-07	5.6E-13	7.6E-07	
Carbazole	2.6E+00	3.8E-08	2.1E-06	8.3E-12	7.7E-10	4.3E-08		4.3E-08	
Chrysene	1.5E+01	2.2E-07	1.6E-05	4.7E-11	1.6E-09	2.0E-07	1.5E-13	2.0E-07	
Dibenz(a,h)anthracene	1.2E+00	1.7E-08	1.2E-06	3.6E-12	1.2E-07	1.5E-05	1.1E-11	1.5E-05	R
Dieldrin	3.3E-02	4.9E-10	2.7E-08	1.1E-13	7.8E-09	4.3E-07	1.7E-12	4.4E-07	
Indeno(1,2,3-cd)pyrene	8.7E+00	1.3E-07	9.1E-06	2.7E-11	9.2E-08	1.1E-05	8.5E-12	1.2E-05	R
PCB-1254	4.3E+00	6.3E-08	4.9E-06	1.4E-11	1.3E-07	1.2E-05	2.7E-11	1.2E-05	R
beta-BHC	1.9E-01	2.7E-09	1.5E-07	5.9E-13	4.9E-09	2.7E-07	1.1E-12	2.8E-07	
Organics Pathway Total					2.1E-06	2.5E-04	2.1E-10	2.5E-04	
Pathway Total - Chemicals					2.3E-06	2.6E-04	9.4E-10	2.6E-04	
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	1.6E-07	2.6E-06	3.4E-11	2.4E-07	4.2E-06	5.2E-10	4.4E-06	R
Cadmium	1.8E+00	2.6E-08	1.5E-08	5.7E-12			3.6E-11	3.6E-11	
Inorganics Pathway Total					2.4E-07	4.2E-06	5.5E-10	4.4E-06	
2,4,6-Trinitrotoluene	3.0E+02	4.3E-06	2.4E-04	9.4E-10	1.3E-07	7.2E-06		7.3E-06	R
2,4-Dinitrotoluene	2.3E-01	3.3E-09	1.9E-07	7.3E-13	2.3E-09	1.3E-07		1.3E-07	
2,6-Dinitrotoluene	8.6E-01	1.3E-08	6.9E-07	2.7E-12	8.5E-09	4.7E-07		4.8E-07	
4,4'-DDE	1.2E+00	1.7E-08	9.6E-07	3.8E-12	5.9E-09	3.3E-07		3.3E-07	
Benz(a)anthracene	6.4E-01	9.3E-09	6.7E-07	2.0E-12	6.8E-09	8.5E-07	6.3E-13	8.5E-07	
Benzo(a)pyrene	6.1E-01	8.9E-09	6.4E-07	1.9E-12	6.5E-08	8.0E-06	6.0E-12	8.1E-06	R
Benzo(b)fluoranthene	6.6E-01	9.6E-09	6.9E-07	2.1E-12	7.0E-09	8.7E-07	6.5E-13	8.8E-07	
Dibenz(a,h)anthracene	9.6E-02	1.4E-09	1.0E-07	3.0E-13	1.0E-08	1.3E-06	9.4E-13	1.3E-06	R
Dieldrin	9.8E-02	1.4E-09	7.9E-08	3.1E-13	2.3E-08	1.3E-06	5.0E-12	1.3E-06	R
Heptachlor	7.2E-02	1.0E-09	5.8E-08	2.3E-13	4.7E-09	2.6E-07	1.0E-12	2.7E-07	
Heptachlor epoxide	3.1E-02	4.5E-10	2.5E-08	9.8E-14	4.1E-09	2.3E-07	8.9E-13	2.3E-07	
Indeno(1,2,3-cd)pyrene	5.5E-01	8.0E-09	5.8E-07	1.7E-12	5.9E-09	7.3E-07	5.4E-13	7.3E-07	
PCB-1254	1.1E+03	1.6E-05	1.2E-03	3.5E-09	3.2E-05	3.1E-03	6.9E-09	3.1E-03	R
RDX	1.0E+02	1.5E-06	8.1E-05	3.2E-10	1.6E-07	8.9E-06		9.1E-06	R
alpha-Chlordane	7.8E-02	1.1E-09	2.5E-08	2.5E-13	4.0E-10	1.1E-08	8.6E-14	1.1E-08	
gamma-Chlordane	8.9E-01	1.3E-08	2.9E-07	2.8E-12	4.5E-09	1.3E-07	9.8E-13	1.3E-07	
Organics Pathway Total					3.2E-05	3.1E-03	7.0E-09	3.2E-03	
Pathway Total - Chemicals					3.3E-05	3.1E-03	7.5E-09	3.2E-03	
Change Houses (CB-12, -23, -8, -22)									
Arsenic	1.2E+01	1.8E-07	2.9E-06	3.8E-11	2.7E-07	4.6E-06	5.8E-10	4.9E-06	R
Cadmium	3.3E+00	4.8E-08	2.7E-08	1.0E-11			6.5E-11	6.5E-11	
Inorganics Pathway Total					2.7E-07	4.6E-06	6.4E-10	4.9E-06	
Benz(a)anthracene	7.2E-02	1.0E-09	7.6E-08	2.3E-13	7.7E-10	9.5E-08	7.0E-14	9.6E-08	
Benzo(a)pyrene	9.2E-02	1.3E-09	9.7E-08	2.9E-13	9.8E-09	1.2E-06	9.0E-13	1.2E-06	R
Benzo(b)fluoranthene	1.5E-01	2.2E-09	1.6E-07	4.7E-13	1.6E-09	2.0E-07	1.5E-13	2.0E-07	
Indeno(1,2,3-cd)pyrene	7.5E-02	1.1E-09	7.9E-08	2.4E-13	8.0E-10	9.9E-08	7.3E-14	1.0E-07	
PCB-1254	1.1E-01	1.6E-09	1.2E-07	3.5E-13	3.2E-09	3.1E-07	6.9E-13	3.1E-07	
Organics Pathway Total					1.6E-08	1.9E-06	1.9E-12	1.9E-06	
Pathway Total - Chemicals					2.8E-07	6.6E-06	6.4E-10	6.9E-06	
Perimeter Area									
Arsenic	1.3E+01	1.8E-07	3.0E-06	4.0E-11	2.7E-07	4.8E-06	6.0E-10	5.1E-06	R

Table 6-13b. Surface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Inorganics Pathway Total					2.7E-07	4.8E-06	6.0E-10	5.1E-06	
Pathway Total - Chemicals					2.7E-07	4.8E-06	6.0E-10	5.1E-06	
National Guard/Managed Recreational - National Guard									
CB-13 and CB-10									
Arsenic	1.1E+01	9.3E-07	8.3E-07	2.5E-07	1.4E-06	1.3E-06	3.7E-06	6.4E-06	R
Cadmium	6.5E+00	5.4E-07	1.6E-08	1.4E-07			9.1E-07	9.1E-07	
Inorganics Pathway Total					1.4E-06	1.3E-06	4.6E-06	7.4E-06	
2,4,6-Trinitrotoluene	2.5E+01	2.1E-06	6.3E-06	5.6E-07	6.4E-08	1.9E-07		2.5E-07	
2,4-Dinitrotoluene	1.5E+00	1.2E-07	3.7E-07	3.3E-08	8.5E-08	2.5E-07		3.4E-07	
2,6-Dinitrotoluene	6.0E-01	5.0E-08	1.5E-07	1.3E-08	3.4E-08	1.0E-07		1.4E-07	
Benz(a)anthracene	4.1E-01	3.4E-08	1.3E-07	9.2E-09	2.5E-08	1.7E-07	2.8E-09	2.0E-07	
Benzo(a)pyrene	3.7E-01	3.1E-08	1.2E-07	8.3E-09	2.3E-07	1.5E-06	2.6E-08	1.8E-06	R
Benzo(b)fluoranthene	4.5E-01	3.8E-08	1.5E-07	1.0E-08	2.8E-08	1.8E-07	3.1E-09	2.2E-07	
Heptachlor	1.7E-02	1.4E-09	4.2E-09	3.8E-10	6.4E-09	1.9E-08	1.7E-09	2.7E-08	
Indeno(1,2,3-cd)pyrene	2.2E-01	1.8E-08	7.1E-08	4.9E-09	1.3E-08	8.9E-08	1.5E-09	1.0E-07	
PCB-1254	1.7E+00	1.4E-07	5.9E-07	3.8E-08	2.9E-07	1.5E-06	7.6E-08	1.8E-06	R
RDX	3.7E+00	3.1E-07	9.2E-07	8.2E-08	3.4E-08	1.0E-07		1.4E-07	
Organics Pathway Total					8.0E-07	4.1E-06	1.1E-07	5.0E-06	
Pathway Total - Chemicals					2.2E-06	5.4E-06	4.8E-06	1.2E-05	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	1.8E-06	1.6E-06	4.8E-07	2.7E-06	2.5E-06	7.2E-06	1.2E-05	R
Cadmium	2.1E+00	1.7E-07	5.2E-09	4.6E-08			2.9E-07	2.9E-07	
Inorganics Pathway Total					2.7E-06	2.5E-06	7.5E-06	1.3E-05	
2,4,6-Trinitrotoluene	4.5E+00	3.8E-07	1.1E-06	1.0E-07	1.1E-08	3.4E-08		4.5E-08	
2,4-Dinitrotoluene	5.3E-01	4.4E-08	1.3E-07	1.2E-08	3.0E-08	8.9E-08		1.2E-07	
4,4'-DDE	2.0E-01	1.7E-08	5.0E-08	4.5E-09	5.7E-09	1.7E-08		2.3E-08	
Benz(a)anthracene	6.4E-01	5.4E-08	2.1E-07	1.4E-08	3.9E-08	2.6E-07	4.4E-09	3.0E-07	
Benzo(a)pyrene	8.2E-01	6.9E-08	2.7E-07	1.8E-08	5.0E-07	3.3E-06	5.7E-08	3.9E-06	R
Benzo(b)fluoranthene	1.1E+00	9.2E-08	3.6E-07	2.5E-08	6.7E-08	4.5E-07	7.6E-09	5.2E-07	
Dibenz(a,h)anthracene	1.8E-01	1.5E-08	5.8E-08	4.0E-09	1.1E-07	7.3E-07	1.2E-08	8.6E-07	
Indeno(1,2,3-cd)pyrene	6.4E-01	5.4E-08	2.1E-07	1.4E-08	3.9E-08	2.6E-07	4.4E-09	3.0E-07	
PCB-1254	4.7E+00	3.9E-07	1.6E-06	1.1E-07	7.9E-07	4.1E-06	2.1E-07	5.1E-06	R
RDX	2.9E+01	2.4E-06	7.1E-06	6.4E-07	2.6E-07	7.8E-07		1.0E-06	R
Organics Pathway Total					1.9E-06	1.0E-05	3.0E-07	1.2E-05	
Pathway Total - Chemicals					4.6E-06	1.3E-05	7.8E-06	2.5E-05	
CB-3/CB-801									
Arsenic	1.3E+01	1.1E-06	9.6E-07	2.9E-07	1.6E-06	1.5E-06	4.3E-06	7.5E-06	R
Cadmium	6.3E+00	5.3E-07	1.6E-08	1.4E-07			8.8E-07	8.8E-07	
Inorganics Pathway Total					1.6E-06	1.5E-06	5.2E-06	8.4E-06	
2,4-Dinitrotoluene	1.3E-01	1.1E-08	3.2E-08	2.9E-09	7.4E-09	2.2E-08		3.0E-08	
Benz(a)anthracene	1.4E+01	1.2E-06	4.5E-06	3.1E-07	8.6E-07	5.7E-06	9.7E-08	6.7E-06	R
Benzo(a)pyrene	1.3E+01	1.1E-06	4.2E-06	2.9E-07	8.0E-06	5.3E-05	9.0E-07	6.2E-05	R
Benzo(b)fluoranthene	1.5E+01	1.3E-06	4.9E-06	3.4E-07	9.2E-07	6.1E-06	1.0E-07	7.1E-06	R
Benzo(k)fluoranthene	5.7E+00	4.8E-07	1.8E-06	1.3E-07	3.5E-08	2.3E-07	3.9E-09	2.7E-07	
Carbazole	2.6E+00	2.2E-07	6.6E-07	5.9E-08	4.4E-09	1.3E-08		1.8E-08	
Chrysene	1.5E+01	1.3E-06	4.9E-06	3.4E-07	9.2E-09	6.1E-08	1.0E-09	7.1E-08	
Dibenz(a,h)anthracene	1.2E+00	9.7E-08	3.7E-07	2.6E-08	7.0E-07	4.7E-06	8.0E-08	5.5E-06	R
Dieldrin	3.3E-02	2.8E-09	8.3E-09	7.5E-10	4.5E-08	1.3E-07	1.2E-08	1.9E-07	
Indeno(1,2,3-cd)pyrene	8.7E+00	7.3E-07	2.8E-06	1.9E-07	5.3E-07	3.5E-06	6.0E-08	4.1E-06	R
PCB-1254	4.3E+00	3.6E-07	1.5E-06	9.6E-08	7.2E-07	3.7E-06	1.9E-07	4.7E-06	R
beta-BHC	1.9E-01	1.6E-08	4.7E-08	4.2E-09	2.8E-08	8.4E-08	7.8E-09	1.2E-07	
Organics Pathway Total					1.2E-05	7.7E-05	1.5E-06	9.1E-05	
Pathway Total - Chemicals					1.3E-05	7.9E-05	6.7E-06	9.9E-05	

Table 6-13b. Surface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	9.1E-07	8.1E-07	2.4E-07	1.4E-06	1.3E-06	3.7E-06	6.3E-06	R
Cadmium	1.8E+00	1.5E-07	4.5E-09	4.0E-08			2.5E-07	2.5E-07	
Inorganics Pathway Total					1.4E-06	1.3E-06	3.9E-06	6.6E-06	
2,4,6-Trinitrotoluene	3.0E+02	2.5E-05	7.4E-05	6.6E-06	7.5E-07	2.2E-06		3.0E-06	R
2,4-Dinitrotoluene	2.3E-01	1.9E-08	5.7E-08	5.1E-09	1.3E-08	3.9E-08		5.2E-08	
2,6-Dinitrotoluene	8.6E-01	7.2E-08	2.1E-07	1.9E-08	4.9E-08	1.5E-07		1.9E-07	
4,4'-DDE	1.2E+00	1.0E-07	3.0E-07	2.7E-08	3.4E-08	1.0E-07		1.4E-07	
Benz(a)anthracene	6.4E-01	5.4E-08	2.1E-07	1.4E-08	3.9E-08	2.6E-07	4.4E-09	3.0E-07	
Benzo(a)pyrene	6.1E-01	5.1E-08	2.0E-07	1.4E-08	3.7E-07	2.5E-06	4.2E-08	2.9E-06	R
Benzo(b)fluoranthene	6.6E-01	5.5E-08	2.1E-07	1.5E-08	4.1E-08	2.7E-07	4.6E-09	3.1E-07	
Dibenz(a,h)anthracene	9.6E-02	8.1E-09	3.1E-08	2.1E-09	5.9E-08	3.9E-07	6.6E-09	4.6E-07	
Dieldrin	9.8E-02	8.3E-09	2.5E-08	2.2E-09	1.3E-07	3.9E-07	3.5E-08	5.6E-07	
Heptachlor	7.2E-02	6.0E-09	1.8E-08	1.6E-09	2.7E-08	8.1E-08	7.3E-09	1.1E-07	
Heptachlor epoxide	3.1E-02	2.6E-09	7.7E-09	6.9E-10	2.4E-08	7.0E-08	6.3E-09	1.0E-07	
Indeno(1,2,3-cd)pyrene	5.5E-01	4.6E-08	1.8E-07	1.2E-08	3.4E-08	2.2E-07	3.8E-09	2.6E-07	
PCB-1254	1.1E+03	9.2E-05	3.8E-04	2.5E-05	1.8E-04	9.6E-04	4.9E-05	1.2E-03	R
RDX	1.0E+02	8.4E-06	2.5E-05	2.2E-06	9.2E-07	2.7E-06		3.7E-06	R
alpha-Chlordane	7.8E-02	6.5E-09	7.8E-09	1.7E-09	2.3E-09	3.4E-09	6.1E-10	6.3E-09	
gamma-Chlordane	8.9E-01	7.4E-08	8.8E-08	2.0E-08	2.6E-08	3.9E-08	6.9E-09	7.2E-08	
Organics Pathway Total					1.9E-04	9.7E-04	4.9E-05	1.2E-03	
Pathway Total - Chemicals					1.9E-04	9.7E-04	5.3E-05	1.2E-03	
Change Houses (CB-12, -23, -8, -22)									
Arsenic	1.2E+01	1.0E-06	9.1E-07	2.7E-07	1.5E-06	1.4E-06	4.1E-06	7.1E-06	R
Cadmium	3.3E+00	2.8E-07	8.2E-09	7.3E-08			4.6E-07	4.6E-07	
Inorganics Pathway Total					1.5E-06	1.4E-06	4.6E-06	7.5E-06	
Benz(a)anthracene	7.2E-02	6.0E-09	2.3E-08	1.6E-09	4.4E-09	2.9E-08	5.0E-10	3.4E-08	
Benzo(a)pyrene	9.2E-02	7.7E-09	3.0E-08	2.1E-09	5.6E-08	3.7E-07	6.4E-09	4.4E-07	
Benzo(b)fluoranthene	1.5E-01	1.3E-08	4.9E-08	3.4E-09	9.2E-09	6.1E-08	1.0E-09	7.1E-08	
Indeno(1,2,3-cd)pyrene	7.5E-02	6.3E-09	2.4E-08	1.7E-09	4.6E-09	3.1E-08	5.2E-10	3.6E-08	
PCB-1254	1.1E-01	9.2E-09	3.8E-08	2.5E-09	1.8E-08	9.6E-08	4.9E-09	1.2E-07	
Organics Pathway Total					9.3E-08	5.9E-07	1.3E-08	7.0E-07	
Pathway Total - Chemicals					1.6E-06	2.0E-06	4.6E-06	8.2E-06	
Perimeter Area									
Arsenic	1.3E+01	1.1E-06	9.4E-07	2.8E-07	1.6E-06	1.5E-06	4.2E-06	7.3E-06	R
Inorganics Pathway Total					1.6E-06	1.5E-06	4.2E-06	7.3E-06	
Pathway Total - Chemicals					1.6E-06	1.5E-06	4.2E-06	7.3E-06	
Open Industrial - Industrial Worker									
CB-13 and CB-10									
Arsenic	1.1E+01	3.9E-06	7.7E-07	8.4E-10	5.8E-06	1.2E-06	1.3E-08	7.1E-06	R
Cadmium	6.5E+00	2.3E-06	1.5E-08	4.9E-10			3.1E-09	3.1E-09	
Inorganics Pathway Total					5.8E-06	1.2E-06	1.6E-08	7.1E-06	
2,4,6-Trinitrotoluene	2.5E+01	8.8E-06	5.8E-06	1.9E-09	2.6E-07	1.7E-07		4.4E-07	
2,4-Dinitrotoluene	1.5E+00	5.2E-07	3.4E-07	1.1E-10	3.5E-07	2.3E-07		5.9E-07	
2,6-Dinitrotoluene	6.0E-01	2.1E-07	1.4E-07	4.5E-11	1.4E-07	9.4E-08		2.4E-07	
Benz(a)anthracene	4.1E-01	1.4E-07	1.2E-07	3.1E-11	1.0E-07	1.5E-07	9.6E-12	2.6E-07	
Benzo(a)pyrene	3.7E-01	1.3E-07	1.1E-07	2.8E-11	9.4E-07	1.4E-06	8.7E-11	2.3E-06	R
Benzo(b)fluoranthene	4.5E-01	1.6E-07	1.4E-07	3.4E-11	1.2E-07	1.7E-07	1.1E-11	2.9E-07	
Heptachlor	1.7E-02	5.9E-09	3.9E-09	1.3E-12	2.7E-08	1.8E-08	5.8E-12	4.4E-08	
Indeno(1,2,3-cd)pyrene	2.2E-01	7.7E-08	6.6E-08	1.7E-11	5.6E-08	8.3E-08	5.1E-12	1.4E-07	
PCB-1254	1.7E+00	5.9E-07	5.5E-07	1.3E-10	1.2E-06	1.4E-06	2.6E-10	2.6E-06	R
RDX	3.7E+00	1.3E-06	8.5E-07	2.8E-10	1.4E-07	9.4E-08		2.4E-07	
Organics Pathway Total					3.3E-06	3.8E-06	3.8E-10	7.1E-06	

Table 6-13b. Surface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Pathway Total - Chemicals					9.2E-06	5.0E-06	1.6E-08	1.4E-05	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	7.5E-06	1.5E-06	1.6E-09	1.1E-05	2.3E-06	2.4E-08	1.4E-05	R
Cadmium	2.1E+00	7.2E-07	4.8E-09	1.6E-10			9.9E-10	9.9E-10	
Inorganics Pathway Total					1.1E-05	2.3E-06	2.5E-08	1.4E-05	
2,4,6-Trinitrotoluene	4.5E+00	1.6E-06	1.0E-06	3.4E-10	4.7E-08	3.1E-08		7.8E-08	
2,4-Dinitrotoluene	5.3E-01	1.8E-07	1.2E-07	4.0E-11	1.2E-07	8.2E-08		2.1E-07	
4,4'-DDE	2.0E-01	7.0E-08	4.6E-08	1.5E-11	2.4E-08	1.6E-08		3.9E-08	
Benz(a)anthracene	6.4E-01	2.2E-07	1.9E-07	4.8E-11	1.6E-07	2.4E-07	1.5E-11	4.0E-07	
Benzo(a)pyrene	8.2E-01	2.9E-07	2.5E-07	6.2E-11	2.1E-06	3.1E-06	1.9E-10	5.2E-06	R
Benzo(b)fluoranthene	1.1E+00	3.8E-07	3.3E-07	8.3E-11	2.8E-07	4.2E-07	2.6E-11	7.0E-07	
Dibenz(a,h)anthracene	1.8E-01	6.3E-08	5.4E-08	1.4E-11	4.6E-07	6.8E-07	4.2E-11	1.1E-06	R
Indeno(1,2,3-cd)pyrene	6.4E-01	2.2E-07	1.9E-07	4.8E-11	1.6E-07	2.4E-07	1.5E-11	4.0E-07	
PCB-1254	4.7E+00	1.6E-06	1.5E-06	3.6E-10	3.3E-06	3.8E-06	7.1E-10	7.1E-06	R
RDX	2.9E+01	1.0E-05	6.6E-06	2.2E-09	1.1E-06	7.2E-07		1.8E-06	R
Organics Pathway Total					7.7E-06	9.3E-06	1.0E-09	1.7E-05	
Pathway Total - Chemicals					1.9E-05	1.2E-05	2.6E-08	3.1E-05	
CB-3/CB-801									
Arsenic	1.3E+01	4.5E-06	8.9E-07	9.7E-10	6.8E-06	1.4E-06	1.5E-08	8.2E-06	R
Cadmium	6.3E+00	2.2E-06	1.4E-08	4.8E-10			3.0E-09	3.0E-09	
Inorganics Pathway Total					6.8E-06	1.4E-06	1.8E-08	8.2E-06	
2,4-Dinitrotoluene	1.3E-01	4.6E-08	3.0E-08	9.9E-12	3.1E-08	2.0E-08		5.1E-08	
Benz(a)anthracene	1.4E+01	4.9E-06	4.2E-06	1.1E-09	3.6E-06	5.3E-06	3.3E-10	8.9E-06	R
Benzo(a)pyrene	1.3E+01	4.5E-06	3.9E-06	9.8E-10	3.3E-05	4.9E-05	3.0E-09	8.2E-05	R
Benzo(b)fluoranthene	1.5E+01	5.2E-06	4.5E-06	1.1E-09	3.8E-06	5.7E-06	3.5E-10	9.5E-06	R
Benzo(k)fluoranthene	5.7E+00	2.0E-06	1.7E-06	4.3E-10	1.5E-07	2.2E-07	1.3E-11	3.6E-07	
Carbazole	2.6E+00	9.2E-07	6.1E-07	2.0E-10	1.8E-08	1.2E-08		3.1E-08	
Chrysene	1.5E+01	5.2E-06	4.5E-06	1.1E-09	3.8E-08	5.7E-08	3.5E-12	9.5E-08	
Dibenz(a,h)anthracene	1.2E+00	4.0E-07	3.5E-07	8.7E-11	2.9E-06	4.3E-06	2.7E-10	7.3E-06	R
Dieldrin	3.3E-02	1.2E-08	7.7E-09	2.5E-12	1.9E-07	1.2E-07	4.1E-11	3.1E-07	
Indeno(1,2,3-cd)pyrene	8.7E+00	3.0E-06	2.6E-06	6.6E-10	2.2E-06	3.3E-06	2.0E-10	5.5E-06	R
PCB-1254	4.3E+00	1.5E-06	1.4E-06	3.3E-10	3.0E-06	3.5E-06	6.5E-10	6.5E-06	R
beta-BHC	1.9E-01	6.6E-08	4.3E-08	1.4E-11	1.2E-07	7.8E-08	2.6E-11	2.0E-07	
Organics Pathway Total					4.9E-05	7.2E-05	4.9E-09	1.2E-04	
Pathway Total - Chemicals					5.6E-05	7.3E-05	2.3E-08	1.3E-04	
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	3.8E-06	7.5E-07	8.2E-10	5.7E-06	1.2E-06	1.2E-08	6.9E-06	R
Cadmium	1.8E+00	6.3E-07	4.2E-09	1.4E-10			8.6E-10	8.6E-10	
Inorganics Pathway Total					5.7E-06	1.2E-06	1.3E-08	6.9E-06	
2,4,6-Trinitrotoluene	3.0E+02	1.0E-04	6.9E-05	2.3E-08	3.1E-06	2.1E-06		5.2E-06	R
2,4-Dinitrotoluene	2.3E-01	8.0E-08	5.3E-08	1.7E-11	5.5E-08	3.6E-08		9.1E-08	
2,6-Dinitrotoluene	8.6E-01	3.0E-07	2.0E-07	6.5E-11	2.0E-07	1.3E-07		3.4E-07	
4,4'-DDE	1.2E+00	4.2E-07	2.8E-07	9.0E-11	1.4E-07	9.4E-08		2.4E-07	
Benz(a)anthracene	6.4E-01	2.2E-07	1.9E-07	4.8E-11	1.6E-07	2.4E-07	1.5E-11	4.1E-07	
Benzo(a)pyrene	6.1E-01	2.1E-07	1.8E-07	4.6E-11	1.6E-06	2.3E-06	1.4E-10	3.9E-06	R
Benzo(b)fluoranthene	6.6E-01	2.3E-07	2.0E-07	5.0E-11	1.7E-07	2.5E-07	1.6E-11	4.2E-07	
Dibenz(a,h)anthracene	9.6E-02	3.4E-08	2.9E-08	7.3E-12	2.4E-07	3.6E-07	2.3E-11	6.1E-07	
Dieldrin	9.8E-02	3.4E-08	2.3E-08	7.5E-12	5.5E-07	3.6E-07	1.2E-10	9.1E-07	
Heptachlor	7.2E-02	2.5E-08	1.7E-08	5.4E-12	1.1E-07	7.5E-08	2.5E-11	1.9E-07	
Heptachlor epoxide	3.1E-02	1.1E-08	7.1E-09	2.3E-12	9.9E-08	6.5E-08	2.1E-11	1.6E-07	
Indeno(1,2,3-cd)pyrene	5.5E-01	1.9E-07	1.7E-07	4.2E-11	1.4E-07	2.1E-07	1.3E-11	3.5E-07	
PCB-1254	1.1E+03	3.8E-04	3.6E-04	8.3E-08	7.7E-04	8.9E-04	1.7E-07	1.7E-03	R
RDX	1.0E+02	3.5E-05	2.3E-05	7.6E-09	3.9E-06	2.5E-06		6.4E-06	R

Table 6-13b. Surface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
alpha-Chlordane	7.8E-02	2.7E-08	7.2E-09	5.9E-12	9.5E-09	3.1E-09	2.1E-12	1.3E-08	
gamma-Chlordane	8.9E-01	3.1E-07	8.2E-08	6.7E-11	1.1E-07	3.6E-08	2.4E-11	1.4E-07	
Organics Pathway Total					7.8E-04	9.0E-04	1.7E-07	1.7E-03	
Pathway Total - Chemicals					7.9E-04	9.0E-04	1.8E-07	1.7E-03	
Change Houses (CB-12, -23, -8, -22)									
Arsenic	1.2E+01	4.2E-06	8.4E-07	9.2E-10	6.4E-06	1.3E-06	1.4E-08	7.7E-06	R
Cadmium	3.3E+00	1.1E-06	7.6E-09	2.5E-10			1.6E-09	1.6E-09	
Inorganics Pathway Total					6.4E-06	1.3E-06	1.5E-08	7.7E-06	
Benz(a)anthracene	7.2E-02	2.5E-08	2.2E-08	5.4E-12	1.8E-08	2.7E-08	1.7E-12	4.6E-08	
Benzo(a)pyrene	9.2E-02	3.2E-08	2.8E-08	7.0E-12	2.3E-07	3.5E-07	2.2E-11	5.8E-07	
Benzo(b)fluoranthene	1.5E-01	5.2E-08	4.5E-08	1.1E-11	3.8E-08	5.7E-08	3.5E-12	9.5E-08	
Indeno(1,2,3-cd)pyrene	7.5E-02	2.6E-08	2.2E-08	5.7E-12	1.9E-08	2.8E-08	1.8E-12	4.7E-08	
PCB-1254	1.1E-01	3.8E-08	3.6E-08	8.3E-12	7.7E-08	8.9E-08	1.7E-11	1.7E-07	
Organics Pathway Total					3.9E-07	5.5E-07	4.5E-11	9.4E-07	
Pathway Total - Chemicals					6.8E-06	1.9E-06	1.5E-08	8.7E-06	
Perimeter Area									
Arsenic	1.3E+01	4.4E-06	8.7E-07	9.5E-10	6.6E-06	1.4E-06	1.4E-08	8.0E-06	R
Inorganics Pathway Total					6.6E-06	1.4E-06	1.4E-08	8.0E-06	
Pathway Total - Chemicals					6.6E-06	1.4E-06	1.4E-08	8.0E-06	
Open Recreational - Recreator									
CB-13 and CB-10									
Arsenic	1.1E+01	5.8E-08	1.7E-07	1.3E-11	8.7E-08	2.6E-07	1.9E-10	3.5E-07	
Cadmium	6.5E+00	3.4E-08	3.3E-09	7.4E-12			4.6E-11	4.6E-11	
Inorganics Pathway Total					8.7E-08	2.6E-07	2.4E-10	3.5E-07	
2,4,6-Trinitrotoluene	2.5E+01	1.3E-07	1.3E-06	2.9E-11	4.0E-09	3.8E-08		4.2E-08	
2,4-Dinitrotoluene	1.5E+00	7.8E-09	7.5E-08	1.7E-12	5.3E-09	5.1E-08		5.6E-08	
2,6-Dinitrotoluene	6.0E-01	3.1E-09	3.0E-08	6.8E-13	2.1E-09	2.0E-08		2.3E-08	
Benz(a)anthracene	4.1E-01	2.1E-09	2.7E-08	4.7E-13	1.6E-09	3.4E-08	1.4E-13	3.5E-08	
Benzo(a)pyrene	3.7E-01	1.9E-09	2.4E-08	4.2E-13	1.4E-08	3.0E-07	1.3E-12	3.2E-07	
Benzo(b)fluoranthene	4.5E-01	2.4E-09	3.0E-08	5.1E-13	1.7E-09	3.7E-08	1.6E-13	3.9E-08	
Heptachlor	1.7E-02	8.8E-11	8.5E-10	1.9E-14	4.0E-10	3.8E-09	8.7E-14	4.2E-09	
Indeno(1,2,3-cd)pyrene	2.2E-01	1.1E-09	1.4E-08	2.5E-13	8.4E-10	1.8E-08	7.7E-14	1.9E-08	
PCB-1254	1.7E+00	8.9E-09	1.2E-07	1.9E-12	1.8E-08	3.0E-07	3.9E-12	3.2E-07	
RDX	3.7E+00	1.9E-08	1.9E-07	4.2E-12	2.1E-09	2.0E-08		2.2E-08	
Organics Pathway Total					5.0E-08	8.2E-07	5.6E-12	8.7E-07	
Pathway Total - Chemicals					1.4E-07	1.1E-06	2.4E-10	1.2E-06	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	1.1E-07	3.2E-07	2.4E-11	1.7E-07	5.1E-07	3.7E-10	6.8E-07	
Cadmium	2.1E+00	1.1E-08	1.0E-09	2.4E-12			1.5E-11	1.5E-11	
Inorganics Pathway Total					1.7E-07	5.1E-07	3.8E-10	6.8E-07	
2,4,6-Trinitrotoluene	4.5E+00	2.4E-08	2.3E-07	5.1E-12	7.1E-10	6.8E-09		7.5E-09	
2,4-Dinitrotoluene	5.3E-01	2.8E-09	2.6E-08	6.0E-13	1.9E-09	1.8E-08		2.0E-08	
4,4'-DDE	2.0E-01	1.0E-09	1.0E-08	2.3E-13	3.6E-10	3.4E-09		3.8E-09	
Benz(a)anthracene	6.4E-01	3.4E-09	4.2E-08	7.3E-13	2.4E-09	5.3E-08	2.3E-13	5.5E-08	
Benzo(a)pyrene	8.2E-01	4.3E-09	5.4E-08	9.3E-13	3.1E-08	6.7E-07	2.9E-12	7.1E-07	
Benzo(b)fluoranthene	1.1E+00	5.8E-09	7.2E-08	1.2E-12	4.2E-09	9.0E-08	3.9E-13	9.5E-08	
Dibenz(a,h)anthracene	1.8E-01	9.4E-10	1.2E-08	2.0E-13	6.9E-09	1.5E-07	6.3E-13	1.5E-07	
Indeno(1,2,3-cd)pyrene	6.4E-01	3.4E-09	4.2E-08	7.3E-13	2.4E-09	5.3E-08	2.3E-13	5.5E-08	
PCB-1254	4.7E+00	2.5E-08	3.3E-07	5.3E-12	4.9E-08	8.3E-07	1.1E-11	8.8E-07	
RDX	2.9E+01	1.5E-07	1.4E-06	3.2E-11	1.6E-08	1.6E-07		1.7E-07	
Organics Pathway Total					1.2E-07	2.0E-06	1.5E-11	2.1E-06	
Pathway Total - Chemicals					2.8E-07	2.5E-06	4.0E-10	2.8E-06	

Table 6-13b. Surface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
CB-3/CB-801									
Arsenic	1.3E+01	6.8E-08	1.9E-07	1.5E-11	1.0E-07	3.1E-07	2.2E-10	4.1E-07	
Cadmium	6.3E+00	3.3E-08	3.2E-09	7.1E-12			4.5E-11	4.5E-11	
Inorganics Pathway Total					1.0E-07	3.1E-07	2.6E-10	4.1E-07	
2,4-Dinitrotoluene	1.3E-01	6.8E-10	6.5E-09	1.5E-13	4.6E-10	4.5E-09		4.9E-09	
Benz(a)anthracene	1.4E+01	7.3E-08	9.1E-07	1.6E-11	5.4E-08	1.1E-06	4.9E-12	1.2E-06	R
Benzo(a)pyrene	1.3E+01	6.8E-08	8.5E-07	1.5E-11	5.0E-07	1.1E-05	4.6E-11	1.1E-05	R
Benzo(b)fluoranthene	1.5E+01	7.9E-08	9.8E-07	1.7E-11	5.7E-08	1.2E-06	5.3E-12	1.3E-06	R
Benzo(k)fluoranthene	5.7E+00	3.0E-08	3.7E-07	6.5E-12	2.2E-09	4.7E-08	2.0E-13	4.9E-08	
Carbazole	2.6E+00	1.4E-08	1.3E-07	3.0E-12	2.8E-10	2.6E-09		2.9E-09	
Chrysene	1.5E+01	7.9E-08	9.8E-07	1.7E-11	5.7E-10	1.2E-08	5.3E-14	1.3E-08	
Dibenz(a,h)anthracene	1.2E+00	6.0E-09	7.5E-08	1.3E-12	4.4E-08	9.5E-07	4.1E-12	9.9E-07	
Dieldrin	3.3E-02	1.8E-10	1.7E-09	3.8E-14	2.8E-09	2.7E-08	6.1E-13	3.0E-08	
Indeno(1,2,3-cd)pyrene	8.7E+00	4.6E-08	5.7E-07	9.9E-12	3.3E-08	7.1E-07	3.1E-12	7.5E-07	
PCB-1254	4.3E+00	2.3E-08	3.0E-07	4.9E-12	4.5E-08	7.6E-07	9.8E-12	8.0E-07	
beta-BHC	1.9E-01	9.8E-10	9.4E-09	2.1E-13	1.8E-09	1.7E-08	3.9E-13	1.9E-08	
Organics Pathway Total					7.4E-07	1.6E-05	7.4E-11	1.6E-05	
Pathway Total - Chemicals					8.4E-07	1.6E-05	3.4E-10	1.7E-05	
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	5.7E-08	1.6E-07	1.2E-11	8.6E-08	2.6E-07	1.9E-10	3.4E-07	
Cadmium	1.8E+00	9.5E-09	9.1E-10	2.1E-12			1.3E-11	1.3E-11	
Inorganics Pathway Total					8.6E-08	2.6E-07	2.0E-10	3.4E-07	
2,4,6-Trinitrotoluene	3.0E+02	1.6E-06	1.5E-05	3.4E-10	4.7E-08	4.5E-07		4.9E-07	
2,4-Dinitrotoluene	2.3E-01	1.2E-09	1.2E-08	2.6E-13	8.2E-10	7.9E-09		8.7E-09	
2,6-Dinitrotoluene	8.6E-01	4.5E-09	4.3E-08	9.8E-13	3.1E-09	2.9E-08		3.2E-08	
4,4'-DDE	1.2E+00	6.3E-09	6.0E-08	1.4E-12	2.1E-09	2.0E-08		2.2E-08	
Benz(a)anthracene	6.4E-01	3.4E-09	4.2E-08	7.3E-13	2.5E-09	5.3E-08	2.3E-13	5.5E-08	
Benzo(a)pyrene	6.1E-01	3.2E-09	4.0E-08	6.9E-13	2.3E-08	5.0E-07	2.1E-12	5.2E-07	
Benzo(b)fluoranthene	6.6E-01	3.5E-09	4.3E-08	7.5E-13	2.5E-09	5.4E-08	2.3E-13	5.7E-08	
Dibenz(a,h)anthracene	9.6E-02	5.0E-10	6.3E-09	1.1E-13	3.7E-09	7.9E-08	3.4E-13	8.3E-08	
Dieldrin	9.8E-02	5.2E-10	4.9E-09	1.1E-13	8.3E-09	7.9E-08	1.8E-12	8.7E-08	
Heptachlor	7.2E-02	3.8E-10	3.6E-09	8.2E-14	1.7E-09	1.6E-08	3.7E-13	1.8E-08	
Heptachlor epoxide	3.1E-02	1.6E-10	1.6E-09	3.5E-14	1.5E-09	1.4E-08	3.2E-13	1.6E-08	
Indeno(1,2,3-cd)pyrene	5.5E-01	2.9E-09	3.6E-08	6.3E-13	2.1E-09	4.5E-08	1.9E-13	4.7E-08	
PCB-1254	1.1E+03	5.8E-06	7.7E-05	1.2E-09	1.2E-05	1.9E-04	2.5E-09	2.0E-04	R
RDX	1.0E+02	5.3E-07	5.0E-06	1.1E-10	5.8E-08	5.5E-07		6.1E-07	
alpha-Chlordane	7.8E-02	4.1E-10	1.6E-09	8.9E-14	1.4E-10	6.9E-10	3.1E-14	8.3E-10	
gamma-Chlordane	8.9E-01	4.7E-09	1.8E-08	1.0E-12	1.6E-09	7.8E-09	3.5E-13	9.4E-09	
Organics Pathway Total					1.2E-05	2.0E-04	2.5E-09	2.1E-04	
Pathway Total - Chemicals					1.2E-05	2.0E-04	2.7E-09	2.1E-04	
Change Houses (CB-12, -23, -8, -22)									
Arsenic	1.2E+01	6.4E-08	1.8E-07	1.4E-11	9.6E-08	2.9E-07	2.1E-10	3.8E-07	
Cadmium	3.3E+00	1.7E-08	1.6E-09	3.7E-12			2.3E-11	2.3E-11	
Inorganics Pathway Total					9.6E-08	2.9E-07	2.3E-10	3.8E-07	
Benz(a)anthracene	7.2E-02	3.8E-10	4.7E-09	8.2E-14	2.8E-10	5.9E-09	2.5E-14	6.2E-09	
Benzo(a)pyrene	9.2E-02	4.8E-10	6.0E-09	1.0E-13	3.5E-09	7.6E-08	3.2E-13	7.9E-08	
Benzo(b)fluoranthene	1.5E-01	7.9E-10	9.8E-09	1.7E-13	5.7E-10	1.2E-08	5.3E-14	1.3E-08	
Indeno(1,2,3-cd)pyrene	7.5E-02	3.9E-10	4.9E-09	8.5E-14	2.9E-10	6.2E-09	2.6E-14	6.4E-09	
PCB-1254	1.1E-01	5.8E-10	7.7E-09	1.2E-13	1.2E-09	1.9E-08	2.5E-13	2.0E-08	
Organics Pathway Total					5.8E-09	1.2E-07	6.8E-13	1.3E-07	
Pathway Total - Chemicals					1.0E-07	4.1E-07	2.3E-10	5.1E-07	
Perimeter Area									
Arsenic	1.3E+01	6.6E-08	1.9E-07	1.4E-11	9.9E-08	3.0E-07	2.1E-10	4.0E-07	

Table 6-13b. Surface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Inorganics Pathway Total					9.9E-08	3.0E-07	2.1E-10	4.0E-07	
Pathway Total - Chemicals					9.9E-08	3.0E-07	2.1E-10	4.0E-07	
Open Residential - Resident Farmer (Adult)									
CB-13 and CB-10									
Arsenic	1.1E+01	6.5E-06	4.5E-06	1.4E-09	9.8E-06	7.0E-06	2.1E-08	1.7E-05	R
Cadmium	6.5E+00	3.8E-06	8.7E-08	8.2E-10			5.2E-09	5.2E-09	
Inorganics Pathway Total					9.8E-06	7.0E-06	2.6E-08	1.7E-05	
2,4,6-Trinitrotoluene	2.5E+01	1.5E-05	3.4E-05	3.2E-09	4.4E-07	1.0E-06		1.5E-06	R
2,4-Dinitrotoluene	1.5E+00	8.7E-07	2.0E-06	1.9E-10	5.9E-07	1.4E-06		1.9E-06	R
2,6-Dinitrotoluene	6.0E-01	3.5E-07	8.0E-07	7.6E-11	2.4E-07	5.5E-07		7.9E-07	
Benz(a)anthracene	4.1E-01	2.4E-07	7.1E-07	5.2E-11	1.8E-07	9.0E-07	1.6E-11	1.1E-06	R
Benzo(a)pyrene	3.7E-01	2.2E-07	6.4E-07	4.7E-11	1.6E-06	8.1E-06	1.5E-10	9.7E-06	R
Benzo(b)fluoranthene	4.5E-01	2.7E-07	7.9E-07	5.8E-11	1.9E-07	9.9E-07	1.8E-11	1.2E-06	R
Heptachlor	1.7E-02	9.9E-09	2.3E-08	2.1E-12	4.5E-08	1.0E-07	9.8E-12	1.5E-07	
Indeno(1,2,3-cd)pyrene	2.2E-01	1.3E-07	3.8E-07	2.8E-11	9.4E-08	4.8E-07	8.6E-12	5.7E-07	
PCB-1254	1.7E+00	1.0E-06	3.2E-06	2.2E-10	2.0E-06	8.0E-06	4.3E-10	1.0E-05	R
RDX	3.7E+00	2.2E-06	4.9E-06	4.7E-10	2.4E-07	5.4E-07		7.8E-07	
Organics Pathway Total					5.6E-06	2.2E-05	6.3E-10	2.8E-05	
Pathway Total - Chemicals					1.5E-05	2.9E-05	2.7E-08	4.4E-05	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	1.3E-05	8.6E-06	2.7E-09	1.9E-05	1.4E-05	4.1E-08	3.2E-05	R
Cadmium	2.1E+00	1.2E-06	2.8E-08	2.6E-10			1.7E-09	1.7E-09	
Inorganics Pathway Total					1.9E-05	1.4E-05	4.3E-08	3.2E-05	
2,4,6-Trinitrotoluene	4.5E+00	2.6E-06	6.0E-06	5.7E-10	7.9E-08	1.8E-07		2.6E-07	
2,4-Dinitrotoluene	5.3E-01	3.1E-07	7.0E-07	6.7E-11	2.1E-07	4.8E-07		6.9E-07	
4,4'-DDE	2.0E-01	1.2E-07	2.7E-07	2.5E-11	4.0E-08	9.1E-08		1.3E-07	
Benz(a)anthracene	6.4E-01	3.8E-07	1.1E-06	8.1E-11	2.7E-07	1.4E-06	2.5E-11	1.7E-06	R
Benzo(a)pyrene	8.2E-01	4.8E-07	1.4E-06	1.0E-10	3.5E-06	1.8E-05	3.2E-10	2.2E-05	R
Benzo(b)fluoranthene	1.1E+00	6.5E-07	1.9E-06	1.4E-10	4.7E-07	2.4E-06	4.3E-11	2.9E-06	R
Dibenz(a,h)anthracene	1.8E-01	1.1E-07	3.1E-07	2.3E-11	7.7E-07	3.9E-06	7.1E-11	4.7E-06	R
Indeno(1,2,3-cd)pyrene	6.4E-01	3.8E-07	1.1E-06	8.1E-11	2.7E-07	1.4E-06	2.5E-11	1.7E-06	R
PCB-1254	4.7E+00	2.8E-06	8.8E-06	6.0E-10	5.5E-06	2.2E-05	1.2E-09	2.8E-05	R
RDX	2.9E+01	1.7E-05	3.8E-05	3.6E-09	1.8E-06	4.2E-06		6.0E-06	R
Organics Pathway Total					1.3E-05	5.4E-05	1.7E-09	6.7E-05	
Pathway Total - Chemicals					3.2E-05	6.8E-05	4.4E-08	1.0E-04	
CB-3/CB-801									
Arsenic	1.3E+01	7.6E-06	5.2E-06	1.6E-09	1.1E-05	8.2E-06	2.5E-08	2.0E-05	R
Cadmium	6.3E+00	3.7E-06	8.4E-08	8.0E-10			5.0E-09	5.0E-09	
Inorganics Pathway Total					1.1E-05	8.2E-06	3.0E-08	2.0E-05	
2,4-Dinitrotoluene	1.3E-01	7.7E-08	1.7E-07	1.7E-11	5.2E-08	1.2E-07		1.7E-07	
Benz(a)anthracene	1.4E+01	8.2E-06	2.4E-05	1.8E-09	6.0E-06	3.1E-05	5.5E-10	3.7E-05	R
Benzo(a)pyrene	1.3E+01	7.6E-06	2.3E-05	1.7E-09	5.6E-05	2.8E-04	5.1E-09	3.4E-04	R
Benzo(b)fluoranthene	1.5E+01	8.8E-06	2.6E-05	1.9E-09	6.4E-06	3.3E-05	5.9E-10	3.9E-05	R
Benzo(k)fluoranthene	5.7E+00	3.3E-06	9.9E-06	7.2E-10	2.4E-07	1.2E-06	2.2E-11	1.5E-06	R
Carbazole	2.6E+00	1.5E-06	3.5E-06	3.4E-10	3.1E-08	7.1E-08		1.0E-07	
Chrysene	1.5E+01	8.8E-06	2.6E-05	1.9E-09	6.4E-08	3.3E-07	5.9E-12	3.9E-07	
Dibenz(a,h)anthracene	1.2E+00	6.8E-07	2.0E-06	1.5E-10	4.9E-06	2.5E-05	4.5E-10	3.0E-05	R
Dieldrin	3.3E-02	2.0E-08	4.5E-08	4.2E-12	3.1E-07	7.2E-07	6.8E-11	1.0E-06	R
Indeno(1,2,3-cd)pyrene	8.7E+00	5.1E-06	1.5E-05	1.1E-09	3.7E-06	1.9E-05	3.4E-10	2.3E-05	R
PCB-1254	4.3E+00	2.5E-06	8.1E-06	5.5E-10	5.0E-06	2.0E-05	1.1E-09	2.5E-05	R
beta-BHC	1.9E-01	1.1E-07	2.5E-07	2.4E-11	2.0E-07	4.5E-07	4.4E-11	6.5E-07	
Organics Pathway Total					8.3E-05	4.2E-04	8.3E-09	5.0E-04	
Pathway Total - Chemicals					9.4E-05	4.2E-04	3.8E-08	5.2E-04	

Table 6-13b. Surface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	6.4E-06	4.4E-06	1.4E-09	9.6E-06	6.9E-06	2.1E-08	1.7E-05	R
Cadmium	1.8E+00	1.1E-06	2.4E-08	2.3E-10			1.4E-09	1.4E-09	
Inorganics Pathway Total					9.6E-06	6.9E-06	2.2E-08	1.7E-05	
2,4,6-Trinitrotoluene	3.0E+02	1.7E-04	4.0E-04	3.8E-08	5.2E-06	1.2E-05		1.7E-05	R
2,4-Dinitrotoluene	2.3E-01	1.4E-07	3.1E-07	2.9E-11	9.2E-08	2.1E-07		3.0E-07	
2,6-Dinitrotoluene	8.6E-01	5.0E-07	1.2E-06	1.1E-10	3.4E-07	7.8E-07		1.1E-06	R
4,4'-DDE	1.2E+00	7.0E-07	1.6E-06	1.5E-10	2.4E-07	5.4E-07		7.8E-07	
Benz(a)anthracene	6.4E-01	3.8E-07	1.1E-06	8.1E-11	2.7E-07	1.4E-06	2.5E-11	1.7E-06	R
Benzo(a)pyrene	6.1E-01	3.6E-07	1.1E-06	7.7E-11	2.6E-06	1.3E-05	2.4E-10	1.6E-05	R
Benzo(b)fluoranthene	6.6E-01	3.9E-07	1.2E-06	8.4E-11	2.8E-07	1.4E-06	2.6E-11	1.7E-06	R
Dibenz(a,h)anthracene	9.6E-02	5.6E-08	1.7E-07	1.2E-11	4.1E-07	2.1E-06	3.8E-11	2.5E-06	R
Dieldrin	9.8E-02	5.8E-08	1.3E-07	1.3E-11	9.2E-07	2.1E-06	2.0E-10	3.0E-06	R
Heptachlor	7.2E-02	4.2E-08	9.6E-08	9.1E-12	1.9E-07	4.3E-07	4.2E-11	6.2E-07	
Heptachlor epoxide	3.1E-02	1.8E-08	4.1E-08	3.9E-12	1.7E-07	3.8E-07	3.6E-11	5.4E-07	
Indeno(1,2,3-cd)pyrene	5.5E-01	3.2E-07	9.6E-07	7.0E-11	2.4E-07	1.2E-06	2.2E-11	1.4E-06	R
PCB-1254	1.1E+03	6.5E-04	2.1E-03	1.4E-07	1.3E-03	5.2E-03	2.8E-07	6.4E-03	R
RDX	1.0E+02	5.9E-05	1.3E-04	1.3E-08	6.5E-06	1.5E-05		2.1E-05	R
alpha-Chlordane	7.8E-02	4.6E-08	4.2E-08	9.9E-12	1.6E-08	1.8E-08	3.5E-12	3.4E-08	
gamma-Chlordane	8.9E-01	5.2E-07	4.8E-07	1.1E-10	1.8E-07	2.1E-07	4.0E-11	3.9E-07	
Organics Pathway Total					1.3E-03	5.2E-03	2.8E-07	6.5E-03	
Pathway Total - Chemicals					1.3E-03	5.2E-03	3.0E-07	6.5E-03	
Change Houses (CB-12, -23, -8, -22)									
Arsenic	1.2E+01	7.1E-06	4.9E-06	1.5E-09	1.1E-05	7.7E-06	2.3E-08	1.8E-05	R
Cadmium	3.3E+00	1.9E-06	4.4E-08	4.2E-10			2.6E-09	2.6E-09	
Inorganics Pathway Total					1.1E-05	7.7E-06	2.6E-08	1.8E-05	
Benz(a)anthracene	7.2E-02	4.2E-08	1.3E-07	9.2E-12	3.1E-08	1.6E-07	2.8E-12	1.9E-07	
Benzo(a)pyrene	9.2E-02	5.4E-08	1.6E-07	1.2E-11	3.9E-07	2.0E-06	3.6E-11	2.4E-06	R
Benzo(b)fluoranthene	1.5E-01	8.8E-08	2.6E-07	1.9E-11	6.4E-08	3.3E-07	5.9E-12	3.9E-07	
Indeno(1,2,3-cd)pyrene	7.5E-02	4.4E-08	1.3E-07	9.5E-12	3.2E-08	1.6E-07	3.0E-12	2.0E-07	
PCB-1254	1.1E-01	6.5E-08	2.1E-07	1.4E-11	1.3E-07	5.2E-07	2.8E-11	6.4E-07	
Organics Pathway Total					6.5E-07	3.2E-06	7.6E-11	3.8E-06	
Pathway Total - Chemicals					1.1E-05	1.1E-05	2.6E-08	2.2E-05	
Perimeter Area									
Arsenic	1.3E+01	7.4E-06	5.0E-06	1.6E-09	1.1E-05	8.0E-06	2.4E-08	1.9E-05	R
Inorganics Pathway Total					1.1E-05	8.0E-06	2.4E-08	1.9E-05	
Pathway Total - Chemicals					1.1E-05	8.0E-06	2.4E-08	1.9E-05	
Open Residential - Resident Farmer (Child)									
CB-13 and CB-10									
Arsenic	1.1E+01	1.2E-05	8.0E-07	6.6E-10	1.8E-05	1.3E-06	9.9E-09	2.0E-05	R
Cadmium	6.5E+00	7.1E-06	1.6E-08	3.8E-10			2.4E-09	2.4E-09	
Inorganics Pathway Total					1.8E-05	1.3E-06	1.2E-08	2.0E-05	
2,4,6-Trinitrotoluene	2.5E+01	2.8E-05	6.1E-06	1.5E-09	8.3E-07	1.8E-07		1.0E-06	R
2,4-Dinitrotoluene	1.5E+00	1.6E-06	3.6E-07	8.8E-11	1.1E-06	2.4E-07		1.4E-06	R
2,6-Dinitrotoluene	6.0E-01	6.6E-07	1.4E-07	3.6E-11	4.5E-07	9.8E-08		5.5E-07	
Benz(a)anthracene	4.1E-01	4.5E-07	1.3E-07	2.4E-11	3.3E-07	1.6E-07	7.5E-12	4.9E-07	
Benzo(a)pyrene	3.7E-01	4.1E-07	1.2E-07	2.2E-11	3.0E-06	1.5E-06	6.8E-11	4.4E-06	R
Benzo(b)fluoranthene	4.5E-01	5.0E-07	1.4E-07	2.7E-11	3.6E-07	1.8E-07	8.3E-12	5.4E-07	
Heptachlor	1.7E-02	1.8E-08	4.1E-09	1.0E-12	8.3E-08	1.8E-08	4.6E-12	1.0E-07	
Indeno(1,2,3-cd)pyrene	2.2E-01	2.4E-07	6.9E-08	1.3E-11	1.8E-07	8.6E-08	4.0E-12	2.6E-07	
PCB-1254	1.7E+00	1.9E-06	5.7E-07	1.0E-10	3.7E-06	1.4E-06	2.0E-10	5.2E-06	R
RDX	3.7E+00	4.0E-06	8.9E-07	2.2E-10	4.4E-07	9.8E-08		5.4E-07	
Organics Pathway Total					1.0E-05	4.0E-06	2.9E-10	1.4E-05	

Table 6-13b. Surface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Pathway Total - Chemicals					2.9E-05	5.2E-06	1.3E-08	3.4E-05	
CB-14, CB-17, and CA-15									
Arsenic	2.1E+01	2.3E-05	1.5E-06	1.3E-09	3.5E-05	2.4E-06	1.9E-08	3.8E-05	R
Cadmium	2.1E+00	2.3E-06	5.0E-09	1.2E-10			7.7E-10	7.7E-10	
Inorganics Pathway Total					3.5E-05	2.4E-06	2.0E-08	3.8E-05	
2,4,6-Trinitrotoluene	4.5E+00	4.9E-06	1.1E-06	2.7E-10	1.5E-07	3.3E-08		1.8E-07	
2,4-Dinitrotoluene	5.3E-01	5.8E-07	1.3E-07	3.1E-11	3.9E-07	8.6E-08		4.8E-07	
4,4'-DDE	2.0E-01	2.2E-07	4.8E-08	1.2E-11	7.5E-08	1.6E-08		9.1E-08	
Benz(a)anthracene	6.4E-01	7.0E-07	2.0E-07	3.8E-11	5.1E-07	2.5E-07	1.2E-11	7.6E-07	
Benzo(a)pyrene	8.2E-01	9.0E-07	2.6E-07	4.9E-11	6.6E-06	3.2E-06	1.5E-10	9.8E-06	R
Benzo(b)fluoranthene	1.1E+00	1.2E-06	3.4E-07	6.5E-11	8.8E-07	4.3E-07	2.0E-11	1.3E-06	R
Dibenz(a,h)anthracene	1.8E-01	2.0E-07	5.6E-08	1.1E-11	1.4E-06	7.1E-07	3.3E-11	2.2E-06	R
Indeno(1,2,3-cd)pyrene	6.4E-01	7.0E-07	2.0E-07	3.8E-11	5.1E-07	2.5E-07	1.2E-11	7.6E-07	
PCB-1254	4.7E+00	5.2E-06	1.6E-06	2.8E-10	1.0E-05	4.0E-06	5.6E-10	1.4E-05	R
RDX	2.9E+01	3.1E-05	6.9E-06	1.7E-09	3.4E-06	7.6E-07		4.2E-06	R
Organics Pathway Total					2.4E-05	9.7E-06	7.9E-10	3.4E-05	
Pathway Total - Chemicals					5.9E-05	1.2E-05	2.1E-08	7.2E-05	
CB-3/CB-801									
Arsenic	1.3E+01	1.4E-05	9.3E-07	7.6E-10	2.1E-05	1.5E-06	1.2E-08	2.3E-05	R
Cadmium	6.3E+00	6.9E-06	1.5E-08	3.7E-10			2.3E-09	2.3E-09	
Inorganics Pathway Total					2.1E-05	1.5E-06	1.4E-08	2.3E-05	
2,4-Dinitrotoluene	1.3E-01	1.4E-07	3.1E-08	7.7E-12	9.7E-08	2.1E-08		1.2E-07	
Benz(a)anthracene	1.4E+01	1.5E-05	4.4E-06	8.3E-10	1.1E-05	5.5E-06	2.6E-10	1.7E-05	R
Benzo(a)pyrene	1.3E+01	1.4E-05	4.1E-06	7.7E-10	1.0E-04	5.1E-05	2.4E-09	1.6E-04	R
Benzo(b)fluoranthene	1.5E+01	1.6E-05	4.7E-06	8.9E-10	1.2E-05	5.9E-06	2.8E-10	1.8E-05	R
Benzo(k)fluoranthene	5.7E+00	6.2E-06	1.8E-06	3.4E-10	4.6E-07	2.2E-07	1.0E-11	6.8E-07	
Carbazole	2.6E+00	2.9E-06	6.4E-07	1.6E-10	5.8E-08	1.3E-08		7.1E-08	
Chrysene	1.5E+01	1.6E-05	4.7E-06	8.9E-10	1.2E-07	5.9E-08	2.8E-12	1.8E-07	
Dibenz(a,h)anthracene	1.2E+00	1.3E-06	3.6E-07	6.8E-11	9.2E-06	4.5E-06	2.1E-10	1.4E-05	R
Dieldrin	3.3E-02	3.7E-08	8.1E-09	2.0E-12	5.9E-07	1.3E-07	3.2E-11	7.1E-07	
Indeno(1,2,3-cd)pyrene	8.7E+00	9.5E-06	2.7E-06	5.2E-10	7.0E-06	3.4E-06	1.6E-10	1.0E-05	R
PCB-1254	4.3E+00	4.7E-06	1.5E-06	2.6E-10	9.4E-06	3.6E-06	5.1E-10	1.3E-05	R
beta-BHC	1.9E-01	2.1E-07	4.5E-08	1.1E-11	3.7E-07	8.1E-08	2.1E-11	4.5E-07	
Organics Pathway Total					1.5E-04	7.5E-05	3.9E-09	2.3E-04	
Pathway Total - Chemicals					1.8E-04	7.6E-05	1.8E-08	2.5E-04	
CB-4/4A and CA-6/6A									
Arsenic	1.1E+01	1.2E-05	7.9E-07	6.5E-10	1.8E-05	1.2E-06	9.7E-09	1.9E-05	R
Cadmium	1.8E+00	2.0E-06	4.4E-09	1.1E-10			6.8E-10	6.8E-10	
Inorganics Pathway Total					1.8E-05	1.2E-06	1.0E-08	1.9E-05	
2,4,6-Trinitrotoluene	3.0E+02	3.3E-04	7.2E-05	1.8E-08	9.8E-06	2.2E-06		1.2E-05	R
2,4-Dinitrotoluene	2.3E-01	2.5E-07	5.5E-08	1.4E-11	1.7E-07	3.8E-08		2.1E-07	
2,6-Dinitrotoluene	8.6E-01	9.4E-07	2.1E-07	5.1E-11	6.4E-07	1.4E-07		7.8E-07	
4,4'-DDE	1.2E+00	1.3E-06	2.9E-07	7.1E-11	4.4E-07	9.8E-08		5.4E-07	
Benz(a)anthracene	6.4E-01	7.0E-07	2.0E-07	3.8E-11	5.1E-07	2.5E-07	1.2E-11	7.7E-07	
Benzo(a)pyrene	6.1E-01	6.7E-07	1.9E-07	3.6E-11	4.9E-06	2.4E-06	1.1E-10	7.3E-06	R
Benzo(b)fluoranthene	6.6E-01	7.3E-07	2.1E-07	3.9E-11	5.3E-07	2.6E-07	1.2E-11	7.9E-07	
Dibenz(a,h)anthracene	9.6E-02	1.1E-07	3.0E-08	5.7E-12	7.7E-07	3.8E-07	1.8E-11	1.1E-06	R
Dieldrin	9.8E-02	1.1E-07	2.4E-08	5.8E-12	1.7E-06	3.8E-07	9.4E-11	2.1E-06	R
Heptachlor	7.2E-02	7.9E-08	1.7E-08	4.3E-12	3.5E-07	7.8E-08	1.9E-11	4.3E-07	
Heptachlor epoxide	3.1E-02	3.4E-08	7.5E-09	1.8E-12	3.1E-07	6.8E-08	1.7E-11	3.8E-07	
Indeno(1,2,3-cd)pyrene	5.5E-01	6.0E-07	1.7E-07	3.3E-11	4.4E-07	2.2E-07	1.0E-11	6.6E-07	
PCB-1254	1.1E+03	1.2E-03	3.7E-04	6.5E-08	2.4E-03	9.3E-04	1.3E-07	3.3E-03	R
RDX	1.0E+02	1.1E-04	2.4E-05	5.9E-09	1.2E-05	2.7E-06		1.5E-05	R

Table 6-13b. Surface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
alpha-Chlordane	7.8E-02	8.6E-08	7.5E-09	4.6E-12	3.0E-08	3.3E-09	1.6E-12	3.3E-08	
gamma-Chlordane	8.9E-01	9.7E-07	8.6E-08	5.3E-11	3.4E-07	3.7E-08	1.8E-11	3.8E-07	
Organics Pathway Total					2.4E-03	9.4E-04	1.3E-07	3.4E-03	
Pathway Total - Chemicals					2.5E-03	9.4E-04	1.4E-07	3.4E-03	
Change Houses (CB-12, -23, -8, -22)									
Arsenic	1.2E+01	1.3E-05	8.8E-07	7.2E-10	2.0E-05	1.4E-06	1.1E-08	2.1E-05	R
Cadmium	3.3E+00	3.6E-06	7.9E-09	1.9E-10			1.2E-09	1.2E-09	
Inorganics Pathway Total					2.0E-05	1.4E-06	1.2E-08	2.1E-05	
Benz(a)anthracene	7.2E-02	7.9E-08	2.3E-08	4.3E-12	5.8E-08	2.8E-08	1.3E-12	8.6E-08	
Benzo(a)pyrene	9.2E-02	1.0E-07	2.9E-08	5.5E-12	7.4E-07	3.6E-07	1.7E-11	1.1E-06	R
Benzo(b)fluoranthene	1.5E-01	1.6E-07	4.7E-08	8.9E-12	1.2E-07	5.9E-08	2.8E-12	1.8E-07	
Indeno(1,2,3-cd)pyrene	7.5E-02	8.2E-08	2.4E-08	4.4E-12	6.0E-08	3.0E-08	1.4E-12	9.0E-08	
PCB-1254	1.1E-01	1.2E-07	3.7E-08	6.5E-12	2.4E-07	9.3E-08	1.3E-11	3.3E-07	
Organics Pathway Total					1.2E-06	5.7E-07	3.5E-11	1.8E-06	
Pathway Total - Chemicals					2.1E-05	2.0E-06	1.2E-08	2.3E-05	
Perimeter Area									
Arsenic	1.3E+01	1.4E-05	9.1E-07	7.4E-10	2.1E-05	1.4E-06	1.1E-08	2.2E-05	R
Inorganics Pathway Total					2.1E-05	1.4E-06	1.1E-08	2.2E-05	
Pathway Total - Chemicals					2.1E-05	1.4E-06	1.1E-08	2.2E-05	

[a] COPCs are identified as chemicals of concern (COCs) if the total HI across all pathways is > 1 (H) or if the total ILCR is > 1E-06 (R).
COPC = chemical of potential concern.
EPC = exposure point concentration.
HI = hazard indx.
HQ = hazard quotient.
ILCR = Incremental Lieftime Cancer Risk.

Table 6-14. Total Hazards/Risks and Chemicals of Concern for Direct Contact with Surface Soil

Receptor	Noncarcinogens		Carcinogens		
	HI	COCs	ILCR	COCs	
Buildings CB-3 and CB-801					
Child Trespasser	0.2		2E-05	PCB-1254	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(123-cd)pyrene
Hunter/Trapper	0.08		2E-05	PCB-1254	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene
National Guard	6	Manganese	1E-04	PCB-1254 Arsenic	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene
Security Guard/ Maintenance Worker	1		3E-04	PCB-1254 Arsenic	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene
Recreator	0.06		2E-05		Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene
Industrial Worker	0.9		1E-04	PCB-1254 Arsenic	Benzo(a)anthancene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene
On-Site Resident Farmer(Adult)	2	PCB-1254	5E-04	PCB-1254 Arsenic Dieldrin	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene
On-Site Resident Farmer (Child)	9	PCB-1254 Antimony	2E-04	PCB-1254 Arsenic	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene
Buildings CB-4/4A and CA-6/6A					
Child Trespasser	51	PCB-1254	3E-04	PCB-1254	
Hunter/Trapper	15	PCB-1254	3E-04	PCB-1254	
National Guard	84	PCB-1254 Manganese	1E-03	PCB-1254 Arsenic 2,4,6-TNT RDX	Benzo(a)pyrene
Security Guard/ Maintenance Worker	221	PCB-1254 2,4,6-TNT	3E-03	PCB-1254 Arsenic Dieldrin 2,4,6-TNT RDX	Benzo(a)pyrene Dibenz(a,h)anthracene

Table 6-14. Total Hazards/Risks and Chemicals of Concern for Direct Contact with Surface Soil (continued)

Receptor	Noncarcinogens		Carcinogens		
	HI	COCs	ILCR	COCs	
Recreator	12	PCB-1254	2E-04	PCB-1254	
Industrial Worker	117	PCB-1254	2E-03	PCB-1254 Arsenic 2,4,6-TNT RDX	Benzo(a)pyrene
On-Site Resident Farmer (Adult)	379	PCB-1254 2,4,6-TNT	6E-03	PCB-1254 Arsenic Dieldrin 2,4,6-TNT 2,6-Dinitrotoluene RDX	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene
On-Site Resident Farmer (Child)	986	PCB-1254 2,4,6-TNT	3E-03	PCB-1254 Arsenic Dieldrin 2,4,6-TNT RDX	Benzo(a)pyrene Dibenz(a,h)anthracene
Buildings CB-13 and CB-10					
Child Trespasser	0.1		2E-06		
Hunter/Trapper	0.04		2E-06		
National Guard	6	Manganese	1E-05	PCB-1254 Arsenic	Benzo(a)pyrene
Security Guard/ Maintenance Worker	0.5		2E-05	PCB-1254 Arsenic	Benzo(a)pyrene
Recreator	0.03		1E-06		
Industrial Worker	0.4		1E-05	PCB-1254 Arsenic	Benzo(a)pyrene
On-Site Resident Farmer (Adult)	1		4E-05	PCB-1254 Arsenic 2,4,6-TNT 2,4-Dinitrotoluene	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene
On-Site Resident Farmer (Child)	3	PCB-1254	3E-05	PCB-1254 Arsenic 2,4,6-TNT 2,4-Dinitrotoluene	Benzo(a)pyrene
Buildings CB-14, CB-17, and CA-15					
Child Trespasser	0.2		4E-06	PCB-1254	
Hunter/Trapper	0.08		4E-06	PCB-1254	
National Guard	6	Manganese	2E-05	PCB-1254 Arsenic RDX	Benzo(a)pyrene
Security Guard/ Maintenance Worker	1		4E-05	PCB-1254 Arsenic RDX	Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene
Recreator	0.06		3E-06		
Industrial Worker	0.7		3E-05	PCB-1254 Arsenic RDX	Benzo(a)pyrene Dibenz(a,h)anthracene

Table 6-14. Total Hazards/Risks and Chemicals of Concern for Direct Contact with Surface Soil (continued)

Receptor	Noncarcinogens		Carcinogens		
	HI	COCs	ILCR	COCs	
On-Site Resident Farmer (Adult)	2	PCB-1254	1E-04	PCB-1254 Arsenic RDX	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene
On-Site Resident Farmer (Child)	6	PCB-1254	7E-05	PCB-1254 Arsenic RDX	Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene
Water Tower					
Child Trespasser	0.0005		NA		
Hunter/Trapper	0.0003		NA		
National Guard	0.002		NA		
Security Guard/ Maintenance Worker	0.0008		NA		
Recreator	0.0001		NA		
Industrial Worker	0.008		NA		
On-Site Resident Farmer (Adult)	0.01		NA		
On-Site Resident Farmer (Child)	0.1		NA		
Change Houses (CB-12, CB-23, CB-8, CB-22)					
Child Trespasser	0.02		7E-07		
Hunter/Trapper	0.007		7E-07		
National Guard	4	Manganese	8E-06	Arsenic	
Security Guard/ Maintenance Worker	0.07		7E-06	Arsenic	Benzo(a)pyrene
Recreator	0.004		5E-07		
Industrial Worker	0.1		9E-06	Arsenic	
On-Site Resident Farmer	0.2		2E-05	Arsenic	Benzo(a)pyrene
On-Site Resident Farmer (child)	1		2E-05	Arsenic	Benzo(a)pyrene
Perimeter Area					
Child Trespasser	0.02		6E-07		
Hunter/Trapper	0.006		6E-07		
National Guard	6	Manganese	7E-06	Arsenic	
Security Guard/ Maintenance Worker	0.05		5E-06	Arsenic	
Recreator	0.004		4E-07		
Industrial Worker	0.1		8E-06	Arsenic	
On-Site Resident Farmer (Adult)	0.2		2E-05	Arsenic	
On-Site Resident Farmer (Child)	1		2E-05	Arsenic	

COC = chemical of concern.
NA = not applicable – no carcinogenic chemicals of potential concern (COPCs) were identified at this EU.
HI = hazard index.
ILCR = Incremental Lifetime Cancer Risk

No COCs were identified at the Water Tower or Perimeter Areas (with the exception of manganese and arsenic at the perimeter area).

Benzo(a)pyrene is the only COC identified at the Change Houses (with the exception of manganese and arsenic). Estimated cancer risks from benzo(a)pyrene are 1E-06 for the Security Guard/Maintenance Worker and 2E-06(adult) and 1E-06 (child) for the On-Site Resident Farmer.

COCs identified for Buildings CB-3 and CB-801 include antimony (Child of On-Site Resident Farmer only) PAHs [(benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene], PCB-1254, and dieldrin.

COCs identified for Buildings CB-4/4A and CA-6/6A; Buildings CB-13 and CB-10; and Buildings CB-14, CB-17, and CA-15 include explosives (2,4,6-trinitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, and RDX), PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene), PCB-1254, and pesticides (dieldrin).

Lead was identified as a COPC in surface soil at all EUs except the perimeter area. The probability of exceeding acceptable fetal blood levels due to adult exposure was estimated to be less than 5% for all receptors at Buildings CB-13 and CB-10; Buildings CB-14, CB-17, and CA-15; Buildings CB-4/4A and CB-6/6A; and the Change Houses. The Buildings CB-3 and CB-801 area had probabilities of <12% of exceeding acceptable fetal blood levels for all receptors.

The highest concentrations of lead in surface soil were found at the Water Tower. The estimated probabilities of exceeding acceptable fetal blood lead levels due to adult exposure at the Water Tower are

- Security Guard/Maintenance Worker <46%,
- Hunter/Trapper <12%,
- National Guard <31%,
- Recreator <10%,
- Industrial Worker <46%, and
- On-Site Resident Farmer <65%.

For the On-Site Resident Farmer child, the estimated probabilities of exceeding the target blood lead level of concern are less than 5% for Buildings CB-13 and CB-10, Buildings CB-14, CB-17, and CA-15, Buildings CB-4/4A and CA-6/6A, and the Change Houses. The estimated probability of exceeding the target blood lead level of concern is less than 27% at Buildings CB-3 and CB-801, and less than 93% at the Water Tower.

Surface soil – indirect contact

Risk and hazard results for indirect contact with COPCs in surface soil are presented in Tables 6-15(a and b) and are summarized in Table 6-16 below for the seven soil EUs. Risks are presented for indirect contact with surface soil by three receptors: the Hunter/Trapper and the On-Site Residential Farmer (adult and child). Indirect contact includes ingestion of venison by the Hunter/Trapper and ingestion of venison, beef, milk, and vegetables by the On-Site Resident Farmer (adult and child).

Arsenic and manganese are identified as COCs for the On-Site Resident Farmer scenarios at Buildings CB-3 and CB-801; Buildings CB-4/4A and CA-6/6A; Buildings CB-13 and CB-10; Buildings CB-14, CB-17, and CA-15; Change Houses (CB-12, CB-23, CB-8, CB-22); and the Perimeter Area. Estimated HQs for ingestion of arsenic in foodstuffs range from 11 to 14 (adult) and 54 to 63 (child) at six of these EUs, with HQs of 23 (adult) and 105 (child) at Buildings CB-14, CB-17, and CA-15. Estimated risks for

ingestion of arsenic in foodstuffs range from 2E-03 to 4E-03 for both adult and child. Estimated HQs for ingestion of manganese in foodstuffs range from 2 to 4 (adult) and 9 to 18 (child). These metals are naturally present in soils in the Ravenna area.

Vanadium is identified as a COC for the On-Site Resident Farmer at Buildings CB-4/4A and CA-6/6A (child HQ = 4), and CB-14, CB-17, and CA-15 (adult HQ = 2, child HQ = 7). Vanadium is naturally present in soils in the Ravenna area. A discussion of background concentrations and their potential impact on the result of the risk assessment is provided in the uncertainty analysis (Section 6.6.4).

Nickel is identified as a COC for the On-Site Resident Farmer scenario at Buildings CB-14, CB-17, and CA-15 with HQs of 1 (adult) and 7 (child). Nickel is also naturally present in soils in the Ravenna area. A discussion of background concentrations and their potential impact on the result of the risk assessment is provided in the uncertainty analysis (Section 6.6.4).

Antimony is identified as a COC for the On-Site Resident Farmer scenario at Buildings CB-3 and CB-801 (adult HQ = 85, child HQ = 396), CB-13 and CB-10 (child HQ = 5), and Change Houses (adult HQ = 2, child HQ = 8). Antimony is naturally present in soils in the Ravenna area. A discussion of background concentrations and their potential impact on the result of the risk assessment is provided in the uncertainty analysis (Section 6.6.4).

Barium is identified as a COC for the On-Site Resident Farmer child scenario at Buildings CB-4/4A and CA-6/6A (HQ=3) and Buildings CB-14, CB-17, and CA-15 (HQ = 3). Barium is naturally present in soils in the Ravenna area. A discussion of background concentrations and their potential impact on the result of the risk assessment is provided in the uncertainty analysis (Section 6.6.4).

Mercury is identified as a COC for the On-Site Resident Farmer child scenario at Buildings CB-4/4A and CA-6/6A (HQ=2). Mercury is naturally present in soils in the Ravenna area. The estimated HQ for the On-Site Resident Farmer child exposed to the background concentration of mercury (0.036 mg/kg) is 0.2.

Cadmium and thallium are identified as COCs for the On-Site Resident Farmer (adult and child) scenarios at Buildings CB-3 and CB-801; Buildings CB-4/4A and CA-6/6A; Buildings CB-13 and CB-10; Buildings CB-14, CB-17, and CA-15; and the Change Houses (CB-12, CB-23, CB-8, CB-22). Thallium HQs for these EUs range from 2 to 5 (adult) and 12 to 25 (child). Cadmium HQs range from <1 to 3 (adult) and 4 to 16 (child). Site-specific background concentrations are not available for these two metals.

Thallium is the only COC identified at the Water Tower and Perimeter Areas (with the exception of manganese and arsenic related to background at the Perimeter Area) with HQs for the On-Site Resident Farmer of 4 (adult) and 17 (child) for both of these EUs. COCs identified for the On-Site Resident Farmer at Buildings CB-3 and CB-801; Buildings CB-4/4A and CA-6/6A; Buildings CB-13 and CB-10; Buildings CB-14, CB-17, and CA-15; and the Change Houses (CB-12, CB-23, CB-8, CB-22) include explosives (2,4,6-trinitrotoluene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, 1,3-dinitrobenzene, and RDX), PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene), PCB-1254, pesticides (4,4'-DDE, dieldrin, beta-BHC, alpha- and gamma-chlordane, endrin aldehyde, heptachlor, and heptachlor epoxide), and one SVOC (carbazole at Buildings CB-3 and CB-801).

Only one COC (PCB-1254 with an estimated risk of 1E-06) is identified for the Hunter/Trapper ingesting venison at Buildings CB-4/4A and CA-6/6A. No COCs were identified for venison ingestion at the other six EUs.

Table 6-15a. Surface Soil Hazards - Ingestion of Foodstuffs

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)				Hazard Quotient (HQ)				Total HI across all pathways	COC[a]
		milk	beef	vegetables	venison	milk	beef	vegetables	venison		
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Hunter/Trapper											
CB-13 and CB-10											
Antimony	1.3E+00				2.2E-11				5.4E-08	5.4E-08	
Arsenic	1.1E+01				7.6E-09				2.5E-05	2.5E-05	
Cadmium	6.5E+00				1.2E-08				1.2E-05	1.2E-05	
Chromium	3.5E+01				1.1E-07				7.2E-08	7.2E-08	
Manganese	1.3E+03				3.8E-06				2.7E-05	2.7E-05	
Thallium	4.9E-01				6.6E-10				8.3E-06	8.3E-06	
Inorganics Pathway Total									7.3E-05	7.3E-05	
2,4,6-Trinitrotoluene	2.5E+01				3.9E-10				7.8E-07	7.8E-07	
2,4-Dinitrotoluene	1.5E+00				1.7E-11				8.3E-09	8.3E-09	
2,6-Dinitrotoluene	6.0E-01				5.2E-12				5.2E-09	5.2E-09	
Heptachlor	1.7E-02				1.7E-12				3.5E-09	3.5E-09	
PCB-1254	1.7E+00				9.5E-10				4.7E-05	4.7E-05	
RDX	3.7E+00				1.5E-10				4.9E-08	4.9E-08	
Organics Pathway Total									4.8E-05	4.8E-05	
Pathway Total									1.2E-04	1.2E-04	
CB-14, CB-17, and CA-15											
Arsenic	2.1E+01				1.3E-08				4.4E-05	4.4E-05	
Barium	1.4E+02				2.1E-08				3.0E-07	3.0E-07	
Cadmium	2.1E+00				3.5E-09				3.5E-06	3.5E-06	
Chromium	2.8E+01				7.7E-08				5.1E-08	5.1E-08	
Cyanide	1.1E+00				2.3E-11				1.2E-09	1.2E-09	
Manganese	1.2E+03				3.1E-06				2.2E-05	2.2E-05	
Nickel	3.2E+01				2.2E-07				1.1E-05	1.1E-05	
Thallium	9.1E-01				1.1E-09				1.4E-05	1.4E-05	
Vanadium	3.5E+01				3.7E-09				5.3E-07	5.3E-07	
Inorganics Pathway Total									9.6E-05	9.6E-05	
2,4,6-Trinitrotoluene	4.5E+00				6.3E-11				1.3E-07	1.3E-07	
2,4-Dinitrotoluene	5.3E-01				5.3E-12				2.7E-09	2.7E-09	
PCB-1254	4.7E+00				2.4E-09				1.2E-04	1.2E-04	
RDX	2.9E+01				1.0E-09				3.4E-07	3.4E-07	
Organics Pathway Total									1.2E-04	1.2E-04	
Pathway Total									2.2E-04	2.2E-04	
CB-3/CB-801											
Antimony	1.1E+02				1.1E-09				2.8E-06	2.8E-06	
Arsenic	1.3E+01				5.2E-09				1.7E-05	1.7E-05	
Cadmium	6.3E+00				7.0E-09				7.0E-06	7.0E-06	
Chromium	4.4E+01				8.0E-08				5.3E-08	5.3E-08	
Manganese	1.3E+03				2.2E-06				1.5E-05	1.5E-05	
Thallium	6.0E-01				4.9E-10				6.1E-06	6.1E-06	
Inorganics Pathway Total									4.9E-05	4.9E-05	
2,4-Dinitrotoluene	1.3E-01				8.6E-13				4.3E-10	4.3E-10	
Dieldrin	3.3E-02				2.8E-12				5.6E-08	5.6E-08	
PCB-1254	4.3E+00				1.4E-09				7.1E-05	7.1E-05	
Organics Pathway Total									7.1E-05	7.1E-05	
Pathway Total									1.2E-04	1.2E-04	
CB-4/4A and CA-6/6A											
Arsenic	1.1E+01				1.7E-08				5.7E-05	5.7E-05	
Barium	1.4E+02				5.5E-08				7.8E-07	7.8E-07	
Cadmium	1.8E+00				7.8E-09				7.8E-06	7.8E-06	
Chromium	2.5E+01				1.8E-07				1.2E-07	1.2E-07	
Cyanide	5.5E-01				2.9E-11				1.5E-09	1.5E-09	
Manganese	7.0E+02				4.7E-06				3.4E-05	3.4E-05	
Mercury	3.4E-01				6.7E-08				2.2E-04	2.2E-04	
Thallium	5.4E-01				1.7E-09				2.1E-05	2.1E-05	
Vanadium	1.9E+01				5.2E-09				7.4E-07	7.4E-07	

Table 6-15a. Surface Soil Hazards - Ingestion of Foodstuffs (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)				Hazard Quotient (HQ)				Total HI across all pathways	COC[a]
		milk	beef	vegetables	venison	milk	beef	vegetables	venison		
Inorganics Pathway Total									3.5E-04	3.5E-04	
1,3-Dinitrobenzene	5.9E+00				1.1E-10				1.1E-06	1.1E-06	
2,4,6-Trinitrotoluene	3.0E+02				1.1E-08				2.1E-05	2.1E-05	
2,4-Dinitrotoluene	2.3E-01				5.9E-12				3.0E-09	3.0E-09	
2,6-Dinitrotoluene	8.6E-01				1.7E-11				1.7E-08	1.7E-08	
Dieldrin	9.8E-02				3.2E-11				6.4E-07	6.4E-07	
Endrin aldehyde	4.4E+00				1.4E-09				4.8E-06	4.8E-06	
Heptachlor	7.2E-02				1.7E-11				3.4E-08	3.4E-08	
Heptachlor epoxide	3.1E-02				2.2E-11				1.7E-06	1.7E-06	
PCB-1254	1.1E+03				1.4E-06				7.1E-02	7.1E-02	
RDX	1.0E+02				9.1E-09				3.0E-06	3.0E-06	
alpha-Chlordane	7.8E-02				6.1E-11				1.2E-07	1.2E-07	
gamma-Chlordane	8.9E-01				7.0E-10				1.4E-06	1.4E-06	
Organics Pathway Total									7.1E-02	7.1E-02	
Pathway Total									7.1E-02	7.1E-02	
Change Houses (CB-12, -23, -8, -22)											
Antimony	2.3E+00				1.1E-11				2.7E-08	2.7E-08	
Arsenic	1.2E+01				2.3E-09				7.8E-06	7.8E-06	
Cadmium	3.3E+00				1.7E-09				1.7E-06	1.7E-06	
Chromium	1.5E+01				1.3E-08				8.7E-09	8.7E-09	
Manganese	8.3E+02				6.8E-07				4.8E-06	4.8E-06	
Thallium	4.3E-01				1.7E-10				2.1E-06	2.1E-06	
Inorganics Pathway Total									1.6E-05	1.6E-05	
PCB-1254	1.1E-01				1.7E-11				8.6E-07	8.6E-07	
Organics Pathway Total									8.6E-07	8.6E-07	
Pathway Total									1.7E-05	1.7E-05	
Perimeter Area											
Arsenic	1.3E+01				4.6E-07				1.5E-03	1.5E-03	
Chromium	1.7E+01				2.8E-06				1.8E-06	1.8E-06	
Cyanide	5.6E-01				6.9E-10				3.4E-08	3.4E-08	
Manganese	1.4E+03				2.2E-04				1.6E-03	1.6E-03	
Thallium	6.4E-01				4.7E-08				5.9E-04	5.9E-04	
Inorganics Pathway Total									3.7E-03	3.7E-03	
Pathway Total									3.7E-03	3.7E-03	
Water Tower											
Chromium	2.5E+02				6.7E-08				4.5E-08	4.5E-08	
Thallium	6.4E-01				7.7E-11				9.6E-07	9.6E-07	
Inorganics Pathway Total									1.0E-06	1.0E-06	
Pathway Total									1.0E-06	1.0E-06	
Open Residential - Resident Farmer (Adult)											
CB-13 and CB-10											
Antimony	1.3E+00	5.4E-07	1.6E-07	3.9E-04	2.2E-11	1.3E-03	4.0E-04	9.7E-01	5.4E-08	9.8E-01	
Arsenic	1.1E+01	1.1E-05	6.9E-05	3.4E-03	7.6E-09	3.7E-02	2.3E-01	1.1E+01	2.5E-05	1.2E+01	Vg
Cadmium	6.5E+00	2.5E-04	1.7E-05	3.0E-03	1.2E-08	2.5E-01	1.7E-02	3.0E+00	1.2E-05	3.2E+00	Vg
Chromium	3.5E+01	5.8E-06	9.8E-04	1.0E-02	1.1E-07	3.9E-06	6.5E-04	7.0E-03	7.2E-08	7.6E-03	
Manganese	1.3E+03	1.7E-03	4.9E-03	4.9E-01	3.8E-06	1.2E-02	3.5E-02	3.5E+00	2.7E-05	3.6E+00	Vg
Thallium	4.9E-01	1.5E-05	5.5E-05	1.5E-04	6.6E-10	1.8E-01	6.9E-01	1.8E+00	8.3E-06	2.7E+00	Vg
Inorganics Pathway Total						4.8E-01	9.7E-01	2.1E+01	7.3E-05	2.2E+01	
1,2-Dichloroethene	7.2E-03	1.5E-10	7.6E-11	3.6E-05		1.6E-08	8.5E-09	4.0E-03		4.0E-03	
2,4,6-Trinitrotoluene	2.5E+01	3.7E-06	1.9E-06	1.8E-02	3.9E-10	7.3E-03	3.9E-03	3.6E+01	7.8E-07	3.6E+01	Vg
2,4-Dinitrotoluene	1.5E+00	1.5E-07	7.7E-08	1.3E-03	1.7E-11	7.3E-05	3.9E-05	6.7E-01	8.3E-09	6.7E-01	
2,6-Dinitrotoluene	6.0E-01	4.3E-08	2.3E-08	7.3E-04	5.2E-12	4.3E-05	2.3E-05	7.3E-01	5.2E-09	7.3E-01	
Heptachlor	1.7E-02	5.4E-08	3.1E-08	5.5E-06	1.7E-12	1.1E-04	6.1E-05	1.1E-02	3.5E-09	1.1E-02	
PCB-1254	1.7E+00	2.1E-04	1.2E-04	5.1E-04	9.5E-10	1.0E+01	6.2E+00	2.6E+01	4.7E-05	4.2E+01	M B Vg
RDX	3.7E+00	2.0E-06	1.1E-06	1.5E-03	1.5E-10	6.7E-04	3.7E-04	5.0E-01	4.9E-08	5.0E-01	
Organics Pathway Total						1.0E+01	6.2E+00	6.3E+01	4.8E-05	8.0E+01	

Table 6-15a. Surface Soil Hazards - Ingestion of Foodstuffs (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)				Hazard Quotient (HQ)				Total HI across all pathways	COC[a]
		milk	beef	vegetables	venison	milk	beef	vegetables	venison		
Pathway Total						1.1E+01	7.1E+00	8.4E+01	1.2E-04	1.0E+02	
CB-14, CB-17, and CA-15											
Arsenic	2.1E+01	2.1E-05	1.3E-04	6.6E-03	1.3E-08	7.1E-02	4.4E-01	2.2E+01	4.4E-05	2.3E+01	Vg
Barium	1.4E+02	1.2E-03	9.5E-05	4.1E-02	2.1E-08	1.8E-02	1.4E-03	5.8E-01	3.0E-07	6.0E-01	
Cadmium	2.1E+00	7.9E-05	5.5E-06	9.5E-04	3.5E-09	7.9E-02	5.5E-03	9.5E-01	3.5E-06	1.0E+00	
Chromium	2.8E+01	4.6E-06	7.7E-04	8.2E-03	7.7E-08	3.0E-06	5.1E-04	5.5E-03	5.1E-08	6.0E-03	
Cyanide	1.1E+00	4.2E-08	2.2E-08	2.6E-03	2.3E-11	2.1E-06	1.1E-06	1.3E-01	1.2E-09	1.3E-01	
Manganese	1.2E+03	1.5E-03	4.4E-03	4.4E-01	3.1E-06	1.1E-02	3.2E-02	3.2E+00	2.2E-05	3.2E+00	Vg
Nickel	3.2E+01	1.1E-02	6.5E-04	1.1E-02	2.2E-07	5.7E-01	3.2E-02	5.6E-01	1.1E-05	1.2E+00	
Thallium	9.1E-01	2.7E-05	1.0E-04	2.7E-04	1.1E-09	3.4E-01	1.3E+00	3.4E+00	1.4E-05	5.0E+00	B Vg
Vanadium	3.5E+01	1.1E-05	2.5E-04	1.0E-02	3.7E-09	1.5E-03	3.6E-02	1.5E+00	5.3E-07	1.5E+00	Vg
Inorganics Pathway Total						1.1E+00	1.8E+00	3.2E+01	9.6E-05	3.5E+01	
1,2-Dichloroethene	3.1E-03	6.4E-11	3.3E-11	1.5E-05		7.1E-09	3.7E-09	1.7E-03		1.7E-03	
2,4,6-Trinitrotoluene	4.5E+00	6.5E-07	3.4E-07	3.2E-03	6.3E-11	1.3E-03	6.9E-04	6.4E+00	1.3E-07	6.4E+00	Vg
2,4-Dinitrotoluene	5.3E-01	5.2E-08	2.7E-08	4.7E-04	5.3E-12	2.6E-05	1.4E-05	2.4E-01	2.7E-09	2.4E-01	
PCB-1254	4.7E+00	5.7E-04	3.4E-04	1.4E-03	2.4E-09	2.9E+01	1.7E+01	7.1E+01	1.2E-04	1.2E+02	M B Vg
RDX	2.9E+01	1.6E-05	8.6E-06	1.2E-02	1.0E-09	5.2E-03	2.9E-03	3.8E+00	3.4E-07	3.9E+00	Vg
Organics Pathway Total						2.9E+01	1.7E+01	8.1E+01	1.2E-04	1.3E+02	
Pathway Total						3.0E+01	1.9E+01	1.1E+02	2.2E-04	1.6E+02	
CB-3/CB-801											
Antimony	1.1E+02	4.7E-05	1.4E-05	3.4E-02	1.1E-09	1.2E-01	3.5E-02	8.5E+01	2.8E-06	8.5E+01	Vg
Arsenic	1.3E+01	1.3E-05	7.9E-05	4.0E-03	5.2E-09	4.3E-02	2.6E-01	1.3E+01	1.7E-05	1.4E+01	Vg
Cadmium	6.3E+00	2.4E-04	1.7E-05	2.9E-03	7.0E-09	2.4E-01	1.7E-02	2.9E+00	7.0E-06	3.1E+00	Vg
Chromium	4.4E+01	7.3E-06	1.2E-03	1.3E-02	8.0E-08	4.8E-06	8.1E-04	8.7E-03	5.3E-08	9.5E-03	
Manganese	1.3E+03	1.6E-03	4.7E-03	4.7E-01	2.2E-06	1.2E-02	3.4E-02	3.4E+00	1.5E-05	3.4E+00	Vg
Thallium	6.0E-01	1.8E-05	6.8E-05	1.8E-04	4.9E-10	2.3E-01	8.5E-01	2.2E+00	6.1E-06	3.3E+00	Vg
Inorganics Pathway Total						6.4E-01	1.2E+00	1.1E+02	4.9E-05	1.1E+02	
1,2-Dichloroethene	7.1E-03	1.5E-10	7.6E-11	3.6E-05		1.6E-08	8.4E-09	4.0E-03		4.0E-03	
2,4-Dinitrotoluene	1.3E-01	1.3E-08	6.8E-09	1.2E-04	8.6E-13	6.4E-06	3.4E-06	5.9E-02	4.3E-10	5.9E-02	
Dieldrin	3.3E-02	1.9E-07	1.1E-07	1.1E-05	2.8E-12	3.8E-03	2.3E-03	2.1E-01	5.6E-08	2.2E-01	
PCB-1254	4.3E+00	5.2E-04	3.1E-04	1.3E-03	1.4E-09	2.6E+01	1.6E+01	6.5E+01	7.1E-05	1.1E+02	M B Vg
Organics Pathway Total						2.6E+01	1.6E+01	6.5E+01	7.1E-05	1.1E+02	
Pathway Total						2.7E+01	1.7E+01	1.7E+02	1.2E-04	2.1E+02	
CB-4/4A and CA-6/6A											
Arsenic	1.1E+01	1.1E-05	6.7E-05	3.4E-03	1.7E-08	3.6E-02	2.2E-01	1.1E+01	5.7E-05	1.1E+01	Vg
Barium	1.4E+02	1.3E-03	9.7E-05	4.2E-02	5.5E-08	1.8E-02	1.4E-03	6.0E-01	7.8E-07	6.2E-01	
Cadmium	1.8E+00	6.9E-05	4.8E-06	8.3E-04	7.8E-09	6.9E-02	4.8E-03	8.3E-01	7.8E-06	9.0E-01	
Chromium	2.5E+01	4.1E-06	6.9E-04	7.4E-03	1.8E-07	2.7E-06	4.6E-04	4.9E-03	1.2E-07	5.4E-03	
Cyanide	5.5E-01	2.1E-08	1.1E-08	1.3E-03	2.9E-11	1.0E-06	5.4E-07	6.5E-02	1.5E-09	6.5E-02	
Manganese	7.0E+02	9.1E-04	2.6E-03	2.6E-01	4.7E-06	6.5E-03	1.9E-02	1.9E+00	3.4E-05	1.9E+00	Vg
Mercury	3.4E-01	9.2E-06	3.3E-05	1.0E-04	6.7E-08	3.1E-02	1.1E-01	3.4E-01	2.2E-04	4.8E-01	
Thallium	5.4E-01	1.6E-05	6.1E-05	1.6E-04	1.7E-09	2.0E-01	7.6E-01	2.0E+00	2.1E-05	3.0E+00	Vg
Vanadium	1.9E+01	5.8E-06	1.4E-04	5.7E-03	5.2E-09	8.2E-04	1.9E-02	8.1E-01	7.4E-07	8.3E-01	
Inorganics Pathway Total						3.6E-01	1.1E+00	1.8E+01	3.5E-04	1.9E+01	
1,2-Dichloroethene	1.2E-02	2.5E-10	1.3E-10	6.0E-05		2.8E-08	1.4E-08	6.7E-03		6.7E-03	
1,3-Dinitrobenzene	5.9E+00	3.7E-07	2.0E-07	7.9E-03	1.1E-10	3.7E-03	2.0E-03	7.9E+01	1.1E-06	7.9E+01	Vg
2,4,6-Trinitrotoluene	3.0E+02	4.3E-05	2.3E-05	2.1E-01	1.1E-08	8.6E-02	4.6E-02	4.2E+02	2.1E-05	4.2E+02	Vg
2,4-Dinitrotoluene	2.3E-01	2.3E-08	1.2E-08	2.1E-04	5.9E-12	1.1E-05	6.0E-06	1.0E-01	3.0E-09	1.0E-01	
2,6-Dinitrotoluene	8.6E-01	6.2E-08	3.3E-08	1.0E-03	1.7E-11	6.2E-05	3.3E-05	1.0E+00	1.7E-08	1.0E+00	Vg
Dieldrin	9.8E-02	5.6E-07	3.3E-07	3.1E-05	3.2E-11	1.1E-02	6.6E-03	6.2E-01	6.4E-07	6.4E-01	
Endrin aldehyde	4.4E+00	2.5E-05	1.5E-05	1.4E-03	1.4E-09	8.3E-02	5.0E-02	4.6E+00	4.8E-06	4.8E+00	Vg
Heptachlor	7.2E-02	2.3E-07	1.3E-07	2.3E-05	1.7E-11	4.6E-04	2.6E-04	4.7E-02	3.4E-08	4.8E-02	
Heptachlor epoxide	3.1E-02	1.0E-06	5.9E-07	9.4E-06	2.2E-11	7.7E-02	4.5E-02	7.2E-01	1.7E-06	8.5E-01	
PCB-1254	1.1E+03	1.3E-01	8.0E-02	3.3E-01	1.4E-06	6.7E+03	4.0E+03	1.7E+04	7.1E-02	2.7E+04	M B Vg
RDX	1.0E+02	5.5E-05	3.0E-05	4.1E-02	9.1E-09	1.8E-02	1.0E-02	1.4E+01	3.0E-06	1.4E+01	Vg
alpha-Chlordane	7.8E-02	3.1E-06	1.8E-06	2.4E-05	6.1E-11	6.2E-03	3.7E-03	4.7E-02	1.2E-07	5.7E-02	
gamma-Chlordane	8.9E-01	3.5E-05	2.1E-05	2.7E-04	7.0E-10	7.1E-02	4.2E-02	5.4E-01	1.4E-06	6.5E-01	

Table 6-15a. Surface Soil Hazards - Ingestion of Foodstuffs (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)				Hazard Quotient (HQ)				Total HI across all pathways	COC[a]
		milk	beef	vegetables	venison	milk	beef	vegetables	venison		
Organics Pathway Total						6.7E+03	4.0E+03	1.7E+04	7.1E-02	2.8E+04	
Pathway Total						6.7E+03	4.0E+03	1.7E+04	7.1E-02	2.8E+04	
Change Houses (CB-12, -23, -8, -22)											
Antimony	2.3E+00	9.6E-07	2.8E-07	7.0E-04	1.1E-11	2.4E-03	7.1E-04	1.7E+00	2.7E-08	1.7E+00	Vg
Arsenic	1.2E+01	1.2E-05	7.5E-05	3.8E-03	2.3E-09	4.0E-02	2.5E-01	1.3E+01	7.8E-06	1.3E+01	Vg
Cadmium	3.3E+00	1.2E-04	8.7E-06	1.5E-03	1.7E-09	1.2E-01	8.7E-03	1.5E+00	1.7E-06	1.6E+00	Vg
Chromium	1.5E+01	2.5E-06	4.2E-04	4.5E-03	1.3E-08	1.7E-06	2.8E-04	3.0E-03	8.7E-09	3.3E-03	
Manganese	8.3E+02	1.1E-03	3.1E-03	3.1E-01	6.8E-07	7.7E-03	2.2E-02	2.2E+00	4.8E-06	2.3E+00	Vg
Thallium	4.3E-01	1.3E-05	4.9E-05	1.3E-04	1.7E-10	1.6E-01	6.1E-01	1.6E+00	2.1E-06	2.4E+00	Vg
Inorganics Pathway Total						3.4E-01	8.9E-01	2.0E+01	1.6E-05	2.1E+01	
PCB-1254	1.1E-01	1.3E-05	8.0E-06	3.3E-05	1.7E-11	6.7E-01	4.0E-01	1.7E+00	8.6E-07	2.7E+00	Vg
Organics Pathway Total						6.7E-01	4.0E-01	1.7E+00	8.6E-07	2.7E+00	
Pathway Total						1.0E+00	1.3E+00	2.1E+01	1.7E-05	2.4E+01	
Perimeter Area											
Arsenic	1.3E+01	1.2E-05	7.7E-05	3.9E-03	4.6E-07	4.2E-02	2.6E-01	1.3E+01	1.5E-03	1.3E+01	Vg
Chromium	1.7E+01	2.8E-06	4.7E-04	5.0E-03	2.8E-06	1.9E-06	3.1E-04	3.3E-03	1.8E-06	3.6E-03	
Cyanide	5.6E-01	2.1E-08	1.1E-08	1.3E-03	6.9E-10	1.0E-06	5.4E-07	6.5E-02	3.4E-08	6.5E-02	
Manganese	1.4E+03	1.8E-03	5.3E-03	5.3E-01	2.2E-04	1.3E-02	3.8E-02	3.8E+00	1.6E-03	3.8E+00	Vg
Thallium	6.4E-01	1.9E-05	7.3E-05	1.9E-04	4.7E-08	2.4E-01	9.1E-01	2.4E+00	5.9E-04	3.5E+00	Vg
Inorganics Pathway Total						3.0E-01	1.2E+00	1.9E+01	3.7E-03	2.1E+01	
1,2-Dichloroethene	4.1E-03	8.4E-11	4.4E-11	2.0E-05		9.4E-09	4.8E-09	2.3E-03		2.3E-03	
Organics Pathway Total						9.4E-09	4.8E-09	2.3E-03		2.3E-03	
Pathway Total						3.0E-01	1.2E+00	1.9E+01	3.7E-03	2.1E+01	
Water Tower											
Chromium	2.5E+02	4.1E-05	7.0E-03	7.4E-02	6.7E-08	2.8E-05	4.6E-03	5.0E-02	4.5E-08	5.4E-02	
Thallium	6.4E-01	1.9E-05	7.3E-05	1.9E-04	7.7E-11	2.4E-01	9.1E-01	2.4E+00	9.6E-07	3.6E+00	Vg
Inorganics Pathway Total						2.4E-01	9.2E-01	2.5E+00	1.0E-06	3.6E+00	
Pathway Total						2.4E-01	9.2E-01	2.5E+00	1.0E-06	3.6E+00	
Open Residential - Resident Farmer (Child)											
CB-13 and CB-10											
Antimony	1.3E+00	4.2E-06	7.4E-07	1.8E-03	1.0E-10	1.0E-02	1.9E-03	4.5E+00	2.5E-07	4.6E+00	Vg
Arsenic	1.1E+01	8.6E-05	3.2E-04	1.6E-02	3.5E-08	2.9E-01	1.1E+00	5.3E+01	1.2E-04	5.5E+01	B Vg
Cadmium	6.5E+00	1.9E-03	8.0E-05	1.4E-02	5.7E-08	1.9E+00	8.0E-02	1.4E+01	5.7E-05	1.6E+01	M Vg
Chromium	3.5E+01	4.5E-05	4.6E-03	4.9E-02	5.0E-07	3.0E-05	3.0E-03	3.3E-02	3.4E-07	3.6E-02	
Manganese	1.3E+03	1.3E-02	2.3E-02	2.3E+00	1.8E-05	9.5E-02	1.6E-01	1.6E+01	1.3E-04	1.7E+01	Vg
Thallium	4.9E-01	1.1E-04	2.6E-04	6.8E-04	3.1E-09	1.4E+00	3.2E+00	8.5E+00	3.9E-05	1.3E+01	M B Vg
Inorganics Pathway Total						3.7E+00	4.5E+00	9.7E+01	3.4E-04	1.0E+02	
1,2-Dichloroethene	7.2E-03	1.1E-09	3.6E-10	1.7E-04		1.3E-07	3.9E-08	1.9E-02		1.9E-02	
2,4,6-Trinitrotoluene	2.5E+01	2.9E-05	9.0E-06	8.3E-02	1.8E-09	5.7E-02	1.8E-02	1.7E+02	3.6E-06	1.7E+02	Vg
2,4-Dinitrotoluene	1.5E+00	1.1E-06	3.6E-07	6.3E-03	7.7E-11	5.7E-04	1.8E-04	3.1E+00	3.9E-08	3.1E+00	Vg
2,6-Dinitrotoluene	6.0E-01	3.3E-07	1.1E-07	3.4E-03	2.4E-11	3.3E-04	1.1E-04	3.4E+00	2.4E-08	3.4E+00	Vg
Heptachlor	1.7E-02	4.2E-07	1.4E-07	2.6E-05	8.1E-12	8.4E-04	2.9E-04	5.1E-02	1.6E-08	5.2E-02	
PCB-1254	1.7E+00	1.6E-03	5.7E-04	2.4E-03	4.4E-09	8.1E+01	2.9E+01	1.2E+02	2.2E-04	2.3E+02	M B Vg
RDX	3.7E+00	1.6E-05	5.2E-06	7.0E-03	6.8E-10	5.2E-03	1.7E-03	2.3E+00	2.3E-07	2.3E+00	Vg
Organics Pathway Total						8.1E+01	2.9E+01	2.9E+02	2.3E-04	4.0E+02	
Pathway Total						8.4E+01	3.3E+01	3.9E+02	5.7E-04	5.1E+02	
CB-14, CB-17, and CA-15											
Arsenic	2.1E+01	1.7E-04	6.2E-04	3.1E-02	6.2E-08	5.5E-01	2.1E+00	1.0E+02	2.1E-04	1.1E+02	B Vg
Barium	1.4E+02	9.6E-03	4.4E-04	1.9E-01	9.7E-08	1.4E-01	6.3E-03	2.7E+00	1.4E-06	2.9E+00	Vg
Cadmium	2.1E+00	6.1E-04	2.6E-05	4.4E-03	1.6E-08	6.1E-01	2.6E-02	4.4E+00	1.6E-05	5.1E+00	Vg
Chromium	2.8E+01	3.6E-05	3.6E-03	3.8E-02	3.6E-07	2.4E-05	2.4E-03	2.6E-02	2.4E-07	2.8E-02	
Cyanide	1.1E+00	3.3E-07	1.0E-07	1.2E-02	1.1E-10	1.6E-05	5.1E-06	6.1E-01	5.4E-09	6.1E-01	
Manganese	1.2E+03	1.2E-02	2.1E-02	2.1E+00	1.4E-05	8.6E-02	1.5E-01	1.5E+01	1.0E-04	1.5E+01	Vg
Nickel	3.2E+01	8.9E-02	3.0E-03	5.3E-02	1.0E-06	4.5E+00	1.5E-01	2.6E+00	5.2E-05	7.2E+00	M Vg
Thallium	9.1E-01	2.1E-04	4.8E-04	1.3E-03	5.3E-09	2.7E+00	6.0E+00	1.6E+01	6.6E-05	2.5E+01	M B Vg
Vanadium	3.5E+01	8.2E-05	1.2E-03	4.9E-02	1.7E-08	1.2E-02	1.7E-01	7.0E+00	2.5E-06	7.1E+00	Vg
Inorganics Pathway Total						8.5E+00	8.6E+00	1.5E+02	4.5E-04	1.7E+02	

Table 6-15a. Surface Soil Hazards - Ingestion of Foodstuffs (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)				Hazard Quotient (HQ)				Total HI across all pathways	COC[a]
		milk	beef	vegetables	venison	milk	beef	vegetables	venison		
1,2-Dichloroethene	3.1E-03	5.0E-10	1.5E-10	7.2E-05		5.5E-08	1.7E-08	8.0E-03		8.0E-03	
2,4,6-Trinitrotoluene	4.5E+00	5.1E-06	1.6E-06	1.5E-02	2.9E-10	1.0E-02	3.2E-03	3.0E+01	5.9E-07	3.0E+01	Vg
2,4-Dinitrotoluene	5.3E-01	4.0E-07	1.3E-07	2.2E-03	2.5E-11	2.0E-04	6.4E-05	1.1E+00	1.2E-08	1.1E+00	Vg
PCB-1254	4.7E+00	4.5E-03	1.6E-03	6.6E-03	1.1E-08	2.2E+02	7.9E+01	3.3E+02	5.5E-04	6.3E+02	M B Vg
RDX	2.9E+01	1.2E-04	4.0E-05	5.4E-02	4.8E-09	4.1E-02	1.3E-02	1.8E+01	1.6E-06	1.8E+01	Vg
Organics Pathway Total						2.2E+02	7.9E+01	3.8E+02	5.6E-04	6.8E+02	
Pathway Total						2.3E+02	8.8E+01	5.3E+02	1.0E-03	8.5E+02	
CB-3/CB-801											
Antimony	1.1E+02	3.6E-04	6.5E-05	1.6E-01	5.2E-09	9.1E-01	1.6E-01	3.9E+02	1.3E-05	4.0E+02	Vg
Arsenic	1.3E+01	1.0E-04	3.7E-04	1.9E-02	2.4E-08	3.3E-01	1.2E+00	6.2E+01	8.1E-05	6.3E+01	B Vg
Cadmium	6.3E+00	1.9E-03	7.8E-05	1.3E-02	3.3E-08	1.9E+00	7.8E-02	1.3E+01	3.3E-05	1.5E+01	M Vg
Chromium	4.4E+01	5.7E-05	5.7E-03	6.1E-02	3.7E-07	3.8E-05	3.8E-03	4.1E-02	2.5E-07	4.4E-02	
Manganese	1.3E+03	1.3E-02	2.2E-02	2.2E+00	1.0E-05	9.2E-02	1.6E-01	1.6E+01	7.2E-05	1.6E+01	Vg
Thallium	6.0E-01	1.4E-04	3.2E-04	8.4E-04	2.3E-09	1.8E+00	4.0E+00	1.0E+01	2.8E-05	1.6E+01	M B Vg
Inorganics Pathway Total						5.0E+00	5.6E+00	5.0E+02	2.3E-04	5.1E+02	
1,2-Dichloroethene	7.1E-03	1.1E-09	3.5E-10	1.7E-04		1.3E-07	3.9E-08	1.8E-02		1.8E-02	
2,4-Dinitrotoluene	1.3E-01	1.0E-07	3.2E-08	5.5E-04	4.0E-12	5.0E-05	1.6E-05	2.7E-01	2.0E-09	2.7E-01	
Dieldrin	3.3E-02	1.5E-06	5.3E-07	4.9E-05	1.3E-11	3.0E-02	1.1E-02	9.9E-01	2.6E-07	1.0E+00	
PCB-1254	4.3E+00	4.1E-03	1.5E-03	6.0E-03	6.6E-09	2.0E+02	7.3E+01	3.0E+02	3.3E-04	5.8E+02	M B Vg
Organics Pathway Total						2.0E+02	7.3E+01	3.0E+02	3.3E-04	5.8E+02	
Pathway Total						2.1E+02	7.8E+01	8.0E+02	5.6E-04	1.1E+03	
CB-4/4A and CA-6/6A											
Arsenic	1.1E+01	8.4E-05	3.1E-04	1.6E-02	8.0E-08	2.8E-01	1.0E+00	5.2E+01	2.7E-04	5.4E+01	B Vg
Barium	1.4E+02	9.9E-03	4.5E-04	1.9E-01	2.6E-07	1.4E-01	6.5E-03	2.8E+00	3.6E-06	2.9E+00	Vg
Cadmium	1.8E+00	5.4E-04	2.2E-05	3.9E-03	3.7E-08	5.4E-01	2.2E-02	3.9E+00	3.7E-05	4.4E+00	Vg
Chromium	2.5E+01	3.2E-05	3.2E-03	3.4E-02	8.2E-07	2.1E-05	2.1E-03	2.3E-02	5.5E-07	2.5E-02	
Cyanide	5.5E-01	1.6E-07	5.1E-08	6.1E-03	1.4E-10	8.1E-06	2.5E-06	3.0E-01	6.9E-09	3.0E-01	
Manganese	7.0E+02	7.1E-03	1.2E-02	1.2E+00	2.2E-05	5.1E-02	8.8E-02	8.8E+00	1.6E-04	8.9E+00	Vg
Mercury	3.4E-01	7.1E-05	1.6E-04	4.8E-04	3.1E-07	2.4E-01	5.2E-01	1.6E+00	1.0E-03	2.3E+00	Vg
Thallium	5.4E-01	1.3E-04	2.8E-04	7.5E-04	7.9E-09	1.6E+00	3.5E+00	9.3E+00	9.8E-05	1.4E+01	M B Vg
Vanadium	1.9E+01	4.5E-05	6.3E-04	2.7E-02	2.4E-08	6.4E-03	9.0E-02	3.8E+00	3.4E-06	3.9E+00	Vg
Inorganics Pathway Total						2.8E+00	5.3E+00	8.3E+01	1.6E-03	9.1E+01	
1,2-Dichloroethene	1.2E-02	1.9E-09	6.0E-10	2.8E-04		2.2E-07	6.7E-08	3.1E-02		3.1E-02	
1,3-Dinitrobenzene	5.9E+00	2.9E-06	9.4E-07	3.7E-02	4.9E-10	2.9E-02	9.4E-03	3.7E+02	4.9E-06	3.7E+02	Vg
2,4,6-Trinitrotoluene	3.0E+02	3.4E-04	1.1E-04	9.8E-01	5.0E-08	6.7E-01	2.1E-01	2.0E+03	9.9E-05	2.0E+03	Vg
2,4-Dinitrotoluene	2.3E-01	1.8E-07	5.6E-08	9.7E-04	2.8E-11	8.8E-05	2.8E-05	4.8E-01	1.4E-08	4.8E-01	
2,6-Dinitrotoluene	8.6E-01	4.8E-07	1.6E-07	4.9E-03	8.1E-11	4.8E-04	1.6E-04	4.9E+00	8.1E-08	4.9E+00	Vg
Dieldrin	9.8E-02	4.4E-06	1.6E-06	1.5E-04	1.5E-10	8.7E-02	3.1E-02	2.9E+00	3.0E-06	3.0E+00	Vg
Endrin aldehyde	4.4E+00	1.9E-04	6.9E-05	6.5E-03	6.7E-09	6.5E-01	2.3E-01	2.2E+01	2.2E-05	2.3E+01	Vg
Heptachlor	7.2E-02	1.8E-06	6.1E-07	1.1E-04	8.0E-11	3.6E-03	1.2E-03	2.2E-01	1.6E-07	2.2E-01	
Heptachlor epoxide	3.1E-02	7.8E-06	2.7E-06	4.4E-05	1.0E-10	6.0E-01	2.1E-01	3.4E+00	7.8E-06	4.2E+00	Vg
PCB-1254	1.1E+03	1.0E+00	3.7E-01	1.5E+00	6.6E-06	5.2E+04	1.9E+04	7.7E+04	3.3E-01	1.5E+05	M B Vg
RDX	1.0E+02	4.3E-04	1.4E-04	1.9E-01	4.3E-08	1.4E-01	4.7E-02	6.3E+01	1.4E-05	6.3E+01	Vg
alpha-Chlordane	7.8E-02	2.4E-05	8.6E-06	1.1E-04	2.9E-10	4.8E-02	1.7E-02	2.2E-01	5.7E-07	2.9E-01	
gamma-Chlordane	8.9E-01	2.8E-04	9.8E-05	1.3E-03	3.2E-09	5.5E-01	2.0E-01	2.5E+00	6.5E-06	3.3E+00	Vg
Organics Pathway Total						5.2E+04	1.9E+04	7.9E+04	3.3E-01	1.5E+05	
Pathway Total						5.2E+04	1.9E+04	8.0E+04	3.3E-01	1.5E+05	
Change Houses (CB-12, -23, -8, -22)											
Antimony	2.3E+00	7.5E-06	1.3E-06	3.3E-03	5.0E-11	1.9E-02	3.3E-03	8.1E+00	1.3E-07	8.1E+00	Vg
Arsenic	1.2E+01	9.4E-05	3.5E-04	1.8E-02	1.1E-08	3.1E-01	1.2E+00	5.8E+01	3.6E-05	6.0E+01	B Vg
Cadmium	3.3E+00	9.7E-04	4.1E-05	7.0E-03	8.1E-09	9.7E-01	4.1E-02	7.0E+00	8.1E-06	8.0E+00	Vg
Chromium	1.5E+01	1.9E-05	2.0E-03	2.1E-02	6.1E-08	1.3E-05	1.3E-03	1.4E-02	4.0E-08	1.5E-02	
Manganese	8.3E+02	8.4E-03	1.5E-02	1.5E+00	3.2E-06	6.0E-02	1.0E-01	1.0E+01	2.3E-05	1.1E+01	Vg
Thallium	4.3E-01	1.0E-04	2.3E-04	6.0E-04	7.7E-10	1.3E+00	2.9E+00	7.5E+00	9.7E-06	1.2E+01	M B Vg
Inorganics Pathway Total						2.6E+00	4.2E+00	9.1E+01	7.7E-05	9.8E+01	
PCB-1254	1.1E-01	1.0E-04	3.7E-05	1.5E-04	8.1E-11	5.2E+00	1.9E+00	7.7E+00	4.0E-06	1.5E+01	M B Vg
Organics Pathway Total						5.2E+00	1.9E+00	7.7E+00	4.0E-06	1.5E+01	

Table 6-15a. Surface Soil Hazards - Ingestion of Foodstuffs (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)				Hazard Quotient (HQ)				Total HI across all pathways	COC[a]
		milk	beef	vegetables	venison	milk	beef	vegetables	venison		
Pathway Total						7.9E+00	6.0E+00	9.9E+01	8.1E-05	1.1E+02	
Perimeter Area											
Arsenic	1.3E+01	9.7E-05	3.6E-04	1.8E-02	2.1E-06	3.2E-01	1.2E+00	6.0E+01	7.2E-03	6.2E+01	B Vg
Chromium	1.7E+01	2.2E-05	2.2E-03	2.3E-02	1.3E-05	1.4E-05	1.5E-03	1.6E-02	8.6E-06	1.7E-02	
Cyanide	5.6E-01	1.6E-07	5.1E-08	6.1E-03	3.2E-09	8.2E-06	2.5E-06	3.1E-01	1.6E-07	3.1E-01	
Manganese	1.4E+03	1.4E-02	2.5E-02	2.5E+00	1.0E-03	1.0E-01	1.8E-01	1.8E+01	7.3E-03	1.8E+01	Vg
Thallium	6.4E-01	1.5E-04	3.4E-04	8.9E-04	2.2E-07	1.9E+00	4.3E+00	1.1E+01	2.7E-03	1.7E+01	M B Vg
Inorganics Pathway Total						2.3E+00	5.6E+00	8.9E+01	1.7E-02	9.7E+01	
1,2-Dichloroethene	4.1E-03	6.6E-10	2.0E-10	9.5E-05		7.3E-08	2.3E-08	1.1E-02		1.1E-02	
Organics Pathway Total						7.3E-08	2.3E-08	1.1E-02		1.1E-02	
Pathway Total						2.3E+00	5.6E+00	8.9E+01	1.7E-02	9.7E+01	
Water Tower											
Chromium	2.5E+02	3.2E-04	3.2E-02	3.5E-01	3.1E-07	2.2E-04	2.2E-02	2.3E-01	2.1E-07	2.5E-01	
Thallium	6.4E-01	1.5E-04	3.4E-04	9.0E-04	3.6E-10	1.9E+00	4.3E+00	1.1E+01	4.5E-06	1.7E+01	M B Vg
Inorganics Pathway Total						1.9E+00	4.3E+00	1.1E+01	4.7E-06	1.8E+01	
Pathway Total						1.9E+00	4.3E+00	1.1E+01	4.7E-06	1.8E+01	

[a] COPCs are identified as chemicals of concern (COCs) for ingestion of venison (Vn), milk (M), beef (B), or vegetables (Vg) if the total HI across all pathways is > 1 or if the total ILCR is > 1E-06.
COPC = chemical of potential concern.
EPC = exposure point concentration.
HI = hazard indx.
HQ = hazard quotient.

Table 6-15b. Surface Soil Risks - Ingestion of Foodstuffs

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)				Risk				Total Risk across all pathways	COC[a]
		milk	beef	vegetables	venison	milk	beef	vegetables	venison		
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Hunter/Trapper											
CB-13 and CB-10											
Arsenic	1.1E+01				3.2E-09				4.9E-09	4.9E-09	
Inorganics Pathway Total									4.9E-09	4.9E-09	
2,4,6-Trinitrotoluene	2.5E+01				1.7E-10				5.0E-12	5.0E-12	
2,4-Dinitrotoluene	1.5E+00				7.1E-12				4.8E-12	4.8E-12	
2,6-Dinitrotoluene	6.0E-01				2.2E-12				1.5E-12	1.5E-12	
Benz(a)anthracene	4.1E-01				7.4E-11				5.4E-11	5.4E-11	
Benzo(a)pyrene	3.7E-01				9.3E-11				6.8E-10	6.8E-10	
Benzo(b)fluoranthene	4.5E-01				1.1E-10				8.3E-11	8.3E-11	
Heptachlor	1.7E-02				7.4E-13				3.4E-12	3.4E-12	
Indeno(1,2,3-cd)pyrene	2.2E-01				9.0E-11				6.6E-11	6.6E-11	
PCB-1254	1.7E+00				4.1E-10				8.1E-10	8.1E-10	
RDX	3.7E+00				6.2E-11				6.9E-12	6.9E-12	
Organics Pathway Total									1.7E-09	1.7E-09	
Pathway Total									6.6E-09	6.6E-09	
CB-14, CB-17, and CA-15											
Arsenic	2.1E+01				5.7E-09				8.5E-09	8.5E-09	
Inorganics Pathway Total									8.5E-09	8.5E-09	
2,4,6-Trinitrotoluene	4.5E+00				2.7E-11				8.1E-13	8.1E-13	
2,4-Dinitrotoluene	5.3E-01				2.3E-12				1.5E-12	1.5E-12	
4,4'-DDE	2.0E-01				3.3E-11				1.1E-11	1.1E-11	
Benz(a)anthracene	6.4E-01				1.1E-10				7.7E-11	7.7E-11	
Benzo(a)pyrene	8.2E-01				1.9E-10				1.4E-09	1.4E-09	
Benzo(b)fluoranthene	1.1E+00				2.5E-10				1.8E-10	1.8E-10	
Dibenz(a,h)anthracene	1.8E-01				8.3E-11				6.0E-10	6.0E-10	
Indeno(1,2,3-cd)pyrene	6.4E-01				2.4E-10				1.7E-10	1.7E-10	
PCB-1254	4.7E+00				1.0E-09				2.0E-09	2.0E-09	
RDX	2.9E+01				4.4E-10				4.8E-11	4.8E-11	
Organics Pathway Total									4.5E-09	4.5E-09	
Pathway Total									1.3E-08	1.3E-08	
CB-3/CB-801											
Arsenic	1.3E+01				2.2E-09				3.4E-09	3.4E-09	
Inorganics Pathway Total									3.4E-09	3.4E-09	
2,4-Dinitrotoluene	1.3E-01				3.7E-13				2.5E-13	2.5E-13	
Benz(a)anthracene	1.4E+01				1.5E-09				1.1E-09	1.1E-09	
Benzo(a)pyrene	1.3E+01				1.9E-09				1.4E-08	1.4E-08	
Benzo(b)fluoranthene	1.5E+01				2.2E-09				1.6E-09	1.6E-09	
Benzo(k)fluoranthene	5.7E+00				1.7E-09				1.3E-10	1.3E-10	
Carbazole	2.6E+00				4.4E-11				8.8E-13	8.8E-13	
Chrysene	1.5E+01				1.6E-09				1.2E-11	1.2E-11	
Dibenz(a,h)anthracene	1.2E+00				3.5E-10				2.5E-09	2.5E-09	
Dieldrin	3.3E-02				1.2E-12				1.9E-11	1.9E-11	
Indeno(1,2,3-cd)pyrene	8.7E+00				2.1E-09				1.6E-09	1.6E-09	
PCB-1254	4.3E+00				6.1E-10				1.2E-09	1.2E-09	
beta-BHC	1.9E-01				3.7E-12				6.6E-12	6.6E-12	
Organics Pathway Total									2.2E-08	2.2E-08	
Pathway Total									2.6E-08	2.6E-08	
CB-4/4A and CA-6/6A											
Arsenic	1.1E+01				7.4E-09				1.1E-08	1.1E-08	
Inorganics Pathway Total									1.1E-08	1.1E-08	
2,4,6-Trinitrotoluene	3.0E+02				4.6E-09				1.4E-10	1.4E-10	
2,4-Dinitrotoluene	2.3E-01				2.5E-12				1.7E-12	1.7E-12	
2,6-Dinitrotoluene	8.6E-01				7.4E-12				5.0E-12	5.0E-12	
4,4'-DDE	1.2E+00				5.0E-10				1.7E-10	1.7E-10	
Benz(a)anthracene	6.4E-01				2.7E-10				2.0E-10	2.0E-10	
Benzo(a)pyrene	6.1E-01				3.5E-10				2.6E-09	2.6E-09	

Table 6-15b. Surface Soil Risks - Ingestion of Foodstuffs (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)				Risk				Total Risk across all pathways	COC[a]
		milk	beef	vegetables	venison	milk	beef	vegetables	venison		
Benzo(b)fluoranthene	6.6E-01				3.8E-10				2.8E-10	2.8E-10	
Dibenz(a,h)anthracene	9.6E-02				1.1E-10				8.2E-10	8.2E-10	
Dieldrin	9.8E-02				1.4E-11				2.2E-10	2.2E-10	
Heptachlor	7.2E-02				7.3E-12				3.3E-11	3.3E-11	
Heptachlor epoxide	3.1E-02				9.3E-12				8.5E-11	8.5E-11	
Indeno(1,2,3-cd)pyrene	5.5E-01				5.3E-10				3.8E-10	3.8E-10	
PCB-1254	1.1E+03				6.1E-07				1.2E-06	1.2E-06	Vn
RDX	1.0E+02				3.9E-09				4.3E-10	4.3E-10	
alpha-Chlordane	7.8E-02				2.6E-11				9.2E-12	9.2E-12	
gamma-Chlordane	8.9E-01				3.0E-10				1.0E-10	1.0E-10	
Organics Pathway Total									1.2E-06	1.2E-06	
Pathway Total									1.2E-06	1.2E-06	
Change Houses (CB-12, -23, -8, -22)											
Arsenic	1.2E+01				1.0E-09				1.5E-09	1.5E-09	
Inorganics Pathway Total									1.5E-09	1.5E-09	
Benz(a)anthracene	7.2E-02				3.7E-12				2.7E-12	2.7E-12	
Benzo(a)pyrene	9.2E-02				6.5E-12				4.7E-11	4.7E-11	
Benzo(b)fluoranthene	1.5E-01				1.1E-11				7.7E-12	7.7E-12	
Indeno(1,2,3-cd)pyrene	7.5E-02				8.7E-12				6.3E-12	6.3E-12	
PCB-1254	1.1E-01				7.4E-12				1.5E-11	1.5E-11	
Organics Pathway Total									7.9E-11	7.9E-11	
Pathway Total									1.6E-09	1.6E-09	
Perimeter Area											
Arsenic	1.3E+01				2.0E-07				3.0E-07	3.0E-07	
Inorganics Pathway Total									3.0E-07	3.0E-07	
Pathway Total									3.0E-07	3.0E-07	
Open Residential - Resident Farmer (Adult)											
CB-13 and CB-10											
Arsenic	1.1E+01	4.7E-06	2.9E-05	1.5E-03	3.2E-09	7.1E-06	4.4E-05	2.2E-03	4.9E-09	2.3E-03	M B Vg
Inorganics Pathway Total						7.1E-06	4.4E-05	2.2E-03	4.9E-09	2.3E-03	
2,4,6-Trinitrotoluene	2.5E+01	1.6E-06	8.3E-07	7.7E-03	1.7E-10	4.7E-08	2.5E-08	2.3E-04	5.0E-12	2.3E-04	Vg
2,4-Dinitrotoluene	1.5E+00	6.3E-08	3.3E-08	5.7E-04	7.1E-12	4.3E-08	2.3E-08	3.9E-04	4.8E-12	3.9E-04	Vg
2,6-Dinitrotoluene	6.0E-01	1.8E-08	1.0E-08	3.1E-04	2.2E-12	1.3E-08	6.8E-09	2.1E-04	1.5E-12	2.1E-04	Vg
Benz(a)anthracene	4.1E-01	1.1E-05	6.7E-06	5.3E-05	7.4E-11	8.0E-06	4.9E-06	3.9E-05	5.4E-11	5.2E-05	M B Vg
Benzo(a)pyrene	3.7E-01	2.4E-05	1.4E-05	4.8E-05	9.3E-11	1.8E-04	1.0E-04	3.5E-04	6.8E-10	6.3E-04	M B Vg
Benzo(b)fluoranthene	4.5E-01	2.9E-05	1.7E-05	5.8E-05	1.1E-10	2.1E-05	1.3E-05	4.2E-05	8.3E-11	7.7E-05	M B Vg
Heptachlor	1.7E-02	2.3E-08	1.3E-08	2.4E-06	7.4E-13	1.0E-07	5.9E-08	1.1E-05	3.4E-12	1.1E-05	Vg
Indeno(1,2,3-cd)pyrene	2.2E-01	4.4E-05	2.7E-05	2.8E-05	9.0E-11	3.2E-05	2.0E-05	2.0E-05	6.6E-11	7.2E-05	M B Vg
PCB-1254	1.7E+00	8.9E-05	5.3E-05	2.2E-04	4.1E-10	1.8E-04	1.1E-04	4.4E-04	8.1E-10	7.2E-04	M B Vg
RDX	3.7E+00	8.7E-07	4.7E-07	6.4E-04	6.2E-11	9.5E-08	5.2E-08	7.0E-05	6.9E-12	7.1E-05	Vg
Organics Pathway Total						4.2E-04	2.5E-04	1.8E-03	1.7E-09	2.5E-03	
Pathway Total						4.2E-04	2.9E-04	4.0E-03	6.6E-09	4.7E-03	
CB-14, CB-17, and CA-15											
Arsenic	2.1E+01	9.1E-06	5.7E-05	2.8E-03	5.7E-09	1.4E-05	8.5E-05	4.2E-03	8.5E-09	4.3E-03	M B Vg
Inorganics Pathway Total						1.4E-05	8.5E-05	4.2E-03	8.5E-09	4.3E-03	
2,4,6-Trinitrotoluene	4.5E+00	2.8E-07	1.5E-07	1.4E-03	2.7E-11	8.4E-09	4.4E-09	4.1E-05	8.1E-13	4.1E-05	Vg
2,4-Dinitrotoluene	5.3E-01	2.2E-08	1.2E-08	2.0E-04	2.3E-12	1.5E-08	8.0E-09	1.4E-04	1.5E-12	1.4E-04	Vg
4,4'-DDE	2.0E-01	5.4E-06	3.3E-06	2.6E-05	3.3E-11	1.8E-06	1.1E-06	8.8E-06	1.1E-11	1.2E-05	M B Vg
Benz(a)anthracene	6.4E-01	1.7E-05	1.0E-05	8.3E-05	1.1E-10	1.3E-05	7.7E-06	6.0E-05	7.7E-11	8.1E-05	M B Vg
Benzo(a)pyrene	8.2E-01	5.3E-05	3.1E-05	1.1E-04	1.9E-10	3.9E-04	2.3E-04	7.7E-04	1.4E-09	1.4E-03	M B Vg
Benzo(b)fluoranthene	1.1E+00	7.2E-05	4.2E-05	1.4E-04	2.5E-10	5.2E-05	3.1E-05	1.0E-04	1.8E-10	1.9E-04	M B Vg
Dibenz(a,h)anthracene	1.8E-01	5.8E-05	3.5E-05	2.3E-05	8.3E-11	4.2E-04	2.6E-04	1.7E-04	6.0E-10	8.5E-04	M B Vg
Indeno(1,2,3-cd)pyrene	6.4E-01	1.3E-04	7.8E-05	8.2E-05	2.4E-10	9.4E-05	5.7E-05	6.0E-05	1.7E-10	2.1E-04	M B Vg
PCB-1254	4.7E+00	2.5E-04	1.5E-04	6.0E-04	1.0E-09	4.9E-04	2.9E-04	1.2E-03	2.0E-09	2.0E-03	M B Vg
RDX	2.9E+01	6.7E-06	3.7E-06	4.9E-03	4.4E-10	7.4E-07	4.0E-07	5.4E-04	4.8E-11	5.5E-04	Vg
Organics Pathway Total						1.5E-03	8.7E-04	3.1E-03	4.5E-09	5.4E-03	

Table 6-15b. Surface Soil Risks - Ingestion of Foodstuffs (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)				Risk				Total Risk across all pathways	COC[a]
		milk	beef	vegetables	venison	milk	beef	vegetables	venison		
Pathway Total						1.5E-03	9.6E-04	7.3E-03	1.3E-08	9.8E-03	
CB-3/CB-801											
Arsenic	1.3E+01	5.5E-06	3.4E-05	1.7E-03	2.2E-09	8.2E-06	5.1E-05	2.6E-03	3.4E-09	2.6E-03	M B Vg
Inorganics Pathway Total						8.2E-06	5.1E-05	2.6E-03	3.4E-09	2.6E-03	
2,4-Dinitrotoluene	1.3E-01	5.5E-09	2.9E-09	5.0E-05	3.7E-13	3.7E-09	2.0E-09	3.4E-05	2.5E-13	3.4E-05	Vg
Benz(a)anthracene	1.4E+01	3.8E-04	2.3E-04	1.8E-03	1.5E-09	2.7E-04	1.7E-04	1.3E-03	1.1E-09	1.8E-03	M B Vg
Benzo(a)pyrene	1.3E+01	8.5E-04	5.0E-04	1.7E-03	1.9E-09	6.2E-03	3.6E-03	1.2E-02	1.4E-08	2.2E-02	M B Vg
Benzo(b)fluoranthene	1.5E+01	9.8E-04	5.7E-04	1.9E-03	2.2E-09	7.1E-04	4.2E-04	1.4E-03	1.6E-09	2.5E-03	M B Vg
Benzo(k)fluoranthene	5.7E+00	1.8E-03	1.1E-03	7.3E-04	1.7E-09	1.3E-04	8.1E-05	5.3E-05	1.3E-10	2.7E-04	M B Vg
Carbazole	2.6E+00	1.4E-06	8.1E-07	4.0E-04	4.4E-11	2.8E-08	1.6E-08	8.0E-06	8.8E-13	8.0E-06	Vg
Chrysene	1.5E+01	4.0E-04	2.5E-04	1.9E-03	1.6E-09	2.9E-06	1.8E-06	1.4E-05	1.2E-11	1.9E-05	M B Vg
Dibenz(a,h)anthracene	1.2E+00	3.7E-04	2.2E-04	1.5E-04	3.5E-10	2.7E-03	1.6E-03	1.1E-03	2.5E-09	5.4E-03	M B Vg
Dieldrin	3.3E-02	8.1E-08	4.8E-08	4.5E-06	1.2E-12	1.3E-06	7.7E-07	7.2E-05	1.9E-11	7.5E-05	M Vg
Indeno(1,2,3-cd)pyrene	8.7E+00	1.7E-03	1.1E-03	1.1E-03	2.1E-09	1.3E-03	7.7E-04	8.1E-04	1.6E-09	2.9E-03	M B Vg
PCB-1254	4.3E+00	2.2E-04	1.3E-04	5.5E-04	6.1E-10	4.5E-04	2.7E-04	1.1E-03	1.2E-09	1.8E-03	M B Vg
beta-BHC	1.9E-01	1.4E-07	8.1E-08	2.7E-05	3.7E-12	2.6E-07	1.5E-07	4.9E-05	6.6E-12	4.9E-05	Vg
Organics Pathway Total						1.2E-02	7.0E-03	1.8E-02	2.2E-08	3.6E-02	
Pathway Total						1.2E-02	7.0E-03	2.0E-02	2.6E-08	3.9E-02	
CB-4/4A and CA-6/6A											
Arsenic	1.1E+01	4.6E-06	2.9E-05	1.4E-03	7.4E-09	7.0E-06	4.3E-05	2.2E-03	1.1E-08	2.2E-03	M B Vg
Inorganics Pathway Total						7.0E-06	4.3E-05	2.2E-03	1.1E-08	2.2E-03	
2,4,6-Trinitrotoluene	3.0E+02	1.8E-05	9.8E-06	9.0E-02	4.6E-09	5.5E-07	2.9E-07	2.7E-03	1.4E-10	2.7E-03	Vg
2,4-Dinitrotoluene	2.3E-01	9.7E-09	5.1E-09	8.9E-05	2.5E-12	6.6E-09	3.5E-09	6.1E-05	1.7E-12	6.1E-05	Vg
2,6-Dinitrotoluene	8.6E-01	2.6E-08	1.4E-08	4.5E-04	7.4E-12	1.8E-08	9.7E-09	3.0E-04	5.0E-12	3.0E-04	Vg
4,4'-DDE	1.2E+00	3.2E-05	2.0E-05	1.5E-04	5.0E-10	1.1E-05	6.6E-06	5.2E-05	1.7E-10	7.0E-05	M B Vg
Benz(a)anthracene	6.4E-01	1.7E-05	1.0E-05	8.3E-05	2.7E-10	1.3E-05	7.7E-06	6.0E-05	2.0E-10	8.1E-05	M B Vg
Benzo(a)pyrene	6.1E-01	4.0E-05	2.3E-05	7.8E-05	3.5E-10	2.9E-04	1.7E-04	5.7E-04	2.6E-09	1.0E-03	M B Vg
Benzo(b)fluoranthene	6.6E-01	4.3E-05	2.5E-05	8.5E-05	3.8E-10	3.1E-05	1.9E-05	6.2E-05	2.8E-10	1.1E-04	M B Vg
Dibenz(a,h)anthracene	9.6E-02	3.1E-05	1.9E-05	1.2E-05	1.1E-10	2.3E-04	1.4E-04	9.0E-05	8.2E-10	4.5E-04	M B Vg
Dieldrin	9.8E-02	2.4E-07	1.4E-07	1.3E-05	1.4E-11	3.8E-06	2.3E-06	2.1E-04	2.2E-10	2.2E-04	M B Vg
Heptachlor	7.2E-02	9.8E-08	5.6E-08	1.0E-05	7.3E-12	4.4E-07	2.5E-07	4.5E-05	3.3E-11	4.6E-05	Vg
Heptachlor epoxide	3.1E-02	4.3E-07	2.5E-07	4.0E-06	9.3E-12	3.9E-06	2.3E-06	3.7E-05	8.5E-11	4.3E-05	M B Vg
Indeno(1,2,3-cd)pyrene	5.5E-01	1.1E-04	6.7E-05	7.1E-05	5.3E-10	8.1E-05	4.9E-05	5.1E-05	3.8E-10	1.8E-04	M B Vg
PCB-1254	1.1E+03	5.7E-02	3.4E-02	1.4E-01	6.1E-07	1.1E-01	6.6E-02	2.5E-01	1.2E-06	3.7E-01	M B Vg Vn
RDX	1.0E+02	2.4E-05	1.3E-05	1.7E-02	3.9E-09	2.6E-06	1.4E-06	1.9E-03	4.3E-10	1.9E-03	M B Vg
alpha-Chlordane	7.8E-02	1.3E-06	7.9E-07	1.0E-05	2.6E-11	4.7E-07	2.8E-07	3.5E-06	9.2E-12	4.3E-06	Vg
gamma-Chlordane	8.9E-01	1.5E-05	9.0E-06	1.2E-04	3.0E-10	5.3E-06	3.1E-06	4.0E-05	1.0E-10	4.9E-05	M B Vg
Organics Pathway Total						1.1E-01	6.6E-02	2.5E-01	1.2E-06	3.8E-01	
Pathway Total						1.1E-01	6.6E-02	2.5E-01	1.2E-06	3.8E-01	
Change Houses (CB-12, -23, -8, -22)											
Arsenic	1.2E+01	5.2E-06	3.2E-05	1.6E-03	1.0E-09	7.8E-06	4.8E-05	2.4E-03	1.5E-09	2.5E-03	M B Vg
Inorganics Pathway Total						7.8E-06	4.8E-05	2.4E-03	1.5E-09	2.5E-03	
Benz(a)anthracene	7.2E-02	1.9E-06	1.2E-06	9.3E-06	3.7E-12	1.4E-06	8.6E-07	6.8E-06	2.7E-12	9.1E-06	M Vg
Benzo(a)pyrene	9.2E-02	6.0E-06	3.5E-06	1.2E-05	6.5E-12	4.4E-05	2.6E-05	8.6E-05	4.7E-11	1.6E-04	M B Vg
Benzo(b)fluoranthene	1.5E-01	9.8E-06	5.7E-06	1.9E-05	1.1E-11	7.1E-06	4.2E-06	1.4E-05	7.7E-12	2.5E-05	M B Vg
Indeno(1,2,3-cd)pyrene	7.5E-02	1.5E-05	9.1E-06	9.6E-06	8.7E-12	1.1E-05	6.7E-06	7.0E-06	6.3E-12	2.5E-05	M B Vg
PCB-1254	1.1E-01	5.7E-06	3.4E-06	1.4E-05	7.4E-12	1.1E-05	6.8E-06	2.8E-05	1.5E-11	4.7E-05	M B Vg
Organics Pathway Total						7.5E-05	4.4E-05	1.4E-04	7.9E-11	2.6E-04	
Pathway Total						8.3E-05	9.3E-05	2.6E-03	1.6E-09	2.7E-03	
Perimeter Area											
Arsenic	1.3E+01	5.3E-06	3.3E-05	1.7E-03	2.0E-07	8.0E-06	5.0E-05	2.5E-03	3.0E-07	2.5E-03	M B Vg
Inorganics Pathway Total						8.0E-06	5.0E-05	2.5E-03	3.0E-07	2.5E-03	
Pathway Total						8.0E-06	5.0E-05	2.5E-03	3.0E-07	2.5E-03	
Open Residential - Resident Farmer (Child)											
CB-13 and CB-10											
Arsenic	1.1E+01	7.4E-06	2.7E-05	1.4E-03	3.0E-09	1.1E-05	4.1E-05	2.1E-03	4.5E-09	2.1E-03	M B Vg
Inorganics Pathway Total						1.1E-05	4.1E-05	2.1E-03	4.5E-09	2.1E-03	

Table 6-15b. Surface Soil Risks - Ingestion of Foodstuffs (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)				Risk				Total Risk across all pathways	COC[a]
		milk	beef	vegetables	venison	milk	beef	vegetables	venison		
2,4,6-Trinitrotoluene	2.5E+01	2.4E-06	7.7E-07	7.2E-03	1.6E-10	7.3E-08	2.3E-08	2.1E-04	4.7E-12	2.1E-04	Vg
2,4-Dinitrotoluene	1.5E+00	9.7E-08	3.1E-08	5.4E-04	6.6E-12	6.6E-08	2.1E-08	3.6E-04	4.5E-12	3.7E-04	Vg
2,6-Dinitrotoluene	6.0E-01	2.9E-08	9.3E-09	2.9E-04	2.1E-12	2.0E-08	6.3E-09	2.0E-04	1.4E-12	2.0E-04	Vg
Benz(a)anthracene	4.1E-01	1.7E-05	6.3E-06	4.9E-05	7.0E-11	1.3E-05	4.6E-06	3.6E-05	5.1E-11	5.3E-05	M B Vg
Benzo(a)pyrene	3.7E-01	3.8E-05	1.3E-05	4.4E-05	8.7E-11	2.7E-04	9.7E-05	3.2E-04	6.3E-10	6.9E-04	M B Vg
Benzo(b)fluoranthene	4.5E-01	4.6E-05	1.6E-05	5.4E-05	1.1E-10	3.3E-05	1.2E-05	4.0E-05	7.7E-11	8.5E-05	M B Vg
Heptachlor	1.7E-02	3.6E-08	1.2E-08	2.2E-06	6.9E-13	1.6E-07	5.5E-08	9.9E-06	3.1E-12	1.0E-05	Vg
Indeno(1,2,3-cd)pyrene	2.2E-01	6.9E-05	2.5E-05	2.6E-05	8.4E-11	5.0E-05	1.8E-05	1.9E-05	6.2E-11	8.7E-05	M B Vg
PCB-1254	1.7E+00	1.4E-04	4.9E-05	2.0E-04	3.8E-10	2.8E-04	9.9E-05	4.1E-04	7.6E-10	7.8E-04	M B Vg
RDX	3.7E+00	1.3E-06	4.4E-07	6.0E-04	5.8E-11	1.5E-07	4.9E-08	6.6E-05	6.4E-12	6.6E-05	Vg
Organics Pathway Total						6.5E-04	2.3E-04	1.7E-03	1.6E-09	2.6E-03	
Pathway Total						6.6E-04	2.7E-04	3.7E-03	6.1E-09	4.7E-03	
CB-14, CB-17, and CA-15											
Arsenic	2.1E+01	1.4E-05	5.3E-05	2.6E-03	5.3E-09	2.1E-05	7.9E-05	4.0E-03	7.9E-09	4.1E-03	M B Vg
Inorganics Pathway Total						2.1E-05	7.9E-05	4.0E-03	7.9E-09	4.1E-03	
2,4,6-Trinitrotoluene	4.5E+00	4.4E-07	1.4E-07	1.3E-03	2.5E-11	1.3E-08	4.1E-09	3.8E-05	7.6E-13	3.8E-05	Vg
2,4-Dinitrotoluene	5.3E-01	3.4E-08	1.1E-08	1.9E-04	2.1E-12	2.3E-08	7.5E-09	1.3E-04	1.4E-12	1.3E-04	Vg
4,4'-DDE	2.0E-01	8.4E-06	3.1E-06	2.4E-05	3.1E-11	2.8E-06	1.0E-06	8.2E-06	1.0E-11	1.2E-05	M B Vg
Benz(a)anthracene	6.4E-01	2.7E-05	9.8E-06	7.7E-05	9.8E-11	2.0E-05	7.1E-06	5.6E-05	7.2E-11	8.3E-05	M B Vg
Benzo(a)pyrene	8.2E-01	8.3E-05	2.9E-05	9.8E-05	1.7E-10	6.1E-04	2.1E-04	7.2E-04	1.3E-09	1.5E-03	M B Vg
Benzo(b)fluoranthene	1.1E+00	1.1E-04	3.9E-05	1.3E-04	2.3E-10	8.1E-05	2.9E-05	9.6E-05	1.7E-10	2.1E-04	M B Vg
Dibenz(a,h)anthracene	1.8E-01	9.0E-05	3.3E-05	2.1E-05	7.7E-11	6.6E-04	2.4E-04	1.6E-04	5.6E-10	1.1E-03	M B Vg
Indeno(1,2,3-cd)pyrene	6.4E-01	2.0E-04	7.3E-05	7.6E-05	2.2E-10	1.5E-04	5.3E-05	5.6E-05	1.6E-10	2.6E-04	M B Vg
PCB-1254	4.7E+00	3.8E-04	1.4E-04	5.6E-04	9.5E-10	7.6E-04	2.7E-04	1.1E-03	1.9E-09	2.2E-03	M B Vg
RDX	2.9E+01	1.0E-05	3.4E-06	4.6E-03	4.1E-10	1.1E-06	3.8E-07	5.1E-04	4.5E-11	5.1E-04	M Vg
Organics Pathway Total						2.3E-03	8.2E-04	2.9E-03	4.2E-09	6.0E-03	
Pathway Total						2.3E-03	9.0E-04	6.9E-03	1.2E-08	1.0E-02	
CB-3/CB-801											
Arsenic	1.3E+01	8.5E-06	3.2E-05	1.6E-03	2.1E-09	1.3E-05	4.8E-05	2.4E-03	3.1E-09	2.4E-03	M B Vg
Inorganics Pathway Total						1.3E-05	4.8E-05	2.4E-03	3.1E-09	2.4E-03	
2,4-Dinitrotoluene	1.3E-01	8.5E-09	2.7E-09	4.7E-05	3.5E-13	5.8E-09	1.8E-09	3.2E-05	2.3E-13	3.2E-05	Vg
Benz(a)anthracene	1.4E+01	5.9E-04	2.1E-04	1.7E-03	1.4E-09	4.3E-04	1.6E-04	1.2E-03	1.0E-09	1.8E-03	M B Vg
Benzo(a)pyrene	1.3E+01	1.3E-03	4.6E-04	1.6E-03	1.8E-09	9.6E-03	3.4E-03	1.1E-02	1.3E-08	2.4E-02	M B Vg
Benzo(b)fluoranthene	1.5E+01	1.5E-03	5.4E-04	1.8E-03	2.1E-09	1.1E-03	3.9E-04	1.3E-03	1.5E-09	2.8E-03	M B Vg
Benzo(k)fluoranthene	5.7E+00	2.9E-03	1.0E-03	6.8E-04	1.6E-09	2.1E-04	7.6E-05	5.0E-05	1.2E-10	3.3E-04	M B Vg
Carbazole	2.6E+00	2.2E-06	7.5E-07	3.7E-04	4.1E-11	4.4E-08	1.5E-08	7.4E-06	8.3E-13	7.5E-06	Vg
Chrysene	1.5E+01	6.3E-04	2.3E-04	1.8E-03	1.5E-09	4.6E-06	1.7E-06	1.3E-05	1.1E-11	1.9E-05	M B Vg
Dibenz(a,h)anthracene	1.2E+00	5.8E-04	2.1E-04	1.4E-04	3.2E-10	4.2E-03	1.5E-03	1.0E-03	2.4E-09	6.8E-03	M B Vg
Dieldrin	3.3E-02	1.3E-07	4.5E-08	4.2E-06	1.1E-12	2.0E-06	7.2E-07	6.8E-05	1.8E-11	7.0E-05	M Vg
Indeno(1,2,3-cd)pyrene	8.7E+00	2.7E-03	9.9E-04	1.0E-03	2.0E-09	2.0E-03	7.2E-04	7.6E-04	1.4E-09	3.5E-03	M B Vg
PCB-1254	4.3E+00	3.5E-04	1.2E-04	5.2E-04	5.7E-10	7.0E-04	2.5E-04	1.0E-03	1.1E-09	2.0E-03	M B Vg
beta-BHC	1.9E-01	2.2E-07	7.6E-08	2.5E-05	3.4E-12	4.0E-07	1.4E-07	4.6E-05	6.2E-12	4.6E-05	Vg
Organics Pathway Total						1.8E-02	6.5E-03	1.7E-02	2.1E-08	4.1E-02	
Pathway Total						1.8E-02	6.6E-03	1.9E-02	2.4E-08	4.3E-02	
CB-4/4A and CA-6/6A											
Arsenic	1.1E+01	7.2E-06	2.7E-05	1.3E-03	6.9E-09	1.1E-05	4.0E-05	2.0E-03	1.0E-08	2.1E-03	M B Vg
Inorganics Pathway Total						1.1E-05	4.0E-05	2.0E-03	1.0E-08	2.1E-03	
2,4,6-Trinitrotoluene	3.0E+02	2.9E-05	9.1E-06	8.4E-02	4.2E-09	8.6E-07	2.7E-07	2.5E-03	1.3E-10	2.5E-03	Vg
2,4-Dinitrotoluene	2.3E-01	1.5E-08	4.8E-09	8.3E-05	2.4E-12	1.0E-08	3.3E-09	5.6E-05	1.6E-12	5.6E-05	Vg
2,6-Dinitrotoluene	8.6E-01	4.1E-08	1.3E-08	4.2E-04	6.9E-12	2.8E-08	9.1E-09	2.8E-04	4.7E-12	2.8E-04	Vg
4,4'-DDE	1.2E+00	5.0E-05	1.8E-05	1.4E-04	4.7E-10	1.7E-05	6.2E-06	4.9E-05	1.6E-10	7.2E-05	M B Vg
Benz(a)anthracene	6.4E-01	2.7E-05	9.8E-06	7.7E-05	2.5E-10	2.0E-05	7.1E-06	5.6E-05	1.8E-10	8.3E-05	M B Vg
Benzo(a)pyrene	6.1E-01	6.2E-05	2.2E-05	7.3E-05	3.3E-10	4.5E-04	1.6E-04	5.3E-04	2.4E-09	1.1E-03	M B Vg
Benzo(b)fluoranthene	6.6E-01	6.7E-05	2.4E-05	7.9E-05	3.6E-10	4.9E-05	1.7E-05	5.8E-05	2.6E-10	1.2E-04	M B Vg
Dibenz(a,h)anthracene	9.6E-02	4.8E-05	1.7E-05	1.1E-05	1.0E-10	3.5E-04	1.3E-04	8.4E-05	7.7E-10	5.6E-04	M B Vg
Dieldrin	9.8E-02	3.7E-07	1.3E-07	1.2E-05	1.3E-11	6.0E-06	2.1E-06	2.0E-04	2.1E-10	2.1E-04	M B Vg
Heptachlor	7.2E-02	1.5E-07	5.2E-08	9.4E-06	6.8E-12	6.9E-07	2.4E-07	4.2E-05	3.1E-11	4.3E-05	Vg

Table 6-15b. Surface Soil Risks - Ingestion of Foodstuffs (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)				Risk				Total Risk across all pathways	COC[a]
		milk	beef	vegetables	venison	milk	beef	vegetables	venison		
Heptachlor epoxide	3.1E-02	6.6E-07	2.3E-07	3.8E-06	8.7E-12	6.0E-06	2.1E-06	3.4E-05	7.9E-11	4.2E-05	M B Vg
Indeno(1,2,3-cd)pyrene	5.5E-01	1.7E-04	6.3E-05	6.6E-05	4.9E-10	1.3E-04	4.6E-05	4.8E-05	3.6E-10	2.2E-04	M B Vg
PCB-1254	1.1E+03	8.9E-02	3.2E-02	1.3E-01	5.7E-07	1.6E-01	6.2E-02	2.3E-01	1.1E-06	4.0E-01	M B Vg Vn
RDX	1.0E+02	3.7E-05	1.2E-05	1.6E-02	3.7E-09	4.0E-06	1.3E-06	1.8E-03	4.0E-10	1.8E-03	M B Vg
alpha-Chlordane	7.8E-02	2.1E-06	7.3E-07	9.5E-06	2.4E-11	7.3E-07	2.6E-07	3.3E-06	8.6E-12	4.3E-06	Vg
gamma-Chlordane	8.9E-01	2.4E-05	8.4E-06	1.1E-04	2.8E-10	8.3E-06	2.9E-06	3.8E-05	9.7E-11	4.9E-05	M B Vg
Organics Pathway Total						1.6E-01	6.2E-02	2.4E-01	1.1E-06	4.0E-01	
Pathway Total						1.6E-01	6.2E-02	2.4E-01	1.2E-06	4.0E-01	
Change Houses (CB-12, -23, -8, -22)											
Arsenic	1.2E+01	8.1E-06	3.0E-05	1.5E-03	9.3E-10	1.2E-05	4.5E-05	2.3E-03	1.4E-09	2.3E-03	M B Vg
Inorganics Pathway Total						1.2E-05	4.5E-05	2.3E-03	1.4E-09	2.3E-03	
Benz(a)anthracene	7.2E-02	3.0E-06	1.1E-06	8.7E-06	3.4E-12	2.2E-06	8.0E-07	6.3E-06	2.5E-12	9.3E-06	M Vg
Benzo(a)pyrene	9.2E-02	9.3E-06	3.3E-06	1.1E-05	6.1E-12	6.8E-05	2.4E-05	8.0E-05	4.4E-11	1.7E-04	M B Vg
Benzo(b)fluoranthene	1.5E-01	1.5E-05	5.4E-06	1.8E-05	9.9E-12	1.1E-05	3.9E-06	1.3E-05	7.2E-12	2.8E-05	M B Vg
Indeno(1,2,3-cd)pyrene	7.5E-02	2.3E-05	8.5E-06	9.0E-06	8.1E-12	1.7E-05	6.2E-06	6.5E-06	5.9E-12	3.0E-05	M B Vg
PCB-1254	1.1E-01	8.9E-06	3.2E-06	1.3E-05	6.9E-12	1.8E-05	6.4E-06	2.6E-05	1.4E-11	5.1E-05	M B Vg
Organics Pathway Total						1.2E-04	4.1E-05	1.3E-04	7.4E-11	2.9E-04	
Pathway Total						1.3E-04	8.6E-05	2.4E-03	1.5E-09	2.6E-03	
Perimeter Area											
Arsenic	1.3E+01	8.3E-06	3.1E-05	1.5E-03	1.8E-07	1.2E-05	4.6E-05	2.3E-03	2.8E-07	2.4E-03	M B Vg
Inorganics Pathway Total						1.2E-05	4.6E-05	2.3E-03	2.8E-07	2.4E-03	
Pathway Total						1.2E-05	4.6E-05	2.3E-03	2.8E-07	2.4E-03	

[a] COPCs are identified as chemicals of concern (COCs) for ingestion of venison (Vn), milk (M), beef (B), or vegetables (Vg) if the total HI across all pathways is > 1 or if the total ILCR is > 1E-06.
COPC = chemical of potential concern.
EPC = exposure point concentration.
HI = hazard index.
HQ = hazard quotient.

Table 6-16. Total Hazards/Risks and Chemicals of Concern for Ingestion of Foodstuffs

Receptor	Noncarcinogens		Carcinogens		
	HI	COCs	ILCR	COCs	
Buildings CB-3 and CB-801					
Hunter/Trapper[a]	0.0001		3E-08		
On-Site Resident Farmer (Adult)	215	PCB-1254 Antimony Arsenic Cadmium Manganese Thallium	4E-02	PCB-1254 Arsenic 2,4-dinitrotoluene Carbozole Dieldrin beta-BHC	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Chrysene Dibenz(ah)anthracene Indeno(1,2,3-cd)pyrene
On-Site Resident Farmer (Child)	1086	PCB-1254 Antimony Arsenic Cadmium Manganese Thallium	4E-02	PCB-1254 Arsenic 2,4-dinitrotoluene Carbozole Dieldrin beta-BHC	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Benzo(k)fluoranthene Chrysene Dibenz(ah)anthracene Indeno(1,2,3-cd)pyrene
Buildings CB-4/4A and CA-6/6A					
Hunter/Trapper[a]	0.07		1E-06	PCB-1254	
On-Site Resident Farmer (Adult)	27728	PCB-1254 Arsenic Manganese Thallium Endrin Aldehyde 1,3-Dinitrobenzene 2,4,6-TNT 2,6-DNT RDX	4E-01	PCB-1254 Arsenic 2,4,6-TNT 2,4-dinitrotoluene 2,6-dinitrotoluene RDX 4,4'-DDE Dieldrin	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(ah)anthracene Indeno(1,2,3-cd)pyrene Heptachlor Heptachlor epoxide alpha-Chlordane gamma-Chlordane
On-Site Resident Farmer (Child)	150,323	PCB-1254 Arsenic Barium Cadmium Manganese Mercury Thallium Vanadium Dieldrin Endrin Aldehyde Heptachlor Epoxide gamma-Chlordane 1,3-Dinitrobenzene 2,4,6-TNT 2,6-DNT RDX	4E-01	PCB-1254 Arsenic 2,4,6-TNT 2,4-dinitrotoluene 2,6-dinitrotoluene RDX 4,4'-DDE Dieldrin	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(ah)anthracene Indeno(1,2,3-cd)pyrene Heptachlor Heptachlor epoxide alpha-Chlordane gamma-Chlordane
Buildings CB-13 and CB-10					
Hunter/Trapper[a]	0.0001		7E-09		
On-Site Resident Farmer (Adult)	102	PCB-1254 Arsenic Cadmium Manganese Thallium 2,4,6-TNT	5E-03	PCB-1254 Arsenic 2,4,6-TNT 2,4-dinitrotoluene 2,6-dinitrotoluene RDX	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Indeno(1,2,3-cd)pyrene Heptachlor

Table 6-16. Total Hazards/Risks and Chemicals of Concern for Ingestion of Foodstuff (continued)

Receptor	Noncarcinogens		Carcinogens		
	HI	COCs	ILCR	COCs	
On-Site Resident Farmer (Child)	509	PCB-1254 Antimony Arsenic Cadmium Manganese Thallium 2,4-dinitrotoluene 2,6-dinitrotoluene 2,4,6-TNT RDX	5E-03	PCB-1254 Arsenic 2,4,6-TNT 2,4-dinitrotoluene 2,6-dinitrotoluene RDX	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Indeno(1,2,3-cd)pyrene Heptachlor
Buildings CB-14, CB-17, and CA-15					
Hunter/Trapper[a]	0.0002		14E-08		
On-Site Resident Farmer (Adult)	162	PCB-1254 Arsenic Cadmium Manganese Nickel Thallium Vanadium 2,4,6-TNT RDX	1E-02	PCB-1254 Arsenic 2,4,6-TNT 2,4-dinitrotoluene RDX 4,4'-DDE	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(ah)anthracene Indeno(1,2,3-cd)pyrene
On-Site Resident Farmer (Child)	848	PCB-1254 Arsenic Barium Cadmium Manganese Nickel Thallium Vanadium 2,4-dinitrotoluene 2,4,6-TNT RDX	1E-02		
Water Tower					
Hunter/Trapper[a]	0.000001		NA		
On-Site Resident Farmer (Adult)	4	Thallium	NA		
On-Site Resident Farmer (Child)	18	Thallium	NA		
Change Houses (CB-12, CB-23, CB-8, and CB-22)					
Hunter/Trapper[a]	0.00002		2E-09		
On-Site Resident Farmer (Adult)	24	PCB-1254 Antimony Arsenic Cadmium Manganese Thallium	3E-03	PCB-1254 Arsenic	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Indeno(1,2,3-cd)pyrene
On-Site Resident Farmer (Child)[c]	113	PCB-1254 Antimony Arsenic	3E-03	PCB-1254 Arsenic	Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene

Table 6-16. Total Hazards/Risks and Chemicals of Concern for Ingestion of Foodstuff (continued)

Receptor	Noncarcinogens		Carcinogens	
	HI	COCs	ILCR	COCs
		Cadmium Manganese Thallium		Indeno(1,2,3-cd)pyrene
Perimeter Area				
Hunter/Trapper[a]	0.004		3E-07	
On-Site Resident Farmer (Adult)	21	Arsenic Manganese	3E-03	Arsenic
On-Site Resident Farmer (Child)	97		2E-03	Arsenic

[a]Hunter/Trapper is exposed via ingestion of venison.
COC = chemical of concern.
HI = hazard index.
ILCR = Incremental Lifetime Cancer Risk.
NA = not applicable – no carcinogenic COPCs were identified at this EU.

Subsurface soil

Risk and hazard results for direct contact with COPCs in suburface soil are presented in Tables 6-17(a and b) and summarized in Table 6-18 below for three soil EUs (Buildings CB-4/4A and CA-6/6A; Buildings CB-13 and CB-10; and Buildings CB-14, CB-17, and CA-15). No COPCs were identified at the Perimeter unit, and no subsurface samples were collected at the remaining soil exposure units. Risks are presented for direct contact with subsurface soil by four receptors: National Guard, Industrial Worker, and On-Site Residential Farmer (adult and child). Direct contact includes incidental ingestion of soil, inhalation of VOCs and particulates (i.e., dust), and dermal contact with soil.

No subsurface soil COCs were identified for the National Guard, Industrial Worker, or Adult On-Site Resident Farmer scenarios at Buildings CB-13 and CB-10 or Buildings CB-14, CB-17, and CA-15. Antimony was identified as a COC for the Child Resident Farmer at CB-13 and CB-10.

Two explosives (2,4,6-trinitrotoluene and RDX) were identified as COCs for the National Guard (2,4,6-TNT only), Industrial Worker, and On-Site Resident Farmer (adult and child) scenarios at Buildings CB-4/4A and CA-6/6A.

Lead was identified as a COPC in subsurface soil at Buildings CB-13 and CB-10; Buildings CB-14, CB-17 and CA-15; and Buildings CB-4/4A and CB-6/6A. For all adult receptors, the estimated probability of fetal blood lead concentrations exceeding acceptable levels was less than 10% at Buildings CB-13 and CB-10; Buildings CB-14, CB-17 and CA-15, and less than 2% at Buildings CB-4/4A and CB-6/6A. For the child receptor, the estimated probabilities of exceeding target blood lead levels are less than 14% at Buildings CB-13 and CB-10; less than 23% Buildings CB-14, CB-17 and CA-15, and less than 1% at Buildings CB-4/4A and CB-6/6A.

6.5.2.4 Summary of chemicals of concern for all media and receptors

Table 6-19 presents a summary of the 30 receptor/medium combinations that have COCs in this BHHRA (This represents all of the receptor/medium combinations where risks and/or hazards are calculated for this BHHRA). RGOs are calculated and presented in Section 6.5.3 for the 33 COCs identified in this BHHRA.

Table 6-17a. Subsurface Soil Hazards - Direct Contact

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
National Guard/Managed Recreational - National Guard									
CB-13 and CB-10									
Antimony	6.2E+01	2.3E-06	6.7E-08	1.1E-09	5.6E-03	1.1E-03		6.7E-03	
Cadmium	1.6E+01	6.0E-07	1.8E-08	2.9E-10	6.0E-04	7.2E-04		1.3E-03	
Chromium	8.6E+01	3.1E-06	9.3E-08	1.5E-09	2.1E-06	4.8E-06		6.9E-06	
Zinc	2.6E+03	9.6E-05	2.9E-06	4.6E-08	3.2E-04	3.2E-05		3.5E-04	
Inorganics Pathway Total					6.6E-03	1.9E-03		8.4E-03	
2,4-Dinitrotoluene	8.6E-02	3.1E-09	9.3E-09	1.5E-12	1.6E-06	4.7E-06		6.2E-06	
Organics Pathway Total					1.6E-06	4.7E-06		6.2E-06	
Pathway Total - Chemicals					6.6E-03	1.9E-03		8.4E-03	
CB-14, CB-17, and CA-15									
2,4-Dinitrotoluene	1.3E-01	4.7E-09	1.4E-08	2.3E-12	2.4E-06	7.1E-06		9.4E-06	
Organics Pathway Total					2.4E-06	7.1E-06		9.4E-06	
Pathway Total - Chemicals					2.4E-06	7.1E-06		9.4E-06	
CB-4/4A and CA-6/6A									
Cadmium	2.4E+00	8.8E-08	2.6E-09	4.2E-11	8.8E-05	1.0E-04		1.9E-04	
Chromium	2.0E+01	7.3E-07	2.2E-08	3.5E-10	4.9E-07	1.1E-06		1.6E-06	
Chromium, hexavalent	3.0E+00	1.1E-07	3.2E-09	5.2E-11	3.6E-05	4.3E-05	1.8E-06	8.1E-05	
Cyanide	5.0E-01	1.8E-08	5.4E-10	8.8E-12	9.2E-07	5.8E-08		9.8E-07	
Inorganics Pathway Total					1.3E-04	1.5E-04	1.8E-06	2.8E-04	
2,4,6-Trinitrotoluene	1.0E+03	3.7E-05	1.1E-04	1.8E-08	7.3E-02	2.2E-01		2.9E-01	
2,6-Dinitrotoluene	1.4E-01	5.1E-09	1.5E-08	2.5E-12	5.1E-06	1.5E-05		2.0E-05	
RDX	4.0E+01	1.5E-06	4.3E-06	7.0E-10	4.9E-04	1.4E-03		1.9E-03	
Organics Pathway Total					7.4E-02	2.2E-01		2.9E-01	
Pathway Total - Chemicals					7.4E-02	2.2E-01	1.8E-06	2.9E-01	
Open Industrial - Industrial Worker									
CB-13 and CB-10									
Antimony	6.2E+01	6.0E-05	4.0E-07	1.3E-08	1.5E-01	6.6E-03		1.6E-01	
Cadmium	1.6E+01	1.6E-05	1.1E-07	3.5E-09	1.6E-02	4.3E-03		2.0E-02	
Chromium	8.6E+01	8.4E-05	5.5E-07	1.8E-08	5.6E-05	2.8E-05		8.4E-05	
Zinc	2.6E+03	2.6E-03	1.7E-05	5.6E-07	8.6E-03	1.9E-04		8.8E-03	
Inorganics Pathway Total					1.8E-01	1.1E-02		1.9E-01	
2,4-Dinitrotoluene	8.6E-02	8.4E-08	5.6E-08	1.8E-11	4.2E-05	2.8E-05		7.0E-05	
Organics Pathway Total					4.2E-05	2.8E-05		7.0E-05	
Pathway Total - Chemicals					1.8E-01	1.1E-02		1.9E-01	
CB-14, CB-17, and CA-15									
2,4-Dinitrotoluene	1.3E-01	1.3E-07	8.4E-08	2.8E-11	6.4E-05	4.2E-05		1.1E-04	
Organics Pathway Total					6.4E-05	4.2E-05		1.1E-04	
Pathway Total - Chemicals					6.4E-05	4.2E-05		1.1E-04	
CB-4/4A and CA-6/6A									
Cadmium	2.4E+00	2.4E-06	1.6E-08	5.1E-10	2.4E-03	6.2E-04		3.0E-03	
Chromium	2.0E+01	2.0E-05	1.3E-07	4.3E-09	1.3E-05	6.7E-06		2.0E-05	
Chromium, hexavalent	3.0E+00	2.9E-06	1.9E-08	6.3E-10	9.7E-04	2.6E-04	2.2E-05	1.3E-03	
Cyanide	5.0E-01	4.9E-07	3.2E-09	1.1E-10	2.5E-05	3.5E-07		2.5E-05	
Inorganics Pathway Total					3.4E-03	8.9E-04	2.2E-05	4.3E-03	
2,4,6-Trinitrotoluene	1.0E+03	9.8E-04	6.5E-04	2.1E-07	2.0E+00	1.3E+00		3.3E+00	H
2,6-Dinitrotoluene	1.4E-01	1.4E-07	9.0E-08	3.0E-11	1.4E-04	9.0E-05		2.3E-04	
RDX	4.0E+01	3.9E-05	2.6E-05	8.5E-09	1.3E-02	8.6E-03		2.2E-02	
Organics Pathway Total					2.0E+00	1.3E+00		3.3E+00	
Pathway Total - Chemicals					2.0E+00	1.3E+00	2.2E-05	3.3E+00	

Table 6-17a. Subsurface Soil Hazards - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Hazard Quotient (HQ)			Total HI across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
Open Residential - Resident Farmer (Adult)									
CB-13 and CB-10									
Antimony	6.2E+01	8.4E-05	1.9E-06	1.8E-08	2.1E-01	3.2E-02		2.4E-01	
Cadmium	1.6E+01	2.3E-05	5.1E-07	4.9E-09	2.3E-02	2.1E-02		4.3E-02	
Chromium	8.6E+01	1.2E-04	2.7E-06	2.5E-08	7.8E-05	1.4E-04		2.2E-04	
Zinc	2.6E+03	3.6E-03	8.2E-05	7.8E-07	1.2E-02	9.1E-04		1.3E-02	
Inorganics Pathway Total					2.5E-01	5.4E-02		3.0E-01	
2,4-Dinitrotoluene	8.6E-02	1.2E-07	2.7E-07	2.6E-11	5.9E-05	1.3E-04		1.9E-04	
Organics Pathway Total					5.9E-05	1.3E-04		1.9E-04	
Pathway Total - Chemicals					2.5E-01	5.4E-02		3.0E-01	
CB-14, CB-17, and CA-15									
2,4-Dinitrotoluene	1.3E-01	1.8E-07	4.1E-07	3.9E-11	8.9E-05	2.0E-04		2.9E-04	
Organics Pathway Total					8.9E-05	2.0E-04		2.9E-04	
Pathway Total - Chemicals					8.9E-05	2.0E-04		2.9E-04	
CB-4/4A and CA-6/6A									
Cadmium	2.4E+00	3.3E-06	7.5E-08	7.1E-10	3.3E-03	3.0E-03		6.3E-03	
Chromium	2.0E+01	2.8E-05	6.3E-07	6.0E-09	1.8E-05	3.2E-05		5.1E-05	
Chromium, hexavalent	3.0E+00	4.1E-06	9.3E-08	8.8E-10	1.4E-03	1.2E-03	3.1E-05	2.6E-03	
Cyanide	5.0E-01	6.9E-07	1.6E-08	1.5E-10	3.4E-05	1.7E-06		3.6E-05	
Inorganics Pathway Total					4.7E-03	4.3E-03	3.1E-05	9.0E-03	
2,4,6-Trinitrotoluene	1.0E+03	1.4E-03	3.1E-03	3.0E-07	2.8E+00	6.3E+00		9.0E+00	H
2,6-Dinitrotoluene	1.4E-01	1.9E-07	4.4E-07	4.2E-11	1.9E-04	4.4E-04		6.3E-04	
RDX	4.0E+01	5.5E-05	1.2E-04	1.2E-08	1.8E-02	4.2E-02		6.0E-02	
Organics Pathway Total					2.8E+00	6.3E+00		9.1E+00	
Pathway Total - Chemicals					2.8E+00	6.3E+00	3.1E-05	9.1E+00	
Open Residential - Resident Farmer (Child)									
CB-13 and CB-10									
Antimony	6.2E+01	7.9E-04	1.7E-06	4.3E-08	2.0E+00	2.9E-02		2.0E+00	H
Cadmium	1.6E+01	2.1E-04	4.6E-07	1.1E-08	2.1E-01	1.9E-02		2.3E-01	
Chromium	8.6E+01	1.1E-03	2.4E-06	5.9E-08	7.3E-04	1.2E-04		8.6E-04	
Zinc	2.6E+03	3.4E-02	7.4E-05	1.8E-06	1.1E-01	8.2E-04		1.1E-01	
Inorganics Pathway Total					2.3E+00	4.8E-02		2.3E+00	
2,4-Dinitrotoluene	8.6E-02	1.1E-06	2.4E-07	6.0E-11	5.5E-04	1.2E-04		6.7E-04	
Organics Pathway Total					5.5E-04	1.2E-04		6.7E-04	
Pathway Total - Chemicals					2.3E+00	4.9E-02		2.3E+00	
CB-14, CB-17, and CA-15									
2,4-Dinitrotoluene	1.3E-01	1.7E-06	3.7E-07	9.0E-11	8.3E-04	1.8E-04		1.0E-03	
Organics Pathway Total					8.3E-04	1.8E-04		1.0E-03	
Pathway Total - Chemicals					8.3E-04	1.8E-04		1.0E-03	
CB-4/4A and CA-6/6A									
Cadmium	2.4E+00	3.1E-05	6.8E-08	1.7E-09	3.1E-02	2.7E-03		3.3E-02	
Chromium	2.0E+01	2.6E-04	5.7E-07	1.4E-08	1.7E-04	2.9E-05		2.0E-04	
Chromium, hexavalent	3.0E+00	3.8E-05	8.4E-08	2.1E-09	1.3E-02	1.1E-03	7.2E-05	1.4E-02	
Cyanide	5.0E-01	6.4E-06	1.4E-08	3.5E-10	3.2E-04	1.5E-06		3.2E-04	
Inorganics Pathway Total					4.4E-02	3.9E-03	7.2E-05	4.8E-02	
2,4,6-Trinitrotoluene	1.0E+03	1.3E-02	2.8E-03	7.0E-07	2.6E+01	5.7E+00		3.1E+01	H
2,6-Dinitrotoluene	1.4E-01	1.8E-06	3.9E-07	9.7E-11	1.8E-03	3.9E-04		2.2E-03	
RDX	4.0E+01	5.1E-04	1.1E-04	2.8E-08	1.7E-01	3.7E-02		2.1E-01	
Organics Pathway Total					2.6E+01	5.7E+00		3.2E+01	
Pathway Total - Chemicals					2.6E+01	5.7E+00	7.2E-05	3.2E+01	

[a] COPCs are identified as chemicals of concern (COCs) if the total HI across all pathways is > 1 (H) or if the total ILCR is > 1E-06 (R).
COPC = chemical of potential concern. HI = hazard index.
EPC = exposure point concentration. ILCR = Incremental Lifetime Cancer Risk.

Table 6-17b. Subsurface Soil Risks - Direct Contact

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
National Guard/Managed Recreational - National Guard									
CB-13 and CB-10									
Cadmium	1.6E+01	2.2E-07	6.4E-09	1.0E-10			6.5E-10	6.5E-10	
Inorganics Pathway Total							6.5E-10	6.5E-10	
2,4-Dinitrotoluene	8.6E-02	1.1E-09	3.3E-09	5.4E-13	7.6E-10	2.3E-09		3.0E-09	
Organics Pathway Total					7.6E-10	2.3E-09		3.0E-09	
Pathway Total - Chemicals					7.6E-10	2.3E-09	6.5E-10	3.7E-09	
CB-14, CB-17, and CA-15									
2,4-Dinitrotoluene	1.3E-01	1.7E-09	5.0E-09	8.2E-13	1.2E-09	3.4E-09		4.6E-09	
Organics Pathway Total					1.2E-09	3.4E-09		4.6E-09	
Pathway Total - Chemicals					1.2E-09	3.4E-09		4.6E-09	
CB-4/4A and CA-6/6A									
Cadmium	2.4E+00	3.1E-08	9.3E-10	1.5E-11			9.5E-11	9.5E-11	
Chromium, hexavalent	3.0E+00	3.9E-08	1.2E-09	1.9E-11			7.8E-10	7.8E-10	
Inorganics Pathway Total							8.8E-10	8.8E-10	
2,4,6-Trinitrotoluene	1.0E+03	1.3E-05	3.9E-05	6.3E-09	3.9E-07	1.2E-06		1.6E-06	R
2,6-Dinitrotoluene	1.4E-01	1.8E-09	5.4E-09	8.8E-13	1.2E-09	3.7E-09		4.9E-09	
RDX	4.0E+01	5.2E-07	1.5E-06	2.5E-10	5.7E-08	1.7E-07		2.3E-07	
Organics Pathway Total					4.5E-07	1.3E-06		1.8E-06	
Pathway Total - Chemicals					4.5E-07	1.3E-06	8.8E-10	1.8E-06	
Open Industrial - Industrial Worker									
CB-13 and CB-10									
Cadmium	1.6E+01	5.8E-06	3.8E-08	1.2E-09			7.9E-09	7.9E-09	
Inorganics Pathway Total							7.9E-09	7.9E-09	
2,4-Dinitrotoluene	8.6E-02	3.0E-08	2.0E-08	6.5E-12	2.0E-08	1.3E-08		3.4E-08	
Organics Pathway Total					2.0E-08	1.3E-08		3.4E-08	
Pathway Total - Chemicals					2.0E-08	1.3E-08	7.9E-09	4.2E-08	
CB-14, CB-17, and CA-15									
2,4-Dinitrotoluene	1.3E-01	4.5E-08	3.0E-08	9.8E-12	3.1E-08	2.0E-08		5.1E-08	
Organics Pathway Total					3.1E-08	2.0E-08		5.1E-08	
Pathway Total - Chemicals					3.1E-08	2.0E-08		5.1E-08	
CB-4/4A and CA-6/6A									
Cadmium	2.4E+00	8.4E-07	5.6E-09	1.8E-10			1.1E-09	1.1E-09	
Chromium, hexavalent	3.0E+00	1.0E-06	6.9E-09	2.3E-10			9.5E-09	9.5E-09	
Inorganics Pathway Total							1.1E-08	1.1E-08	
2,4,6-Trinitrotoluene	1.0E+03	3.5E-04	2.3E-04	7.6E-08	1.1E-05	7.0E-06		1.7E-05	R
2,6-Dinitrotoluene	1.4E-01	4.9E-08	3.2E-08	1.1E-11	3.3E-08	2.2E-08		5.5E-08	
RDX	4.0E+01	1.4E-05	9.2E-06	3.0E-09	1.5E-06	1.0E-06		2.5E-06	R
Organics Pathway Total					1.2E-05	8.0E-06		2.0E-05	
Pathway Total - Chemicals					1.2E-05	8.0E-06	1.1E-08	2.0E-05	
Open Residential - Resident Farmer (Adult)									
CB-13 and CB-10									
Cadmium	1.6E+01	9.7E-06	2.2E-07	2.1E-09			1.3E-08	1.3E-08	
Inorganics Pathway Total							1.3E-08	1.3E-08	
2,4-Dinitrotoluene	8.6E-02	5.0E-08	1.2E-07	1.1E-11	3.4E-08	7.8E-08		1.1E-07	
Organics Pathway Total					3.4E-08	7.8E-08		1.1E-07	
Pathway Total - Chemicals					3.4E-08	7.8E-08	1.3E-08	1.3E-07	
CB-14, CB-17, and CA-15									
2,4-Dinitrotoluene	1.3E-01	7.6E-08	1.7E-07	1.7E-11	5.2E-08	1.2E-07		1.7E-07	
Organics Pathway Total					5.2E-08	1.2E-07		1.7E-07	
Pathway Total - Chemicals					5.2E-08	1.2E-07		1.7E-07	

Table 6-17b. Subsurface Soil Risks - Direct Contact (continued)

COPC	EPC (mg/kg)	Daily Intake (mg/kg-d)			Risk			Total Risk across all pathways	COC[a]
		Ingestion	Dermal	Inhalation	Ingestion	Dermal	Inhalation		
CB-4/4A and CA-6/6A									
Cadmium	2.4E+00	1.4E-06	3.2E-08	3.1E-10			1.9E-09	1.9E-09	
Chromium, hexavalent	3.0E+00	1.7E-06	4.0E-08	3.8E-10			1.6E-08	1.6E-08	
Inorganics Pathway Total							1.8E-08	1.8E-08	
2,4,6-Trinitrotoluene	1.0E+03	5.9E-04	1.3E-03	1.3E-07	1.8E-05	4.0E-05		5.8E-05	R
2,6-Dinitrotoluene	1.4E-01	8.2E-08	1.9E-07	1.8E-11	5.6E-08	1.3E-07		1.8E-07	
RDX	4.0E+01	2.3E-05	5.3E-05	5.1E-09	2.6E-06	5.9E-06		8.5E-06	R
Organics Pathway Total					2.0E-05	4.6E-05		6.7E-05	
Pathway Total - Chemicals					2.0E-05	4.6E-05	1.8E-08	6.7E-05	
Open Residential - Resident Farmer (Child)									
CB-13 and CB-10									
Cadmium	1.6E+01	1.8E-05	4.0E-08	9.8E-10			6.2E-09	6.2E-09	
Inorganics Pathway Total							6.2E-09	6.2E-09	
2,4-Dinitrotoluene	8.6E-02	9.4E-08	2.1E-08	5.1E-12	6.4E-08	1.4E-08		7.8E-08	
Organics Pathway Total					6.4E-08	1.4E-08		7.8E-08	
Pathway Total - Chemicals					6.4E-08	1.4E-08	6.2E-09	8.4E-08	
CB-14, CB-17, and CA-15									
2,4-Dinitrotoluene	1.3E-01	1.4E-07	3.1E-08	7.7E-12	9.7E-08	2.1E-08		1.2E-07	
Organics Pathway Total					9.7E-08	2.1E-08		1.2E-07	
Pathway Total - Chemicals					9.7E-08	2.1E-08		1.2E-07	
CB-4/4A and CA-6/6A									
Cadmium	2.4E+00	2.6E-06	5.8E-09	1.4E-10			9.0E-10	9.0E-10	
Chromium, hexavalent	3.0E+00	3.3E-06	7.2E-09	1.8E-10			7.4E-09	7.4E-09	
Inorganics Pathway Total							8.3E-09	8.3E-09	
2,4,6-Trinitrotoluene	1.0E+03	1.1E-03	2.4E-04	6.0E-08	3.3E-05	7.3E-06		4.0E-05	R
2,6-Dinitrotoluene	1.4E-01	1.5E-07	3.4E-08	8.3E-12	1.0E-07	2.3E-08		1.3E-07	
RDX	4.0E+01	4.4E-05	9.6E-06	2.4E-09	4.8E-06	1.1E-06		5.9E-06	R
Organics Pathway Total					3.8E-05	8.4E-06		4.6E-05	
Pathway Total - Chemicals					3.8E-05	8.4E-06	8.3E-09	4.6E-05	

[a] COPCs are identified as chemicals of concern (COCs) if the total HI across all pathways is > 1 (H) or if the total ILCR is > 1E-06 (R).
COPC = chemical of potential concern. HI = hazard index.
EPC = exposure point concentration. ILCR = Incremental Lifetime Cancer Risk.

Table 6-18. Total Hazards/Risks and Chemicals of Concern for Direct Contact with Subsurface Soil

Receptor	Noncarcinogens		Carcinogens	
	HI	COCs	ILCR	COCs
Buildings CB-4/4A and CA-6/6A				
National Guard	0.3		2E-06	2,4,6-TNT
Industrial Worker	3	2,4,6-TNT	2E-05	2,4,6-TNT RDX
On-Site Resident Farmer (Adult)	9	2,4,6-TNT	7E-05	2,4,6-TNT RDX
On-Site Resident Farmer (Child)	32	2,4,6-TNT	5E-05	2,4,6-TNT RDX
Buildings CB-13 and CB-10				
National Guard	0.008		4E-09	
Industrial Worker	0.2		4E-08	
On-Site Resident Farmer (Adult)	0.3		1E-07	
On-Site Resident Farmer (Child)	2	Antimony	8E-08	
Buildings CB-14, CB-17, and CA-15				
National Guard	0.000009		5E-09	
Industrial Worker	0.0001		5E-08	
On-Site Resident Farmer (Adult)	0.0003		2E-07	
On-Site Resident Farmer (Child)	0.001		1E-07	

COC = chemical of concern.
HI = hazard index.
ILCR = Incremental Lifetime Cancer Risk.

Table 6-19. Receptor/Medium/EU Combinations with COCs

COC	Groundwater				Surface Water[a]							Sediment				Subsurface Soil						Surface Soil – Direct Contact							Surface Soil I- Foodstuffs	
	Nat. Guard	Res. Farmer Adult	Res. Farmer Child	Child Tres.	Hunter/ Traper	Nat. Guard	Recreator	Res. Farmer Adult	Res. Farmer Child	Child Tres.	Hunter/ Trapper	Nat. Guard	Recreator	Res. Farmer Adult	Res. Farmer Child	Nat. Guard	Ind. Worker	Res. Farmer Adult	Res. Farmer Child	Child Tres.	Hunter/ Trapper	Nat. Guard	Recreator	Sec. Guard	Ind. Worker	Res. Farmer Adult	Res. Farmer Child	Hunter/ Trapper	Res. Farmer Adult	Res. Farmer Child
Metals																														
Antimony														**E**	**E**				**13**								**3**			**3**, **CH**	**3**, **13**, **CH**
Arsenic*	LL1	**LL1**	**LL1**	C	C, OA, E	C, OA, E	C	**C, OA**, E	**C, OA, E**	C, OA	C, OA			E, **C**, A, OA	E, C, A, OA						14	3, 4, 13, 14, CH, P		3, 4, 13, 14, CH, P	3, 4, 13, 14, CH, P	3, 4, 13, 14, CH, P	3, 4, 13, 14, CH, P		**3**, **4**, **13**, **14**, **CH**, **P**	**3**, **4**, **13**, **14**, **CH**, **P**
Barium*																														**4**, **14**
Cadmium																													**3**, **13**, **14**, **CH**	**3**, **4**, **13**, **14**, **CH**
Manganese*		**LL1**	**LL1**		C[b], OA[b]			**C**[b], **OA**[c]	**C**[c], **OA**[c]						**E**							**3**, **4**, **13**, **14**, **CH**, **P**							**3**, **4**, **13**, **14**, **CH**, **P**	**3**, **4**, **13**, **14**, **CH**, **P**
Mercury																														**4**
Nickel*																													**14**	**14**
Thallium																													**3**, **4**, **13**, **14**, **CH**, **P**, **W**	**3**, **4**, **13**, **14**, **CH**, **P**, **W**
Vanadium*																													**14**	**4**, **14**
Explosives																														
1,3-Dinitrobenzene																													**4**	**4**
2,4-Dinitrotoluene	LL1	LL1	LL1											A	A											13	**13**		3, 4, **13**, **14**	3, 4, **13**, **14**
2,6-Dinitrotoluene	LL1	LL1	LL1																							4			**4**, **13**	**4**, **13**
2,4,6-Trinitrotoluene		LL1	LL1													4	**4**	**4**	**4**			4		**4**	4	**4**, 13	**4**, 13		**4**, **13**, **14**	**4**, **13**, **14**
RDX	LL1	LL1	LL1		OA[b]			OA[b]	OA[b]								4	4	4			4, 14		4, 14	4, 14	4, 14	4, 14		**4**, 13, **14**	**4**, **13**, **14**
Polynuclear Aromatic Hydrocarbons (PAHs)																														
Benzo(a)anthracene										A				A	A					3	3	3	3	3	3	3, 4, 13, 14	3		**3**, 4, 13, 14, CH	**3**, 4, 13, 14, CH
Benzo(a)pyrene										A	A	A	A	C, **A**	C, **A**					3	3	3, 4, 13, 14	3	**3**, 4, 13, 14, CH	3, 4, 13, 14	**3**, 4, 13, 14, CH	**3**, 4, 13, 14, CH		**3**, **4**, **13**, **14**, **CH**	**3**, **4**, **13**, **14**, **CH**
Benzo(b)fluoranthene										A	A		A	A	A					3	3	3	3	3, 14	3	3, 4, 13, 14	3, 14		**3**, **4**, 13, **14**, CH	**3**, **4**, 13, **14**, CH
Benzo(k)fluoranthene														A												3			**3**	**3**
Chrysene																													3	3
Dibenz(a,h)anthracene										A	A	A	A	A	A					3	3	3		3, 4, 14	3, 14	3, 4, 14	3, 4, 14		**3**, **4**, **14**	**3**, **4**, **14**
Indeno(1,2,3-cd)pyrene														A	A					3		3		3	3	3, 4, 14	3		**3**, **4**, 13, **14**, CH	**3**, **4**, 13, **14**, CH
Polychlorinated Biphenyls (PCBs)																														
PCB-1254														C, A	C, A					3, **4**, 14	3, **4**, 14	3, **4**, 13, 14	**4**	3, **4**, 13, 14	3, **4**, 13, 14	**3**, **4**, 13, **14**	**3**, **4**, **13**, **14**	4	**3**, **4**, **13**, **14**, **CH**	**3**, **4**, **13**, **14**, **CH**
Pesticides																														
alpha-Chlordane																													4	4
gamma-Chlordane																													4	**4**
4,4'-DDE	LL1	LL1	LL1																										4, 14	4, 14
Dieldrin																								4		3, 4	4		3, **4**	3, **4**
Endrin Aldehyde																													**4**	**4**
Heptachlor																													4, 13	4, 13
Heptachlor epoxide																													4	**4**
beta-BHC																													3	3
Volatile Organic Chemicals (VOCs)																														
Chloroform	LL1	LL1	LL1																											
Other Semi-Volatile Organic Chemicals (SVOCs)																														
bis(2-Ethylhexyl)phthalate					**OA**[b]			**OA**[c]	**OA**[c]																					
Carbazol																													3	3

COC = chemical of concern. Only receptor/medium combinations with COCs are shown.
Bold indicates chemical is a COC with a hazard >1 or risk >10^{-4}
*Risk/hazards for arsenic (groundwater, surface soil, food), barium (surface soil), manganese (groundwater, surface water, surface soil, food), nickel (food), and vanadium (food) result from naturally occurring concentrations of these metals as described in Section 6.5.2.

Ch. Tres = Child Trespasser - applies to Modified Caretaker/Managed Recreational and National Guard/Managed Recreational land uses.
Hunt/Trap = Hunter/Trapper - applies to Modified Caretaker/Managed Recreational and National Guard/Managed Recreational land uses.
Nat. Guard - National Guard - applies to National Guard/Managed Recreational land use.
Recreator = Recreator - applies to Modified Caretaker/Managed Recreational and National Guard/Managed Recreational land uses.
Sec. Guard = Security Guard/Maintenance Worker - applies to Modified Caretaker/Managed Recreational land use.
Ind. Worker = Industrial Worker - applies to Open Industrial land use.
Res. Farmer = On-Site Residential Farmer (adult and child) = applies to Open Residential land use.

Groundwater
LL1 = Monitoring wells in Load Line 1 Building Area.

Surface Soil and Sediment EUs
C = Outlet C and Charlie's Pond.
OA = Off-AOC.
A = Outlets A and B.
E = Outlets D, E, and F and Criggy's Pond.

Soil EUs
3 = CB-3 and CB-801
4 = CB-4/4A and CA-6/6A
13 = CB-13 and CB-10
14 = CB-14, CB-17, and CA-15
W = Water Tower
CH = Change Houses
P = Perimeter Area

[a] Chemicals listed are for direct contact with surface water unless otherwise noted.
[b] Chemical is a COC for fish ingestion only.
[c] Chemical is a COC for direct contact with surface water and fish ingestion.

Since risks >10^{-4} are unacceptable and HIs >1 are defined as the level of concern for potential adverse noncarcinogenic health effects (see Section 6.5.1), chemicals meeting these criteria are identified as being COCs with unacceptable risks/hazards for LL 1. The COCs with unacceptable risks/hazards are identified below.

Groundwater

The HQs for exposure of an On-Site Resident Farmer to manganese in groundwater from the LL 1 building areas are 2 (adult) and 7 (child). The HQ for exposure of an On-Site Resident Farmer child to arsenic in groundwater from the LL 1 building areas is 3, the estimated risk for exposure of an On-Site Resident Farmer adult is 1E-04. Manganese and arsenic are the only COCs with unacceptable risks/hazards identified for groundwater.

Surface water and sediment

Surface water and sediment risks/hazards for direct contact are summarized in Figure 6-2 for the National Guard scenario and Figure 6-3 for the On-Site Resident Farmer scenarios. These figures show the total risk/hazard from all COCs or groups of COCs (e.g., PAHs).

Surface water and sediment COCs with unacceptable risks/hazards are summarized in Table 6-20 for the On-Site Resident Farmer. No COCs with unacceptable risks/hazards were identified for any of the other receptors exposed to these media.

Table 6-20. Chemicals of Concern[a] with Unacceptable Risks/Hazards: Direct and Indirect Contact with Surface Water and Sediment

COC[b]	Outlets D, E, and F and Criggy's Pond	Outlet C and Charlie's Pond	Off-AOC	Outlets A and B
Antimony	Sediment			
Arsenic	Surface Water	Surface Water and Sediment	Surface Water	
Manganese	Sediment	Surface Water and Fish	Surface Water and Fish	
bis(2-Ethylhexyl)phthalate			Fish	
Benzo(a)pyrene				Sediment

[a]COCs with unacceptable risks/hazards are COCs with a total HI >1 or a total ILCR > 10^{-4}; only COCs meeting these criteria are shown here.
[b] Five COCs with unacceptable risks/hazards were identified for exposure to surface water, sediment, and fish by the On-Site Resident Farmer.
AOC = area of concern.
COC = chemical of concern.
Surface Water = COC for direct contact with surface water by On-Site Resident Farmer (adult and child).
Sediment = COC for direct contact with surface water by On-Site Resident Farmer (adult and child).
Fish = COC for ingestion of fish by Hunter/Trapper and On-Site Resident Farmer (adult and child).

Surface and subsurface soil – direct contact

Surface and subsurface soil risks/hazards for direct contact are summarized in Figure 6-4 for the National Guard scenario, Figure 6-5 for the Industrial Worker scenario, and Figure 6-6 for the On-Site Resident Farmer scenarios. These figures show the total risk/hazard from all COCs or groups of COCs (e.g., PAHs).

As shown in Table 6-21 below, three COCs with unacceptable risks/hazards are identified for soil: PCB-1254 in surface soil for all receptors at Buildings CB-4/4A and CA-6/6A and for the On-Site Resident

NATIONAL GUARD RISKS: SURFACE WATER AND SEDIMENT

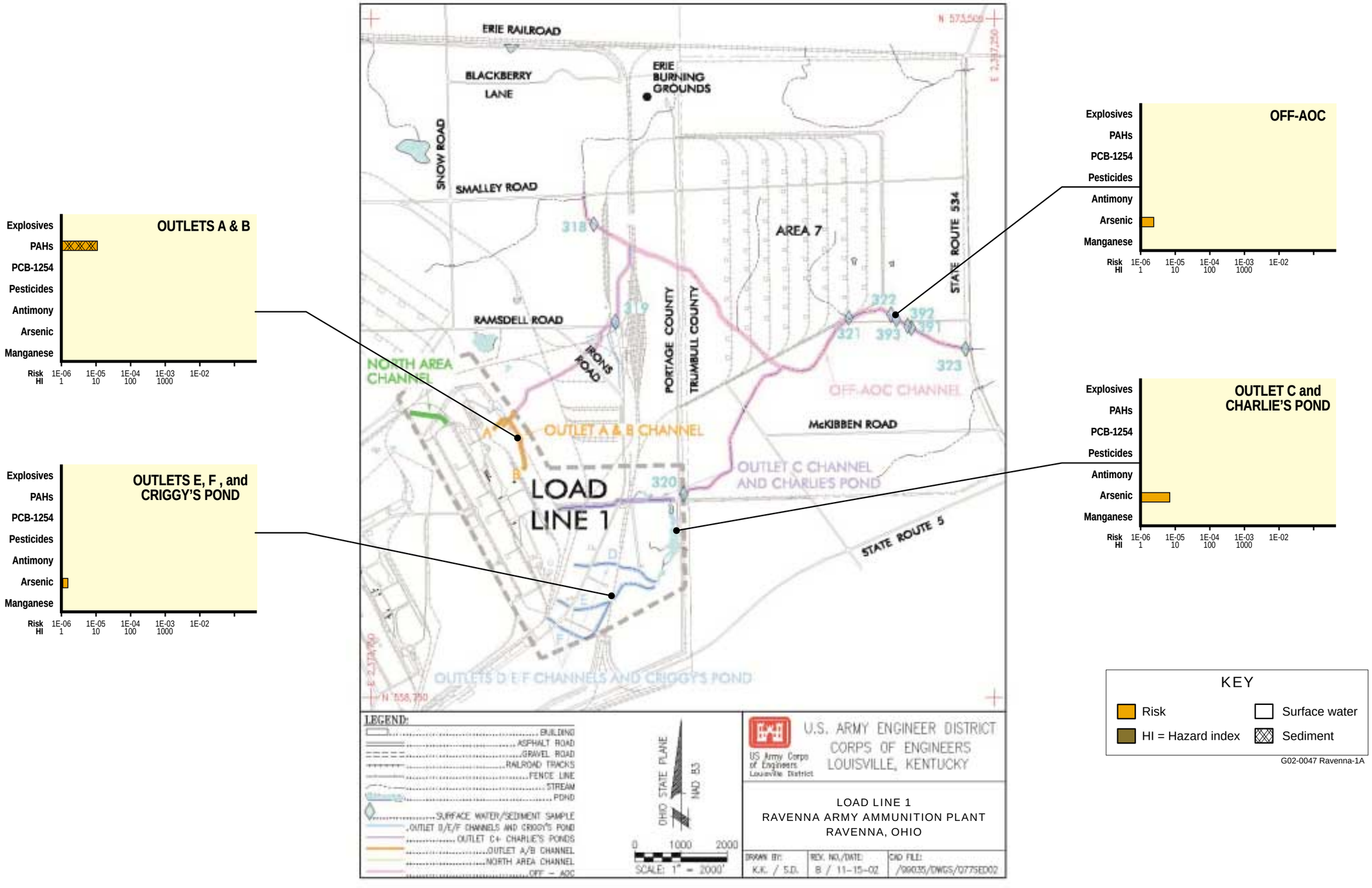
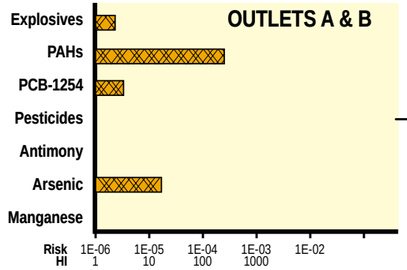
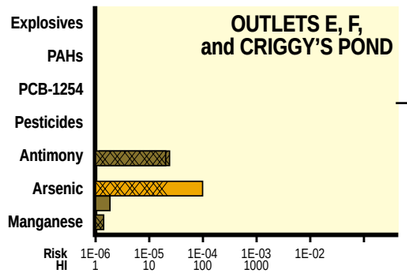
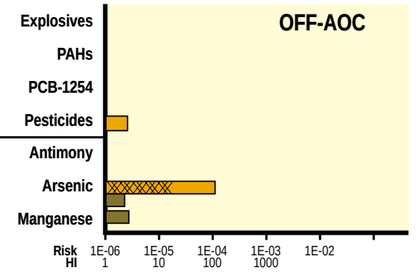


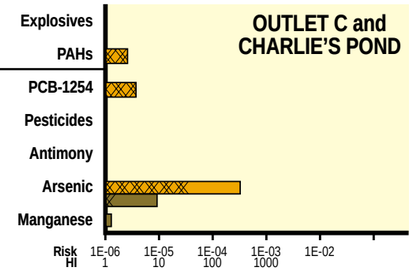
Figure 6-2. Summary of Human Health Risk for National Guard Trainee at Load Line I Aggregates by Drainage Area

ON-SITE RESIDENT FARMER RISKS: SURFACE WATER AND SEDIMENT









KEY

Risk — Surface water

HI = Hazard index — Sediment

NOTE:
See Table 6-19 for a listing of COCs by exposure unit for the Residential Farmer (Child) scenario.

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Figure 6-3. Summary of Human Health Risk for On-Site Resident Farmer (Adult) at Load Line I Aggregates by Drainage Area

NATIONAL GUARD RISK: SOIL

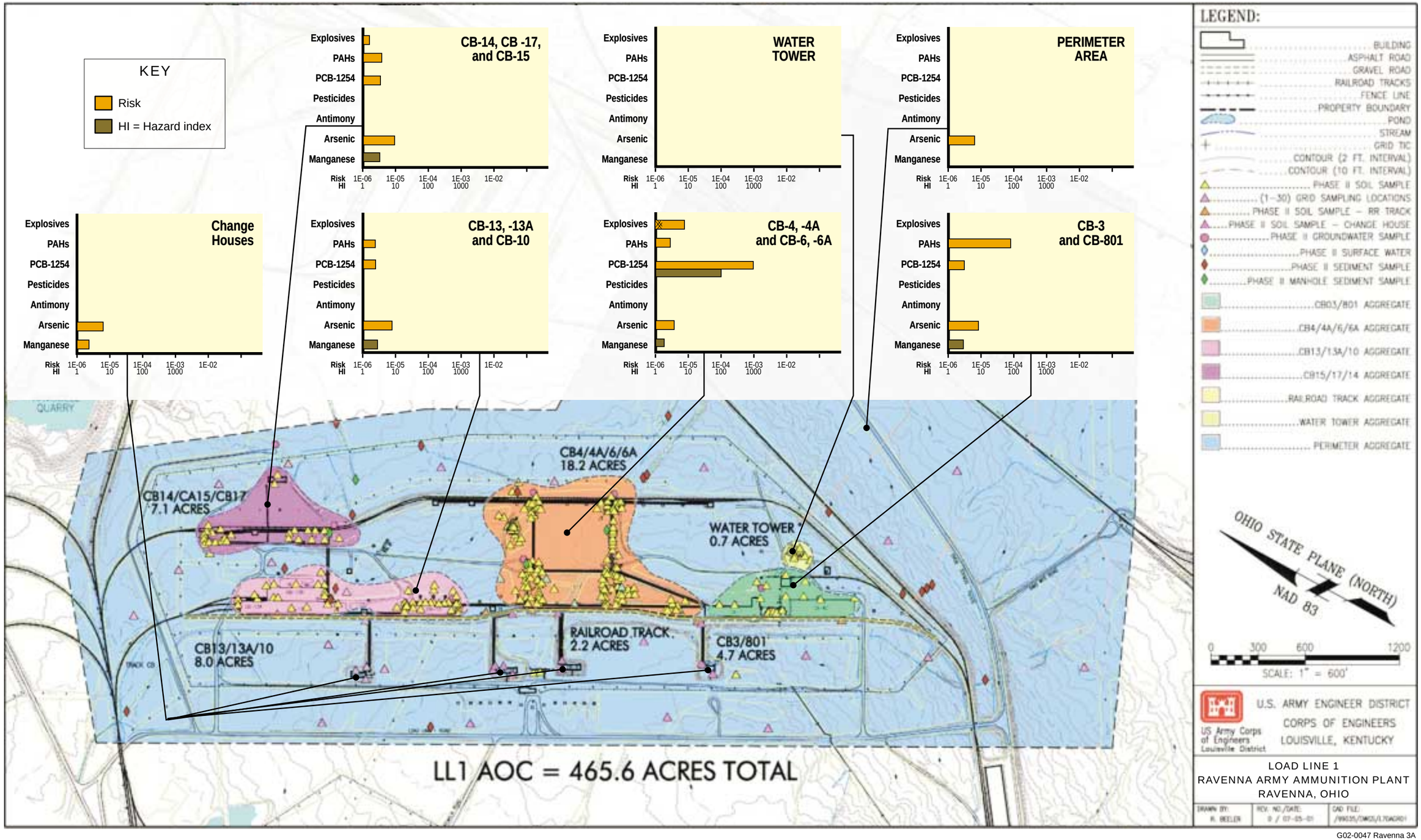

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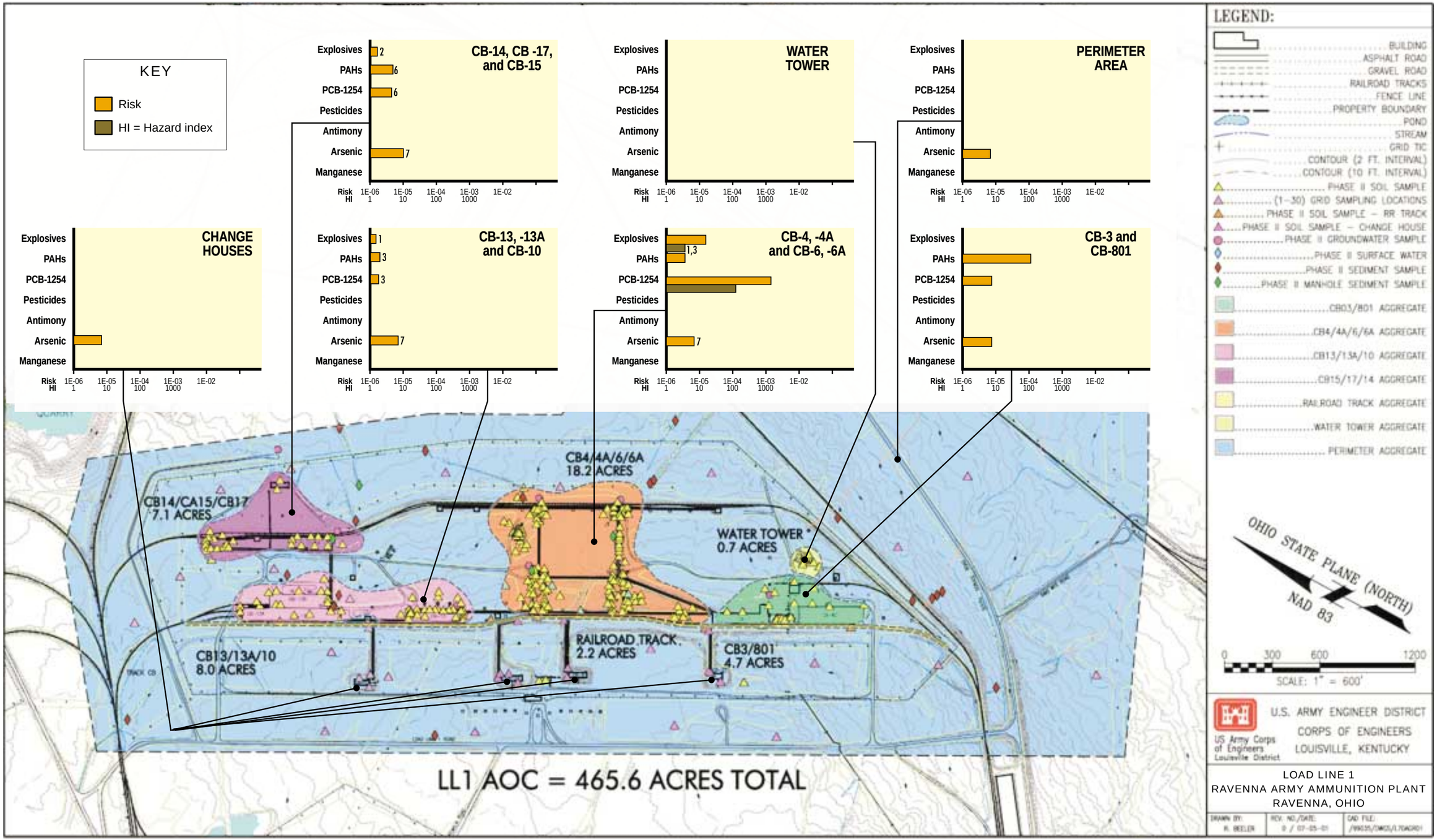
Figure 6-4. Summary of Human Health Risk for National Guard in Soil Aggregates at Load Line 1 Phase II RI

INDUSTRIAL WORKER RISK: SOIL



G02-0047 Ravenna 4A

Figure 6-5. Summary of Human Health Risk for Industrial Worker in Soil Aggregates at Load Line 1 Phase II RI

ON-SITE RESIDENT FARMER RISK: SOIL

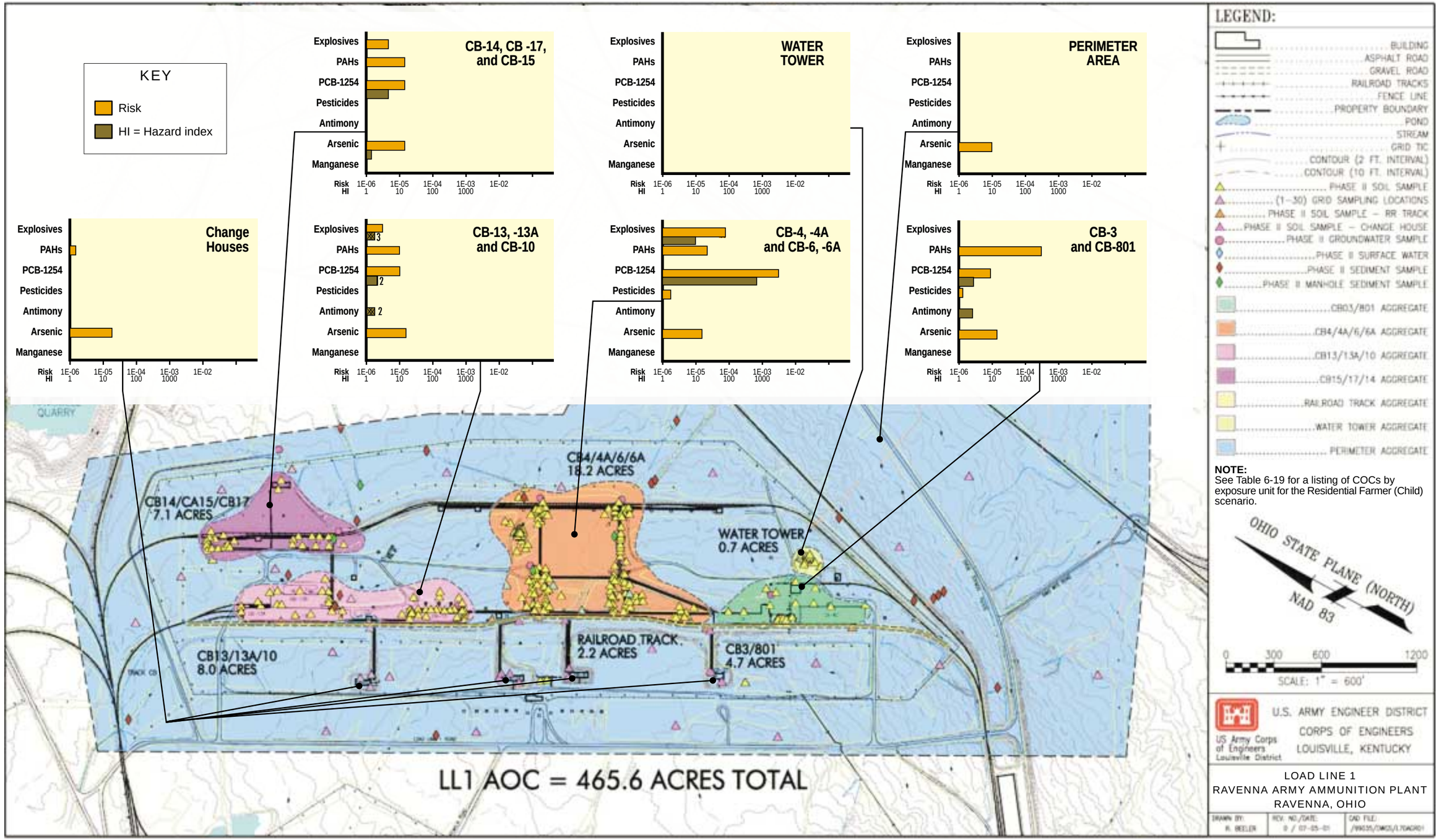


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Figure 6-6. Summary of Human Health Risk for On-Site Resident Farmer at Load Line I Phase II RI

Table 6-21. Chemicals of Concern[a] with Unacceptable Risks/Hazards: Direct Contact with Soil[b]

EU	Receptor	COCs with Unacceptable Risks/Hazards			
		PCB-1254	Benzo(a)pyrene	2,4,6-TNT	Antimony
Buildings CB-3 and CB-801					
	Security Guard/Maint. Worker		X		
	On-Site Resident Farmer	X	X		X (surface and subsurface)
Buildings CB-4/4A and CA-6/6A					
	Child Trespasser	X			
	Hunter/Trapper	X			
	National Guard	X			
	Security Guard/Maint. Worker	X		X	
	Recreator	X			
	Industrial Worker	X		X (subsurface only)	
	On-Site Resident Farmer	X		X (surface and subsurface)	
Buildings CB-14, CB-17, and CA-15					
	On-Site Resident Farmer	X			
Buildings CB-13 and CB-10					
	On-Site Resident Farmer	X			X (subsurface only)

[a]COCs with unacceptable risks/hazards are COCs with a total HI >1 or a total ILCR > 10^{-4}; only COCs meeting these criteria are shown here.
[b]All COCs listed are for surface soil unless otherwise noted.
COC = chemical of concern.
EU = exposure unit.

Farmer at Buildings B-14, CB-17, and CA-15, Buildings CB-3 and CB-809, and Buildings CB-13 and CB-10; benzo(a)pyrene in surface soil for the Security Guard/Maintenance Worker and On-Site Resident Farmer at Buildings CB-3 and CB-801; and 2,4,6-trinitrotoluene in surface and subsurface soil for the On-Site Resident Farmer, in surface soil for the Security Guard/Maintenance Worker, and subsurface soil for the Industrial Worker at Buildings CB-4/4A and CA-6/6A.

Surface soil – indirect contact

As shown in Table 6-22, COCs with unacceptable risks/hazards from exposure to surface soil via ingestion of foodstuffs by an On-Site Resident Farmer include explosives (2,4,6-Trinitrotoluene, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, and RDX), PAHs (Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenz(a,h)anthracene, and Indeno(123-cd)pyrene), PCB-1254, pesticides (dieldrin, endrin aldehyde, heptachlor epoxide, and gamma-chlordane), antimony, cadmium, mercury, thallium, and vanadium.

No COCs with unacceptable risks/hazards are identified for ingestion of venison by either the Hunter/Trapper or On-Site Resident Farmer.

Table 6-22. Chemicals of Concern[a] with Unacceptable Risks/Hazards: Indirect Contact with Surface Soil[a] by the On-Site Resident Farmer

COC[b]	CB-3, CB-801	CB-4/4A, CA-6/6A	CB-13, CB-10	CB-14, CB-17, CA-15	Change Houses	Perimeter Area	Water Tower
PCB-1254	B, V, M	B, V, M	B, V, M	B, V, M	B, V, M		
Benzo(a)anthracene	B, V, M				B, V, M		
Benzo(a)pyrene	B, V, M	B, V, M	B, V, M	B, V, M			
Benzo(b)fluoranthene	B, V, M	B, V, M		B, V, M			
Benzo(k)fluoranthene	B,V,M						
Dibenz(a,h)anthracene	B, V, M	B, V, M		B, V, M			
Indeno(123-cd)pyrene	B, V, M	B, V, M		B, V, M			
2,4,6-Trinitrotoluene		V	V	V			
2,4-Dinitrotoluene			V	V			
2,6-Dinitrotoluene		V	V				
RDX		V	V	V			
1,3-Dinitrobenzene		V					
Dieldrin		B, V, M					
Endrin Aldehyde		V					
gamma-Chlordane		V					
Heptachlor epoxide		V					
Antimony	V		V		V		
Cadmium	V, M	V	V, M	V	V		
Mercury		V					
Thallium	B, V, M	V	B, V, M	V	B, V, M	B, V, M	B, V
Vanadium		V		V			

[a]On-Site Resident Farmer is the only receptor for these indirect exposures.
[b]COCs with unacceptable risks/hazards are COCs with a total HI >1 or a total ILCR > 10^{-4}; only COCs meeting these criteria are shown here.
[c]Chemical is a COC with unacceptable risk/hazard for child receptor only.
COC = chemical of concern.
B = COC for ingestion of beef.
V = COC for ingestion of homegrown vegetables.
M = COC for ingestion of milk.

6.5.3 Remedial Goal Options

To support the remedial alternative selection process, RGOs were developed for each chemical identified as a COC in the direct exposure pathways for this LL 1 BHHRA. RGOs are calculated using the methodology presented in RAGS Part B (EPA 1991b) while incorporating site-specific exposure parameters applicable to LL 1. These RGOs are risk-based concentrations that will be used in the FS to define the extent of contamination that must be remediated and will help cost various alternatives. RGOs are media- and chemical-specific concentrations and are calculated for COCs within each land use/receptor scenario for a given medium. The process for calculating RGOs for this BHHRA is a rearrangement of the cancer risk or non-cancer hazard equation, with the goal of obtaining the concentration that will produce a specific risk or hazard level. For example, the RGO for RDX at the cancer risk level of 10^{-4} for the National Guard receptor is the concentration of RDX that produces a risk of 10^{-4} when using the exposure parameters specific to the National Guard receptor.

As discussed in Section 6.5.1, the cancer risk and non-cancer hazard are calculated as

Risk = (Intake) × (CSF) and
Hazard = (Intake) / (RfD),

The pathway-specific (e.g., drinking water ingestion) equations for the intake are provided in Section 6.3.3. Note that all of the intake equations shown in Section 6.3.3 include a concentration term multiplied by several other exposure parameters.

To obtain the RGO for a specific risk level (e.g., 10^{-4}), the risk equation is rearranged so that the equation is solved for C, the concentration term. Similarly, to obtain the RGO for a specific hazard level (e.g., 1.0), the hazard equation is rearranged so that the equation is solved for the concentration term.

To demonstrate for the drinking water ingestion pathway, note that by using the drinking water ingestion intake equation from Section 6.3.3 (equation 4) and the general risk equation from Section 6.5.1, the risk from ingestion of drinking water is calculated as

$$Risk_{ing(water)} = (C \times IR_w \times EF \times ED \times CSF) / (BW \times AT).$$

To obtain the RGO at the 10^{-4} risk level for the ingestion of drinking water, a value of 10^{-4} is substituted in the equation above for $Risk_{ing(water)}$, and the equation is rearranged to solve for C. Thus, the general RGO equation at the 10^{-4} risk level for the ingestion of drinking water is calculated as

$$RGO_{ing(water)} \text{ at } 10^{-4} = (10^{-4} \times BW \times AT) / (IR_w \times EF \times ED \times CSF).$$

A similar rearrangement of the ingestion of drinking water hazard equation is made, producing the general RGO equation at the 1.0 hazard level for this pathway/medium

$$RGO_{ing(water)} \text{ at } 1.0 = (1.0 \times BW \times AT \times RfD) / (IR_w \times EF \times ED).$$

Thus, to obtain the ingestion of drinking water RGO at the 10^{-4} risk level for the National Guard receptor exposed to RDX, the parameter values for the National Guard receptor (from Table 6-2) and the chemical-specific parameter (oral CSF, from Appendix Q, Table Q-9) for RDX are used

$$RGO_{ing(water)} \text{ at } 10^{-4} \text{ for RDX} = [(10^{-4})(70)(25550)] / (1)(180)(25)(0.11)] = 0.361 \text{ mg/L}.$$

In this example, the RGO calculated is 0.361 mg/L, which will produce a drinking water ingestion risk of 10^{-4} for the National Guard receptor.

Note that if a calculated RGO is not physically possible (e.g., more than the pure chemical), then the RGO is adjusted accordingly. For example, if the calculated RGO is 5.5E+06 mg/kg, then the RGO is adjusted downward to 1.0E+06 mg/kg.

For this BHHRA, RGOs are calculated for each exposure route (e.g., ingestion), as well as for the total chemical risk or hazard across all appropriate exposure routes. Carcinogenic RGOs are calculated and presented in this BHHRA for risk levels of 10^{-4} and 10^{-6}. To obtain the carcinogenic RGO at another risk level, one should adjust the RGO at 10^{-4} or 10^{-6} accordingly, taking care to check the resulting concentration against the physical limits discussed above (e.g., 1.0E+06 mg/kg). For example, to obtain the RGO at the 10^{-5} risk level, one should multiply the RGO at the 10^{-6} risk level by 10 (and then check the result to ensure that the concentration is physically possible). Noncarcinogenic RGOs are calculated and presented in this BHHRA for hazard levels of 0.1 and 1.0. To find the noncarcinogenic RGO at

another hazard level, one should adjust the RGO at the 0.1 or 1.0 hazard levels accordingly, taking care to check the resulting concentration against the physical limits discussed above (e.g., 1.0E+06 mg/kg). For example, to obtain the RGO at the 3.0 hazard level, one should multiply the RGO at the 1.0 hazard level by 3 (and then check the result to ensure that the concentration is physically possible).

As described previously, COCs were identified for groundwater, surface water, sediment, subsurface soil, and surface soil. A unique list of COCs for each medium was obtained from the On-Site Resident Farmer (since its parameters are generally the most conservative). That is, the list of On-Site Resident Farmer COCs (i.e., all chemicals with total risk $>10^{-6}$ or total HI >1) was used to determine which RGOs are calculated on a medium-by-medium basis. Manganese is a COC in soil for the National Guard receptor but not the Resident Farmer because this metal is primarily toxic via inhalation and the National Guard scenario includes a higher particle emission factor (PEF) than any other exposure scenario. Therefore, manganese was included in the list of COCs used for calculating RGOs. For completeness, RGOs were calculated for all receptor/medium combinations evaluated in this BHHRA. For example, even though 2,4-dinitrotoluene is not a surface soil COC for the National Guard receptor, surface soil RGOs for 2,4-dinitrotoluene are calculated for the On-Site Resident Farmer and the National Guard receptor, as well as all other receptors, because 2,4-dinitrotoluene is a surface soil COC for the On-Site Resident Farmer.

RGOs for COCs in groundwater, surface water, sediment, surface soil, and subsurface soil are presented in Tables 6-23 through 6-27.

6.6 UNCERTAINTY ANALYSIS

In estimating exposure and risks to receptors from contact with contaminated media, assumptions are made that incorporate the uncertainties inherent in the process. This section identifies the uncertainties associated with each step of the risk assessment process and, where possible, quantifies those uncertainties. Uncertainties are not cumulative and are not mutually exclusive.

6.6.1 Uncertainties Associated with the Data Evaluation

Although the data evaluation process used to select COPCs adheres to established procedures and guidance, it also requires making decisions and developing assumptions on the basis of historical information, disposal records, process knowledge, and best professional judgment about the data. Uncertainties are associated with all such assumptions. The background concentrations and PRGs used to screen analytes are also subject to uncertainty.

In addition, the determination of the chemical for certain analytes is subject to various assumptions. For example, it is assumed that all metallic thallium is present as the most toxic form (thallium carbonate).

Another area of uncertainty involves the qualitative evaluation (and elimination from further consideration) of essential nutrients, many of which have no available toxicity values. In addition, the toxicity values used in the derivation of PRGs are subject to change, as additional information becomes available from scientific research. These periodic changes in toxicity values may cause the PRG values to change as well.

Uncertainty can be introduced in the data aggregation process. Any changes to criteria governing how data are grouped affect the summary statistics. For example, if data from a single sample are removed from an aggregate, the maximum detected concentration could change for that aggregate. This change

Table 6-23. Groundwater Remedial Goal Options (µg/L) for Open Residential Chemicals of Concern

COC	Ingestion RGO				Dermal RGO				Inhalation RGO				Total Across All Pathways			
	HQ =		Risk =		HQ =		Risk =		HQ =		Risk =		HQ =		Risk =	
	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4
National Guard/Managed Recreational - National Guard																
Arsenic	4.3E+00	4.3E+01	2.6E-01	2.6E+01	8.3E+02	8.3E+03	5.2E+01	5.2E+03	--	--	--	--	4.2E+00	4.2E+01	2.6E-01	2.6E+01
Manganese	6.5E+02	6.5E+03	--	--	5.4E+03	5.4E+04	--	--	--	--	--	--	5.8E+02	5.8E+03	--	--
2,4,6-Trinitrotoluene	7.1E+00	7.1E+01	1.3E+01	1.3E+03	4.3E+02	4.3E+03	8.0E+02	8.0E+04	--	--	--	--	7.0E+00	7.0E+01	1.3E+01	1.3E+03
2,4-Dinitrotoluene	2.8E+01	2.8E+02	5.8E-01	5.8E+01	1.5E+03	1.5E+04	3.2E+01	3.2E+03	--	--	--	--	2.8E+01	2.8E+02	5.7E-01	5.7E+01
2,6-Dinitrotoluene	1.4E+01	1.4E+02	5.8E-01	5.8E+01	1.2E+03	1.2E+04	4.8E+01	4.8E+03	--	--	--	--	1.4E+01	1.4E+02	5.8E-01	5.8E+01
4,4'-DDE	--	--	1.2E+00	1.2E+02	--	--	1.0E+00	1.0E+02	--	--	--	--	--	--	5.4E-01	5.4E+01
Chloroform	1.4E+02	1.4E+03	6.5E+01	6.5E+03	3.3E+03	3.3E+04	1.5E+03	1.5E+05			4.9E-01	4.9E+01	1.4E+02	1.4E+03	4.9E-01	4.9E+01
RDX	4.3E+01	4.3E+02	3.6E+00	3.6E+02	4.6E+02	4.6E+03	3.9E+01	3.9E+03	--	--	--	--	3.9E+01	3.9E+02	3.3E+00	3.3E+02
Open Residential - Resident Farmer (Adult)																
Arsenic	1.1E+00	1.1E+01	5.7E-02	5.7E+00	4.3E+02	4.3E+03	2.2E+01	2.2E+03	--	--	--	--	1.1E+00	1.1E+01	5.7E-02	5.7E+00
Manganese	1.7E+02	1.7E+03	--	--	2.8E+03	2.8E+04	--	--	--	--	--	--	1.6E+02	1.6E+03	--	--
2,4,6-Trinitrotoluene	1.8E+00	1.8E+01	2.8E+00	2.8E+02	2.2E+02	2.2E+03	3.4E+02	3.4E+04	--	--	--	--	1.8E+00	1.8E+01	2.8E+00	2.8E+02
2,4-Dinitrotoluene	7.3E+00	7.3E+01	1.3E-01	1.3E+01	7.9E+02	7.9E+03	1.4E+01	1.4E+03	--	--	--	--	7.2E+00	7.2E+01	1.2E-01	1.2E+01
2,6-Dinitrotoluene	3.7E+00	3.7E+01	1.3E-01	1.3E+01	6.0E+02	6.0E+03	2.1E+01	2.1E+03	--	--	--	--	3.6E+00	3.6E+01	1.2E-01	1.2E+01
4,4'-DDE	--	--	2.5E-01	2.5E+01	--	--	4.3E-01	4.3E+01	--	--	--	--	--	--	1.6E-01	1.6E+01
Chloroform	3.7E+01	3.7E+02	1.4E+01	1.4E+03	1.7E+03	1.7E+04	6.5E+02	6.5E+04			2.1E-01	2.1E+01	3.6E+01	3.6E+02	2.1E-01	2.1E+01
RDX	1.1E+01	1.1E+02	7.7E-01	7.7E+01	2.4E+02	2.4E+03	1.7E+01	1.7E+03	--	--	--	--	1.0E+01	1.0E+02	7.4E-01	7.4E+01
Open Residential - Resident Farmer (Child)																
Arsenic	3.1E-01	3.1E+00	8.1E-02	8.1E+00	2.1E+02	2.1E+03	5.3E+01	5.3E+03	--	--	--	--	3.1E-01	3.1E+00	8.1E-02	8.1E+00
Manganese	4.8E+01	4.8E+02	--	--	1.3E+03	1.3E+04	--	--	--	--	--	--	4.6E+01	4.6E+02	--	--
2,4,6-Trinitrotoluene	5.2E-01	5.2E+00	4.1E+00	4.1E+02	1.1E+02	1.1E+03	8.3E+02	8.3E+04	--	--	--	--	5.2E-01	5.2E+00	4.0E+00	4.0E+02
2,4-Dinitrotoluene	2.1E+00	2.1E+01	1.8E-01	1.8E+01	3.8E+02	3.8E+03	3.3E+01	3.3E+03	--	--	--	--	2.1E+00	2.1E+01	1.8E-01	1.8E+01
2,6-Dinitrotoluene	1.0E+00	1.0E+01	1.8E-01	1.8E+01	2.9E+02	2.9E+03	5.0E+01	5.0E+03	--	--	--	--	1.0E+00	1.0E+01	1.8E-01	1.8E+01
4,4'-DDE	--	--	3.6E-01	3.6E+01	--	--	1.0E+00	1.0E+02	--	--	--	--	--	--	2.7E-01	2.7E+01
Chloroform	1.0E+01	1.0E+02	2.0E+01	2.0E+03	8.1E+02	8.1E+03	1.6E+03	1.6E+05			4.5E-01	4.5E+01	1.0E+01	1.0E+02	4.4E-01	4.4E+01
RDX	3.1E+00	3.1E+01	1.1E+00	1.1E+02	1.1E+02	1.1E+03	4.0E+01	4.0E+03	--	--	--	--	3.0E+00	3.0E+01	1.1E+00	1.1E+02

COC = chemical of concern.
-- not applicable - no toxicity data are available for this exposure pathway or toxic endpoint.
RGO = remedial goal option.

Table 6-24. Surface Water Remedial Goal Options (µg/L) for Open Residential Chemicals of Concern - Direct Contact

COC	Ingestion RGO				Dermal RGO				Inhalation RGO				Total Across All Pathways			
	HQ =		Risk =		HQ =		Risk =		HQ =		Risk =		HQ =		Risk =	
	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Child Trespasser																
Arsenic	9.9E+01	9.9E+02	1.5E+01	1.5E+03	2.7E+02	2.7E+03	4.2E+01	4.2E+03					7.2E+01	7.2E+02	1.1E+01	1.1E+03
Manganese	1.5E+04	1.5E+05			1.7E+03	1.7E+04	--	--	--	--	--	--	1.6E+03	1.6E+04		
Bis(2-ethylhexyl)phthalate	6.6E+03	6.6E+04	1.6E+03	1.6E+05	8.2E+02	8.2E+03	2.1E+02	2.1E+04					7.3E+02	7.3E+03	1.8E+02	1.8E+04
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Hunter/Trapper																
Arsenic	8.5E+01	8.5E+02	4.4E+00	4.4E+02	7.1E+02	7.1E+03	3.7E+01	3.7E+03					7.6E+01	7.6E+02	3.9E+00	3.9E+02
Manganese	1.3E+04	1.3E+05			4.6E+03	4.6E+04							3.4E+03	3.4E+04		
Bis(2-ethylhexyl)phthalate	5.7E+03	5.7E+04	4.7E+02	4.7E+04	2.2E+03	2.2E+04	1.8E+02	1.8E+04					1.6E+03	1.6E+04	1.3E+02	1.3E+04
National Guard/Managed Recreational - National Guard																
Arsenic	6.8E+01	6.8E+02	4.3E+00	4.3E+02	5.7E+02	5.7E+03	3.5E+01	3.5E+03					6.1E+01	6.1E+02	3.8E+00	3.8E+02
Manganese	1.0E+04	1.0E+05			3.7E+03	3.7E+04	--	--	--	--	--	--	2.7E+03	2.7E+04		
Bis(2-ethylhexyl)phthalate	4.6E+03	4.6E+04	4.6E+02	4.6E+04	1.7E+03	1.7E+04	1.7E+02	1.7E+04					1.3E+03	1.3E+04	1.3E+02	1.3E+04
Open Recreational - Recreator																
Arsenic	3.4E+02	3.4E+03	1.8E+01	1.8E+03	8.3E+02	8.3E+03	4.3E+01	4.3E+03					2.4E+02	2.4E+03	1.3E+01	1.3E+03
Manganese	5.2E+04	5.2E+05			5.4E+03	5.4E+04	--	--	--	--	--	--	4.9E+03	4.9E+04		
Bis(2-ethylhexyl)phthalate	2.3E+04	2.3E+05	1.9E+03	1.9E+05	2.5E+03	2.5E+04	2.1E+02	2.1E+04					2.3E+03	2.3E+04	1.9E+02	1.9E+04
Open Residential - Resident Farmer (Adult)																
Arsenic	1.1E+00	1.1E+01	5.7E-02	5.7E+00	4.3E+02	4.3E+03	2.2E+01	2.2E+03					1.1E+00	1.1E+01	5.7E-02	5.7E+00
Manganese	1.7E+02	1.7E+03			2.8E+03	2.8E+04	--	--	--	--	--	--	1.6E+02	1.6E+03		
Bis(2-ethylhexyl)phthalate	7.3E+01	7.3E+02	6.1E+00	6.1E+02	1.3E+03	1.3E+04	1.1E+02	1.1E+04					6.9E+01	6.9E+02	5.8E+00	5.8E+02
Open Residential - Resident Farmer (Child)																
Arsenic	3.1E-01	3.1E+00	8.1E-02	8.1E+00	2.1E+02	2.1E+03	5.3E+01	5.3E+03					3.1E-01	3.1E+00	8.1E-02	8.1E+00
Manganese	4.8E+01	4.8E+02			1.3E+03	1.3E+04	--	--	--	--	--	--	4.6E+01	4.6E+02		
Bis(2-ethylhexyl)phthalate	2.1E+01	2.1E+02	8.7E+00	8.7E+02	6.3E+02	6.3E+03	2.6E+02	2.6E+04	--	--	--	--	2.0E+01	2.0E+02	8.4E+00	8.4E+02

COC = chemical of concern.
-- not applicable - no toxicity data are available for this exposure pathway or toxic endpoint.

Table 6-25. Sediment Remedial Goal Options (mg/kg) for Open Residential Chemicals of Concern

COC	Ingestion RGO				Dermal RGO				Inhalation RGO				Total Across All Pathways			
	HQ =		Risk =		HQ =		Risk =		HQ =		Risk =		HQ =		Risk =	
	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Child Trespasser																
Antimony	7.9E+02	7.9E+03	--	--	1.2E+03	1.2E+04	--	--	--	--	--	--	4.8E+02	4.8E+03	--	--
Arsenic	5.9E+02	5.9E+03	9.2E+01	9.2E+03	1.9E+02	1.9E+03	3.0E+01	3.0E+03			8.5E+04	1.0E+06	1.4E+02	1.4E+03	2.2E+01	2.2E+03
Manganese	9.1E+04	9.1E+05	--	--	3.7E+04	3.7E+05	--	--	2.6E+05	1.0E+06	--	--	2.4E+04	2.4E+05	--	--
2,4-Dinitrotoluene	3.9E+03	3.9E+04	2.0E+02	2.0E+04	4.0E+02	4.0E+03	2.1E+01	2.1E+03	--	--	--	--	3.7E+02	3.7E+03	1.9E+01	1.9E+03
Benz(a)anthracene	--	--	1.9E+02	1.9E+04	--	--	8.6E+00	8.6E+02	--	--	1.0E+06	1.0E+06	--	--	8.2E+00	8.2E+02
Benzo(a)pyrene	--	--	1.9E+01	1.9E+03	--	--	8.6E-01	8.6E+01	--	--	4.1E+05	1.0E+06	--	--	8.2E-01	8.2E+01
Benzo(b)fluoranthene	--	--	1.9E+02	1.9E+04	--	--	8.6E+00	8.6E+02	--	--	1.0E+06	1.0E+06	--	--	8.2E+00	8.2E+02
Benzo(k)fluoranthene	--	--	1.9E+03	1.9E+05	--	--	8.6E+01	8.6E+03	--	--	1.0E+06	1.0E+06	--	--	8.2E+01	8.2E+03
Dibenz(a,h)anthracene	--	--	1.9E+01	1.9E+03	--	--	8.6E-01	8.6E+01	--	--	4.1E+05	1.0E+06	--	--	8.2E-01	8.2E+01
Indeno(1,2,3-cd)pyrene	--	--	1.9E+02	1.9E+04	--	--	8.6E+00	8.6E+02	--	--	1.0E+06	1.0E+06	--	--	8.2E+00	8.2E+02
PCB-1254	3.9E+01	3.9E+02	6.9E+01	6.9E+03	2.3E+00	2.3E+01	4.0E+00	4.0E+02	--	--	6.4E+05	1.0E+06	2.2E+00	2.2E+01	3.8E+00	3.8E+02
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Hunter/Trapper																
Antimony	1.4E+03	1.4E+04	--	--	4.3E+03	4.3E+04	--	--	--	--	--	--	1.0E+03	1.0E+04	--	--
Arsenic	1.0E+03	1.0E+04	5.3E+01	5.3E+03	6.8E+02	6.8E+03	3.5E+01	3.5E+03			2.4E+04	1.0E+06	4.1E+02	4.1E+03	2.1E+01	2.1E+03
Manganese	1.6E+05	1.0E+06	--	--	1.3E+05	1.0E+06	--	--	2.2E+05	1.0E+06	--	--	5.4E+04	5.4E+05	--	--
2,4-Dinitrotoluene	6.8E+03	6.8E+04	1.2E+02	1.2E+04	1.4E+03	1.4E+04	2.4E+01	2.4E+03	--	--	--	--	1.2E+03	1.2E+04	2.0E+01	2.0E+03
Benz(a)anthracene	--	--	1.1E+02	1.1E+04	--	--	1.0E+01	1.0E+03	--	--	1.0E+06	1.0E+06	--	--	9.3E+00	9.3E+02
Benzo(a)pyrene	--	--	1.1E+01	1.1E+03	--	--	1.0E+00	1.0E+02	--	--	1.2E+05	1.0E+06	--	--	9.3E-01	9.3E+01
Benzo(b)fluoranthene	--	--	1.1E+02	1.1E+04	--	--	1.0E+01	1.0E+03	--	--	1.0E+06	1.0E+06	--	--	9.3E+00	9.3E+02
Benzo(k)fluoranthene	--	--	1.1E+03	1.1E+05	--	--	1.0E+02	1.0E+04	--	--	1.0E+06	1.0E+06	--	--	9.3E+01	9.3E+03
Dibenz(a,h)anthracene	--	--	1.1E+01	1.1E+03	--	--	1.0E+00	1.0E+02	--	--	1.2E+05	1.0E+06	--	--	9.3E-01	9.3E+01
Indeno(1,2,3-cd)pyrene	--	--	1.1E+02	1.1E+04	--	--	1.0E+01	1.0E+03	--	--	1.0E+06	1.0E+06	--	--	9.3E+00	9.3E+02
PCB-1254	6.8E+01	6.8E+02	4.0E+01	4.0E+03	8.1E+00	8.1E+01	4.7E+00	4.7E+02	--	--	1.8E+05	1.0E+06	7.3E+00	7.3E+01	4.2E+00	4.2E+02
National Guard/Managed Recreational - National Guard																
Antimony	1.1E+03	1.1E+04	--	--	5.5E+03	5.5E+04	--	--	--	--	--	--	9.1E+02	9.1E+03	--	--
Arsenic	8.2E+02	8.2E+03	5.1E+01	5.1E+03	8.8E+02	8.8E+03	5.4E+01	5.4E+03	--	--	1.1E+04	1.0E+06	4.2E+02	4.2E+03	2.6E+01	2.6E+03
Manganese	1.3E+05	1.0E+06	--	--	1.7E+05	1.0E+06	--	--	8.1E+04	8.1E+05	--	--	3.8E+04	3.8E+05	--	--
2,4-Dinitrotoluene	5.5E+03	5.5E+04	1.1E+02	1.1E+04	1.8E+03	1.8E+04	3.8E+01	3.8E+03	--	--	--	--	1.4E+03	1.4E+04	2.8E+01	2.8E+03
Benz(a)anthracene	--	--	1.0E+02	1.0E+04	--	--	1.6E+01	1.6E+03	--	--	5.1E+05	1.0E+06	--	--	1.4E+01	1.4E+03
Benzo(a)pyrene	--	--	1.0E+01	1.0E+03	--	--	1.6E+00	1.6E+02	--	--	5.1E+04	1.0E+06	--	--	1.4E+00	1.4E+02

Table 6-25. Sediment Remedial Goal Options (mg/kg) for Open Residential Chemicals of Concern (continued)

COC	Ingestion RGO				Dermal RGO				Inhalation RGO				Total Across All Pathways			
	HQ =		Risk =		HQ =		Risk =		HQ =		Risk =		HQ =		Risk =	
	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4
Benzo(b)fluoranthene	--	--	1.0E+02	1.0E+04	--	--	1.6E+01	1.6E+03	--	--	5.1E+05	1.0E+06	--	--	1.4E+01	1.4E+03
Benzo(k)fluoranthene	--	--	1.0E+03	1.0E+05	--	--	1.6E+02	1.6E+04	--	--	1.0E+06	1.0E+06	--	--	1.4E+02	1.4E+04
Dibenz(a,h)anthracene	--	--	1.0E+01	1.0E+03	--	--	1.6E+00	1.6E+02	--	--	5.1E+04	1.0E+06	--	--	1.4E+00	1.4E+02
Indeno(1,2,3-cd)pyrene	--	--	1.0E+02	1.0E+04	--	--	1.6E+01	1.6E+03	--	--	5.1E+05	1.0E+06	--	--	1.4E+01	1.4E+03
PCB-1254	5.5E+01	5.5E+02	3.8E+01	3.8E+03	1.1E+01	1.1E+02	7.4E+00	7.4E+02	--	--	8.0E+04	1.0E+06	8.8E+00	8.8E+01	6.2E+00	6.2E+02
Open Recreational - Recreator																
Antimony	3.3E+03	3.3E+04	--	--	5.1E+03	5.1E+04	--	--	--	--	--	--	2.0E+03	2.0E+04	--	--
Arsenic	2.5E+03	2.5E+04	1.3E+02	1.3E+04	8.1E+02	8.1E+03	4.2E+01	4.2E+03	--	--	5.9E+04	1.0E+06	6.1E+02	6.1E+03	3.2E+01	3.2E+03
Manganese	3.8E+05	1.0E+06	--	--	1.6E+05	1.0E+06	--	--	5.4E+05	1.0E+06	--	--	9.2E+04	9.2E+05	--	--
2,4-Dinitrotoluene	1.6E+04	1.6E+05	2.8E+02	2.8E+04	1.7E+03	1.7E+04	2.9E+01	2.9E+03	--	--	--	--	1.5E+03	1.5E+04	2.7E+01	2.7E+03
Benz(a)anthracene	--	--	2.6E+02	2.6E+04	--	--	1.2E+01	1.2E+03	--	--	1.0E+06	1.0E+06	--	--	1.2E+01	1.2E+03
Benzo(a)pyrene	--	--	2.6E+01	2.6E+03	--	--	1.2E+00	1.2E+02	--	--	2.8E+05	1.0E+06	--	--	1.2E+00	1.2E+02
Benzo(b)fluoranthene	--	--	2.6E+02	2.6E+04	--	--	1.2E+01	1.2E+03	--	--	1.0E+06	1.0E+06	--	--	1.2E+01	1.2E+03
Benzo(k)fluoranthene	--	--	2.6E+03	2.6E+05	--	--	1.2E+02	1.2E+04	--	--	1.0E+06	1.0E+06	--	--	1.2E+02	1.2E+04
Dibenz(a,h)anthracene	--	--	2.6E+01	2.6E+03	--	--	1.2E+00	1.2E+02	--	--	2.8E+05	1.0E+06	--	--	1.2E+00	1.2E+02
Indeno(1,2,3-cd)pyrene	--	--	2.6E+02	2.6E+04	--	--	1.2E+01	1.2E+03	--	--	1.0E+06	1.0E+06	--	--	1.2E+01	1.2E+03
PCB-1254	1.6E+02	1.6E+03	9.5E+01	9.5E+03	9.8E+00	9.8E+01	5.7E+00	5.7E+02	--	--	4.4E+05	1.0E+06	9.2E+00	9.2E+01	5.4E+00	5.4E+02
Open Residential - Resident Farmer (Adult)																
Antimony	2.9E+01	2.9E+02	--	--	1.9E+02	1.9E+03	--	--	--	--	--	--	2.5E+01	2.5E+02	--	--
Arsenic	2.2E+01	2.2E+02	1.1E+00	1.1E+02	3.0E+01	3.0E+02	1.6E+00	1.6E+02	--	--	5.2E+02	5.2E+04	1.3E+01	1.3E+02	6.6E-01	6.6E+01
Manganese	3.4E+03	3.4E+04	--	--	5.9E+03	5.9E+04	--	--	4.8E+03	4.8E+04	--	--	1.5E+03	1.5E+04	--	--
2,4-Dinitrotoluene	1.5E+02	1.5E+03	2.5E+00	2.5E+02	6.4E+01	6.4E+02	1.1E+00	1.1E+02	--	--	--	--	4.5E+01	4.5E+02	7.6E-01	7.6E+01
Benz(a)anthracene	--	--	2.3E+00	2.3E+02	--	--	4.6E-01	4.6E+01	--	--	2.5E+04	1.0E+06	--	--	3.8E-01	3.8E+01
Benzo(a)pyrene	--	--	2.3E-01	2.3E+01	--	--	4.6E-02	4.6E+00	--	--	2.5E+03	2.5E+05	--	--	3.8E-02	3.8E+00
Benzo(b)fluoranthene	--	--	2.3E+00	2.3E+02	--	--	4.6E-01	4.6E+01	--	--	2.5E+04	1.0E+06	--	--	3.8E-01	3.8E+01
Benzo(k)fluoranthene	--	--	2.3E+01	2.3E+03	--	--	4.6E+00	4.6E+02	--	--	2.5E+05	1.0E+06	--	--	3.8E+00	3.8E+02
Dibenz(a,h)anthracene	--	--	2.3E-01	2.3E+01	--	--	4.6E-02	4.6E+00	--	--	2.5E+03	2.5E+05	--	--	3.8E-02	3.8E+00
Indeno(1,2,3-cd)pyrene	--	--	2.3E+00	2.3E+02	--	--	4.6E-01	4.6E+01	--	--	2.5E+04	1.0E+06	--	--	3.8E-01	3.8E+01
PCB-1254	1.5E+00	1.5E+01	8.5E-01	8.5E+01	3.7E-01	3.7E+00	2.1E-01	2.1E+01	--	--	3.9E+03	3.9E+05	2.9E-01	2.9E+00	1.7E-01	1.7E+01

Table 6-25. Sediment Remedial Goal Options (mg/kg) for Open Residential Chemicals of Concern (continued)

COC	Ingestion RGO				Dermal RGO				Inhalation RGO				Total Across All Pathways			
	HQ =		Risk =		HQ =		Risk =		HQ =		Risk =		HQ =		Risk =	
	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4
Open Residential - Resident Farmer (Child)																
Antimony	3.1E+00	3.1E+01	--	--	2.1E+02	2.1E+03	--	--	--	--	--	--	3.1E+00	3.1E+01	--	--
Arsenic	2.3E+00	2.3E+01	6.1E-01	6.1E+01	3.4E+01	3.4E+02	8.8E+00	8.8E+02	--	--	1.1E+03	1.1E+05	2.2E+00	2.2E+01	5.7E-01	5.7E+01
Manganese	3.6E+02	3.6E+03	--	--	6.5E+03	6.5E+04	--	--	2.1E+03	2.1E+04	--	--	2.9E+02	2.9E+03	--	--
2,4-Dinitrotoluene	1.6E+01	1.6E+02	1.3E+00	1.3E+02	7.1E+01	7.1E+02	6.1E+00	6.1E+02	--	--	--	--	1.3E+01	1.3E+02	1.1E+00	1.1E+02
Benz(a)anthracene	--	--	1.3E+00	1.3E+02	--	--	2.5E+00	2.5E+02	--	--	5.4E+04	1.0E+06	--	--	8.4E-01	8.4E+01
Benzo(a)pyrene	--	--	1.3E-01	1.3E+01	--	--	2.5E-01	2.5E+01	--	--	5.4E+03	5.4E+05	--	--	8.4E-02	8.4E+00
Benzo(b)fluoranthene	--	--	1.3E+00	1.3E+02	--	--	2.5E+00	2.5E+02	--	--	5.4E+04	1.0E+06	--	--	8.4E-01	8.4E+01
Benzo(k)fluoranthene	--	--	1.3E+01	1.3E+03	--	--	2.5E+01	2.5E+03	--	--	5.4E+05	1.0E+06	--	--	8.4E+00	8.4E+02
Dibenz(a,h)anthracene	--	--	1.3E-01	1.3E+01	--	--	2.5E-01	2.5E+01	--	--	5.4E+03	5.4E+05	--	--	8.4E-02	8.4E+00
Indeno(1,2,3-cd)pyrene	--	--	1.3E+00	1.3E+02	--	--	2.5E+00	2.5E+02	--	--	5.4E+04	1.0E+06	--	--	8.4E-01	8.4E+01
PCB-1254	1.6E-01	1.6E+00	4.6E-01	4.6E+01	4.1E-01	4.1E+00	1.2E+00	1.2E+02	--	--	8.4E+03	8.4E+05	1.1E-01	1.1E+00	3.3E-01	3.3E+01

COC = chemical of concern.
-- not applicable - no toxicity data are available for this exposure pathway or toxic endpoint.

Table 6-26. Surface Soil Remedial Goal Options (mg/kg) for Open Residential Chemicals of Concern - Direct Contact

COC	Ingestion RGO				Dermal RGO				Inhalation RGO				Total Across All Pathways			
	HQ =		Risk =		HQ =		Risk =		HQ =		Risk =		HQ =		Risk =	
	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Child Trespasser																
Antimony	7.9E+02	7.9E+03	--	--	1.2E+03	1.2E+04	--	--	--	--	--	--	4.8E+02	4.8E+03	--	--
Arsenic	5.9E+02	5.9E+03	9.2E+01	9.2E+03	1.9E+02	1.9E+03	3.0E+01	3.0E+03			8.5E+04	1.0E+06	1.4E+02	1.4E+03	2.2E+01	2.2E+03
Manganese	9.1E+04	9.1E+05	--	--	3.7E+04	3.7E+05	--	--	2.6E+05	1.0E+06	--	--	2.4E+04	2.4E+05	--	--
2,4,6-Trinitrotoluene	9.9E+02	9.9E+03	4.6E+03	4.6E+05	1.0E+02	1.0E+03	4.7E+02	4.7E+04	--	--	--	--	9.1E+01	9.1E+02	4.3E+02	4.3E+04
2,4-Dinitrotoluene	3.9E+03	3.9E+04	2.0E+02	2.0E+04	4.0E+02	4.0E+03	2.1E+01	2.1E+03	--	--	--	--	3.7E+02	3.7E+03	1.9E+01	1.9E+03
2,6-Dinitrotoluene	2.0E+03	2.0E+04	2.0E+02	2.0E+04	2.0E+02	2.0E+03	2.1E+01	2.1E+03	--	--	--	--	1.8E+02	1.8E+03	1.9E+01	1.9E+03
Benz(a)anthracene	--	--	1.9E+02	1.9E+04	--	--	8.6E+00	8.6E+02	--	--	1.0E+06	1.0E+06	--	--	8.2E+00	8.2E+02
Benzo(a)pyrene	--	--	1.9E+01	1.9E+03	--	--	8.6E-01	8.6E+01	--	--	4.1E+05	1.0E+06	--	--	8.2E-01	8.2E+01
Benzo(b)fluoranthene	--	--	1.9E+02	1.9E+04	--	--	8.6E+00	8.6E+02	--	--	1.0E+06	1.0E+06	--	--	8.2E+00	8.2E+02
Benzo(k)fluoranthene	--	--	1.9E+03	1.9E+05	--	--	8.6E+01	8.6E+03	--	--	1.0E+06	1.0E+06	--	--	8.2E+01	8.2E+03
Dibenz(a,h)anthracene	--	--	1.9E+01	1.9E+03	--	--	8.6E-01	8.6E+01	--	--	4.1E+05	1.0E+06	--	--	8.2E-01	8.2E+01
Dieldrin	9.9E+01	9.9E+02	8.6E+00	8.6E+02	1.0E+01	1.0E+02	8.8E-01	8.8E+01	--	--	7.9E+04	1.0E+06	9.1E+00	9.1E+01	8.0E-01	8.0E+01
Indeno(1,2,3-cd)pyrene	--	--	1.9E+02	1.9E+04	--	--	8.6E+00	8.6E+02	--	--	1.0E+06	1.0E+06	--	--	8.2E+00	8.2E+02
PCB-1254	3.9E+01	3.9E+02	6.9E+01	6.9E+03	2.3E+00	2.3E+01	4.0E+00	4.0E+02	--	--	6.4E+05	1.0E+06	2.2E+00	2.2E+01	3.8E+00	3.8E+02
RDX	5.9E+03	5.9E+04	1.3E+03	1.3E+05	6.0E+02	6.0E+03	1.3E+02	1.3E+04	--	--	--	--	5.5E+02	5.5E+03	1.2E+02	1.2E+04
Maintained Industrial/Managed Recreational and National Guard/Managed Recreational - Hunter/Trapper																
Antimony	1.4E+03	1.4E+04	--	--	4.3E+03	4.3E+04	--	--	--	--	--	--	1.0E+03	1.0E+04	--	--
Arsenic	1.0E+03	1.0E+04	5.3E+01	5.3E+03	6.8E+02	6.8E+03	3.5E+01	3.5E+03			2.4E+04	1.0E+06	4.1E+02	4.1E+03	2.1E+01	2.1E+03
Manganese	1.6E+05	1.0E+06	--	--	1.3E+05	1.0E+06	--	--	2.2E+05	1.0E+06	--	--	5.4E+04	5.4E+05	--	--
2,4,6-Trinitrotoluene	1.7E+03	1.7E+04	2.6E+03	2.6E+05	3.6E+02	3.6E+03	5.5E+02	5.5E+04	--	--	--	--	2.9E+02	2.9E+03	4.6E+02	4.6E+04
2,4-Dinitrotoluene	6.8E+03	6.8E+04	1.2E+02	1.2E+04	1.4E+03	1.4E+04	2.4E+01	2.4E+03	--	--	--	--	1.2E+03	1.2E+04	2.0E+01	2.0E+03
2,6-Dinitrotoluene	3.4E+03	3.4E+04	1.2E+02	1.2E+04	7.1E+02	7.1E+03	2.4E+01	2.4E+03	--	--	--	--	5.9E+02	5.9E+03	2.0E+01	2.0E+03
Benz(a)anthracene	--	--	1.1E+02	1.1E+04	--	--	1.0E+01	1.0E+03	--	--	1.0E+06	1.0E+06	--	--	9.3E+00	9.3E+02
Benzo(a)pyrene	--	--	1.1E+01	1.1E+03	--	--	1.0E+00	1.0E+02	--	--	1.2E+05	1.0E+06	--	--	9.3E-01	9.3E+01
Benzo(b)fluoranthene	--	--	1.1E+02	1.1E+04	--	--	1.0E+01	1.0E+03	--	--	1.0E+06	1.0E+06	--	--	9.3E+00	9.3E+02
Benzo(k)fluoranthene	--	--	1.1E+03	1.1E+05	--	--	1.0E+02	1.0E+04	--	--	1.0E+06	1.0E+06	--	--	9.3E+01	9.3E+03
Dibenz(a,h)anthracene	--	--	1.1E+01	1.1E+03	--	--	1.0E+00	1.0E+02	--	--	1.2E+05	1.0E+06	--	--	9.3E-01	9.3E+01
Dieldrin	1.7E+02	1.7E+03	5.0E+00	5.0E+02	3.6E+01	3.6E+02	1.0E+00	1.0E+02	--	--	2.3E+04	1.0E+06	2.9E+01	2.9E+02	8.6E-01	8.6E+01
Indeno(1,2,3-cd)pyrene	--	--	1.1E+02	1.1E+04	--	--	1.0E+01	1.0E+03	--	--	1.0E+06	1.0E+06	--	--	9.3E+00	9.3E+02

Table 6-26. Surface Soil Remedial Goal Options (mg/kg) for Open Residential Chemicals of Concern- Direct Contact (continued)

	Ingestion RGO				Dermal RGO				Inhalation RGO				Total Across All Pathways			
	HQ =		Risk =		HQ =		Risk =		HQ =		Risk =		HQ =		Risk =	
COC	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4
PCB-1254	6.8E+01	6.8E+02	4.0E+01	4.0E+03	8.1E+00	8.1E+01	4.7E+00	4.7E+02	--	--	1.8E+05	1.0E+06	7.3E+00	7.3E+01	4.2E+00	4.2E+02
RDX	1.0E+04	1.0E+05	7.2E+02	7.2E+04	2.1E+03	2.1E+04	1.5E+02	1.5E+04	--	--			1.8E+03	1.8E+04	1.2E+02	1.2E+04
National Guard/Managed Recreational - National Guard																
Antimony	1.7E+02	1.7E+03	--	--	8.6E+02	8.6E+03	--	--	--	--	--	--	1.4E+02	1.4E+03	--	--
Arsenic	1.3E+02	1.3E+03	7.9E+00	7.9E+02	1.4E+02	1.4E+03	8.5E+00	8.5E+02	--	--	3.0E+00	3.0E+02	6.6E+01	6.6E+02	1.7E+00	1.7E+02
Manganese	2.0E+04	2.0E+05	--	--	2.6E+04	2.6E+05	--	--	2.3E+01	2.3E+02	--	--	2.3E+01	2.3E+02	--	--
2,4,6-Trinitrotoluene	2.1E+02	2.1E+03	4.0E+02	4.0E+04	7.2E+01	7.2E+02	1.3E+02	1.3E+04	--	--	--	--	5.4E+01	5.4E+02	1.0E+02	1.0E+04
2,4-Dinitrotoluene	8.5E+02	8.5E+03	1.8E+01	1.8E+03	2.9E+02	2.9E+03	5.9E+00	5.9E+02	--	--	--	--	2.1E+02	2.1E+03	4.4E+00	4.4E+02
2,6-Dinitrotoluene	4.3E+02	4.3E+03	1.8E+01	1.8E+03	1.4E+02	1.4E+03	5.9E+00	5.9E+02	--	--	--	--	1.1E+02	1.1E+03	4.4E+00	4.4E+02
Benz(a)anthracene	--	--	1.6E+01	1.6E+03	--	--	2.5E+00	2.5E+02	--	--	1.4E+02	1.4E+04	--	--	2.1E+00	2.1E+02
Benzo(a)pyrene	--	--	1.6E+00	1.6E+02	--	--	2.5E-01	2.5E+01	--	--	1.4E+01	1.4E+03	--	--	2.1E-01	2.1E+01
Benzo(b)fluoranthene	--	--	1.6E+01	1.6E+03	--	--	2.5E+00	2.5E+02	--	--	1.4E+02	1.4E+04	--	--	2.1E+00	2.1E+02
Benzo(k)fluoranthene	--	--	1.6E+02	1.6E+04	--	--	2.5E+01	2.5E+03	--	--	1.4E+03	1.4E+05	--	--	2.1E+01	2.1E+03
Dibenz(a,h)anthracene	--	--	1.6E+00	1.6E+02	--	--	2.5E-01	2.5E+01	--	--	1.4E+01	1.4E+03	--	--	2.1E-01	2.1E+01
Dieldrin	2.1E+01	2.1E+02	7.5E-01	7.5E+01	7.2E+00	7.2E+01	2.5E-01	2.5E+01	--	--	2.8E+00	2.8E+02	5.4E+00	5.4E+01	1.8E-01	1.8E+01
Indeno(1,2,3-cd)pyrene	--	--	1.6E+01	1.6E+03	--	--	2.5E+00	2.5E+02	--	--	1.4E+02	1.4E+04	--	--	2.1E+00	2.1E+02
PCB-1254	8.5E+00	8.5E+01	6.0E+00	6.0E+02	1.6E+00	1.6E+01	1.1E+00	1.1E+02	--	--	2.2E+01	2.2E+03	1.4E+00	1.4E+01	9.2E-01	9.2E+01
RDX	1.3E+03	1.3E+04	1.1E+02	1.1E+04	4.3E+02	4.3E+03	3.6E+01	3.6E+03	--	--	--	--	3.2E+02	3.2E+03	2.7E+01	2.7E+03
Open Industrial - Industrial Worker																
Antimony	4.1E+01	4.1E+02	--	--	9.3E+02	9.3E+03	--	--	--	--	--	--	3.9E+01	3.9E+02	--	--
Arsenic	3.1E+01	3.1E+02	1.9E+00	1.9E+02	1.5E+02	1.5E+03	9.2E+00	9.2E+02			8.8E+02	8.8E+04	2.5E+01	2.5E+02	1.6E+00	1.6E+02
Manganese	4.7E+03	4.7E+04	--	--	2.8E+04	2.8E+05	--	--	6.7E+03	6.7E+04	--	--	2.5E+03	2.5E+04	--	--
2,4,6-Trinitrotoluene	5.1E+01	5.1E+02	9.5E+01	9.5E+03	7.7E+01	7.7E+02	1.4E+02	1.4E+04	--	--	--	--	3.1E+01	3.1E+02	5.7E+01	5.7E+03
2,4-Dinitrotoluene	2.0E+02	2.0E+03	4.2E+00	4.2E+02	3.1E+02	3.1E+03	6.4E+00	6.4E+02	--	--	--	--	1.2E+02	1.2E+03	2.5E+00	2.5E+02
2,6-Dinitrotoluene	1.0E+02	1.0E+03	4.2E+00	4.2E+02	1.5E+02	1.5E+03	6.4E+00	6.4E+02	--	--	--	--	6.2E+01	6.2E+02	2.5E+00	2.5E+02
Benz(a)anthracene	--	--	3.9E+00	3.9E+02	--	--	2.6E+00	2.6E+02	--	--	4.3E+04	1.0E+06	--	--	1.6E+00	1.6E+02
Benzo(a)pyrene	--	--	3.9E-01	3.9E+01	--	--	2.6E-01	2.6E+01	--	--	4.3E+03	4.3E+05	--	--	1.6E-01	1.6E+01
Benzo(b)fluoranthene	--	--	3.9E+00	3.9E+02	--	--	2.6E+00	2.6E+02	--	--	4.3E+04	1.0E+06	--	--	1.6E+00	1.6E+02
Benzo(k)fluoranthene	--	--	3.9E+01	3.9E+03	--	--	2.6E+01	2.6E+03	--	--	4.3E+05	1.0E+06	--	--	1.6E+01	1.6E+03
Dibenz(a,h)anthracene	--	--	3.9E-01	3.9E+01	--	--	2.6E-01	2.6E+01	--	--	4.3E+03	4.3E+05	--	--	1.6E-01	1.6E+01

Table 6-26. Surface Soil Remedial Goal Options (mg/kg) for Open Residential Chemicals of Concern- Direct Contact (continued)

COC	Ingestion RGO				Dermal RGO				Inhalation RGO				Total Across All Pathways			
	HQ =		Risk =		HQ =		Risk =		HQ =		Risk =		HQ =		Risk =	
	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4
Dieldrin	5.1E+00	5.1E+01	1.8E-01	1.8E+01	7.7E+00	7.7E+01	2.7E-01	2.7E+01	--	--	8.2E+02	8.2E+04	3.1E+00	3.1E+01	1.1E-01	1.1E+01
Indeno(1,2,3-cd)pyrene	--	--	3.9E+00	3.9E+02	--	--	2.6E+00	2.6E+02	--	--	4.3E+04	1.0E+06	--	--	1.6E+00	1.6E+02
PCB-1254	2.0E+00	2.0E+01	1.4E+00	1.4E+02	1.8E+00	1.8E+01	1.2E+00	1.2E+02	--	--	6.6E+03	6.6E+05	9.5E-01	9.5E+00	6.6E-01	6.6E+01
RDX	3.1E+02	3.1E+03	2.6E+01	2.6E+03	4.6E+02	4.6E+03	3.9E+01	3.9E+03	--	--	--	--	1.8E+02	1.8E+03	1.6E+01	1.6E+03
Open Recreational - Recreator																
Antimony	3.3E+03	3.3E+04	--	--	5.1E+03	5.1E+04	--	--	--	--	--	--	2.0E+03	2.0E+04	--	--
Arsenic	2.5E+03	2.5E+04	1.3E+02	1.3E+04	8.1E+02	8.1E+03	4.2E+01	4.2E+03	--	--	5.9E+04	1.0E+06	6.1E+02	6.1E+03	3.2E+01	3.2E+03
Manganese	3.8E+05	1.0E+06	--	--	1.6E+05	1.0E+06	--	--	5.4E+05	1.0E+06	--	--	9.2E+04	9.2E+05	--	--
2,4,6-Trinitrotoluene	4.1E+03	4.1E+04	6.4E+03	6.4E+05	4.3E+02	4.3E+03	6.6E+02	6.6E+04	--	--	--	--	3.9E+02	3.9E+03	6.0E+02	6.0E+04
2,4-Dinitrotoluene	1.6E+04	1.6E+05	2.8E+02	2.8E+04	1.7E+03	1.7E+04	2.9E+01	2.9E+03	--	--	--	--	1.5E+03	1.5E+04	2.7E+01	2.7E+03
2,6-Dinitrotoluene	8.2E+03	8.2E+04	2.8E+02	2.8E+04	8.5E+02	8.5E+03	2.9E+01	2.9E+03	--	--	--	--	7.7E+02	7.7E+03	2.7E+01	2.7E+03
Benz(a)anthracene	--	--	2.6E+02	2.6E+04	--	--	1.2E+01	1.2E+03	--	--	1.0E+06	1.0E+06	--	--	1.2E+01	1.2E+03
Benzo(a)pyrene	--	--	2.6E+01	2.6E+03	--	--	1.2E+00	1.2E+02	--	--	2.8E+05	1.0E+06	--	--	1.2E+00	1.2E+02
Benzo(b)fluoranthene	--	--	2.6E+02	2.6E+04	--	--	1.2E+01	1.2E+03	--	--	1.0E+06	1.0E+06	--	--	1.2E+01	1.2E+03
Benzo(k)fluoranthene	--	--	2.6E+03	2.6E+05	--	--	1.2E+02	1.2E+04	--	--	1.0E+06	1.0E+06	--	--	1.2E+02	1.2E+04
Dibenz(a,h)anthracene	--	--	2.6E+01	2.6E+03	--	--	1.2E+00	1.2E+02	--	--	2.8E+05	1.0E+06	--	--	1.2E+00	1.2E+02
Dieldrin	4.1E+02	4.1E+03	1.2E+01	1.2E+03	4.3E+01	4.3E+02	1.2E+00	1.2E+02	--	--	5.5E+04	1.0E+06	3.9E+01	3.9E+02	1.1E+00	1.1E+02
Indeno(1,2,3-cd)pyrene	--	--	2.6E+02	2.6E+04	--	--	1.2E+01	1.2E+03	--	--	1.0E+06	1.0E+06	--	--	1.2E+01	1.2E+03
PCB-1254	1.6E+02	1.6E+03	9.5E+01	9.5E+03	9.8E+00	9.8E+01	5.7E+00	5.7E+02	--	--	4.4E+05	1.0E+06	9.2E+00	9.2E+01	5.4E+00	5.4E+02
RDX	2.5E+04	2.5E+05	1.7E+03	1.7E+05	2.6E+03	2.6E+04	1.8E+02	1.8E+04	--	--	--	--	2.3E+03	2.3E+04	1.6E+02	1.6E+04
Open Residential - Resident Farmer (Adult)																
Antimony	2.9E+01	2.9E+02	--	--	1.9E+02	1.9E+03	--	--	--	--	--	--	2.5E+01	2.5E+02	--	--
Arsenic	2.2E+01	2.2E+02	1.1E+00	1.1E+02	3.0E+01	3.0E+02	1.6E+00	1.6E+02	--	--	5.2E+02	5.2E+04	1.3E+01	1.3E+02	6.6E-01	6.6E+01
Manganese	3.4E+03	3.4E+04	--	--	5.9E+03	5.9E+04	--	--	4.8E+03	4.8E+04	--	--	1.5E+03	1.5E+04	--	--
2,4,6-Trinitrotoluene	3.7E+01	3.7E+02	5.7E+01	5.7E+03	1.6E+01	1.6E+02	2.5E+01	2.5E+03	--	--	--	--	1.1E+01	1.1E+02	1.7E+01	1.7E+03
2,4-Dinitrotoluene	1.5E+02	1.5E+03	2.5E+00	2.5E+02	6.4E+01	6.4E+02	1.1E+00	1.1E+02	--	--	--	--	4.5E+01	4.5E+02	7.6E-01	7.6E+01
2,6-Dinitrotoluene	7.3E+01	7.3E+02	2.5E+00	2.5E+02	3.2E+01	3.2E+02	1.1E+00	1.1E+02	--	--	--	--	2.2E+01	2.2E+02	7.6E-01	7.6E+01
Benz(a)anthracene	--	--	2.3E+00	2.3E+02	--	--	4.6E-01	4.6E+01	--	--	2.5E+04	1.0E+06	--	--	3.8E-01	3.8E+01
Benzo(a)pyrene	--	--	2.3E-01	2.3E+01	--	--	4.6E-02	4.6E+00	--	--	2.5E+03	2.5E+05	--	--	3.8E-02	3.8E+00
Benzo(b)fluoranthene	--	--	2.3E+00	2.3E+02	--	--	4.6E-01	4.6E+01	--	--	2.5E+04	1.0E+06	--	--	3.8E-01	3.8E+01
Benzo(k)fluoranthene	--	--	2.3E+01	2.3E+03	--	--	4.6E+00	4.6E+02	--	--	2.5E+05	1.0E+06	--	--	3.8E+00	3.8E+02

Table 6-26. Surface Soil Remedial Goal Options (mg/kg) for Open Residential Chemicals of Concern- Direct Contact (continued)

COC	Ingestion RGO				Dermal RGO				Inhalation RGO				Total Across All Pathways			
	HQ =		Risk =		HQ =		Risk =		HQ =		Risk =		HQ =		Risk =	
	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4
Dibenz(a,h)anthracene	--	--	2.3E-01	2.3E+01	--	--	4.6E-02	4.6E+00	--	--	2.5E+03	2.5E+05	--	--	3.8E-02	3.8E+00
Dieldrin	3.7E+00	3.7E+01	1.1E-01	1.1E+01	1.6E+00	1.6E+01	4.7E-02	4.7E+00	--	--	4.9E+02	4.9E+04	1.1E+00	1.1E+01	3.2E-02	3.2E+00
Indeno(1,2,3-cd)pyrene	--	--	2.3E+00	2.3E+02	--	--	4.6E-01	4.6E+01	--	--	2.5E+04	1.0E+06	--	--	3.8E-01	3.8E+01
PCB-1254	1.5E+00	1.5E+01	8.5E-01	8.5E+01	3.7E-01	3.7E+00	2.1E-01	2.1E+01	--	--	3.9E+03	3.9E+05	2.9E-01	2.9E+00	1.7E-01	1.7E+01
RDX	2.2E+02	2.2E+03	1.5E+01	1.5E+03	9.6E+01	9.6E+02	6.8E+00	6.8E+02	--	--	--	--	6.7E+01	6.7E+02	4.7E+00	4.7E+02
Open Residential - Resident Farmer (Child)																
Antimony	3.1E+00	3.1E+01	--	--	2.1E+02	2.1E+03	--	--	--	--	--	--	3.1E+00	3.1E+01	--	--
Arsenic	2.3E+00	2.3E+01	6.1E-01	6.1E+01	3.4E+01	3.4E+02	8.8E+00	8.8E+02	--	--	1.1E+03	1.1E+05	2.2E+00	2.2E+01	5.7E-01	5.7E+01
Manganese	3.6E+02	3.6E+03	--	--	6.5E+03	6.5E+04	--	--	2.1E+03	2.1E+04	--	--	2.9E+02	2.9E+03	--	--
2,4,6-Trinitrotoluene	3.9E+00	3.9E+01	3.0E+01	3.0E+03	1.8E+01	1.8E+02	1.4E+02	1.4E+04	--	--	--	--	3.2E+00	3.2E+01	2.5E+01	2.5E+03
2,4-Dinitrotoluene	1.6E+01	1.6E+02	1.3E+00	1.3E+02	7.1E+01	7.1E+02	6.1E+00	6.1E+02	--	--	--	--	1.3E+01	1.3E+02	1.1E+00	1.1E+02
2,6-Dinitrotoluene	7.8E+00	7.8E+01	1.3E+00	1.3E+02	3.6E+01	3.6E+02	6.1E+00	6.1E+02	--	--	--	--	6.4E+00	6.4E+01	1.1E+00	1.1E+02
Benz(a)anthracene	--	--	1.3E+00	1.3E+02	--	--	2.5E+00	2.5E+02	--	--	5.4E+04	1.0E+06	--	--	8.4E-01	8.4E+01
Benzo(a)pyrene	--	--	1.3E-01	1.3E+01	--	--	2.5E-01	2.5E+01	--	--	5.4E+03	5.4E+05	--	--	8.4E-02	8.4E+00
Benzo(b)fluoranthene	--	--	1.3E+00	1.3E+02	--	--	2.5E+00	2.5E+02	--	--	5.4E+04	1.0E+06	--	--	8.4E-01	8.4E+01
Benzo(k)fluoranthene	--	--	1.3E+01	1.3E+03	--	--	2.5E+01	2.5E+03	--	--	5.4E+05	1.0E+06	--	--	8.4E+00	8.4E+02
Dibenz(a,h)anthracene	--	--	1.3E-01	1.3E+01	--	--	2.5E-01	2.5E+01	--	--	5.4E+03	5.4E+05	--	--	8.4E-02	8.4E+00
Dieldrin	3.9E-01	3.9E+00	5.7E-02	5.7E+00	1.8E+00	1.8E+01	2.6E-01	2.6E+01	--	--	1.0E+03	1.0E+05	3.2E-01	3.2E+00	4.7E-02	4.7E+00
Indeno(1,2,3-cd)pyrene	--	--	1.3E+00	1.3E+02	--	--	2.5E+00	2.5E+02	--	--	5.4E+04	1.0E+06	--	--	8.4E-01	8.4E+01
PCB-1254	1.6E-01	1.6E+00	4.6E-01	4.6E+01	4.1E-01	4.1E+00	1.2E+00	1.2E+02	--	--	8.4E+03	8.4E+05	1.1E-01	1.1E+00	3.3E-01	3.3E+01
RDX	2.3E+01	2.3E+02	8.3E+00	8.3E+02	1.1E+02	1.1E+03	3.8E+01	3.8E+03	--	--	--	--	1.9E+01	1.9E+02	6.8E+00	6.8E+02
Maintained Industrial/Managed Recreational - Security Guard/Maintenance Worker																
Antimony	9.8E+02	9.8E+03	--	--	2.7E+02	2.7E+03	--	--	--	--	--	--	2.1E+02	2.1E+03	--	--
Arsenic	7.4E+02	7.4E+03	4.6E+01	4.6E+03	4.2E+01	4.2E+02	2.6E+00	2.6E+02	--	--	2.1E+04	1.0E+06	4.0E+01	4.0E+02	2.5E+00	2.5E+02
Manganese	1.1E+05	1.0E+06	--	--	8.1E+03	8.1E+04	--	--	1.6E+05	1.0E+06	--	--	7.3E+03	7.3E+04	--	--
2,4,6-Trinitrotoluene	1.2E+03	1.2E+04	2.3E+03	2.3E+05	2.2E+01	2.2E+02	4.1E+01	4.1E+03	--	--	--	--	2.2E+01	2.2E+02	4.1E+01	4.1E+03
2,4-Dinitrotoluene	4.9E+03	4.9E+04	1.0E+02	1.0E+04	8.8E+01	8.8E+02	1.8E+00	1.8E+02	--	--	--	--	8.7E+01	8.7E+02	1.8E+00	1.8E+02
2,6-Dinitrotoluene	2.5E+03	2.5E+04	1.0E+02	1.0E+04	4.4E+01	4.4E+02	1.8E+00	1.8E+02	--	--	--	--	4.3E+01	4.3E+02	1.8E+00	1.8E+02
Benz(a)anthracene	--	--	9.4E+01	9.4E+03	--	--	7.6E-01	7.6E+01	--	--	1.0E+06	1.0E+06	--	--	7.5E-01	7.5E+01
Benzo(a)pyrene	--	--	9.4E+00	9.4E+02	--	--	7.6E-02	7.6E+00	--	--	1.0E+05	1.0E+06	--	--	7.5E-02	7.5E+00
Benzo(b)fluoranthene	--	--	9.4E+01	9.4E+03	--	--	7.6E-01	7.6E+01	--	--	1.0E+06	1.0E+06	--	--	7.5E-01	7.5E+01

Table 6-26. Surface Soil Remedial Goal Options (mg/kg) for Open Residential Chemicals of Concern- Direct Contact (continued)

COC	Ingestion RGO				Dermal RGO				Inhalation RGO				Total Across All Pathways			
	HQ =		Risk =		HQ =		Risk =		HQ =		Risk =		HQ =		Risk =	
	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4	0.1	1.0	10-6	10-4
Benzo(k)fluoranthene	--	--	9.4E+02	9.4E+04	--	--	7.6E+00	7.6E+02	--	--	1.0E+06	1.0E+06	--	--	7.5E+00	7.5E+02
Dibenz(a,h)anthracene	--	--	9.4E+00	9.4E+02	--	--	7.6E-02	7.6E+00	--	--	1.0E+05	1.0E+06	--	--	7.5E-02	7.5E+00
Dieldrin	1.2E+02	1.2E+03	4.3E+00	4.3E+02	2.2E+00	2.2E+01	7.7E-02	7.7E+00	--	--	2.0E+04	1.0E+06	2.2E+00	2.2E+01	7.6E-02	7.6E+00
Indeno(1,2,3-cd)pyrene	--	--	9.4E+01	9.4E+03	--	--	7.6E-01	7.6E+01	--	--	1.0E+06	1.0E+06	--	--	7.5E-01	7.5E+01
PCB-1254	4.9E+01	4.9E+02	3.4E+01	3.4E+03	5.1E-01	5.1E+00	3.5E-01	3.5E+01	--	--	1.6E+05	1.0E+06	5.0E-01	5.0E+00	3.5E-01	3.5E+01
RDX	7.4E+03	7.4E+04	6.2E+02	6.2E+04	1.3E+02	1.3E+03	1.1E+01	1.1E+03	--	--	--	--	1.3E+02	1.3E+03	1.1E+01	1.1E+03

COC = chemical of concern.
-- not applicable - no toxicity data are available for this exposure pathway or toxic endpoint.

Table 6-27. Subsurface Soil Remedial Goal Options (mg/kg) for Open Residential Chemicals of Concern - Direct Contact

	Ingestion RGO				Dermal RGO				Inhalation RGO				Total Across All Pathways			
	HQ =		Risk =		HQ =		Risk =		HQ =		Risk =		HQ =		Risk =	
COC	**0.1**	**1.0**	**10-6**	**10-4**	**0.1**	**1.0**	**10-6**	**10-4**	**0.1**	**1.0**	**10-6**	**10-4**	**0.1**	**1.0**	**10-6**	**10-4**
National Guard/Managed Recreational - National Guard																
Antimony	1.1E+03	1.1E+04	--	--	5.5E+03	5.5E+04	--	--	--	--	--	--	9.1E+02	9.1E+03	--	--
2,4,6-Trinitrotoluene	1.4E+03	1.4E+04	2.6E+03	2.6E+05	4.6E+02	4.6E+03	8.6E+02	8.6E+04	--	--	--	--	3.4E+02	3.4E+03	6.4E+02	6.4E+04
RDX	8.2E+03	8.2E+04	7.0E+02	7.0E+04	2.8E+03	2.8E+04	2.3E+02	2.3E+04	--	--	--	--	2.1E+03	2.1E+04	1.8E+02	1.8E+04
Open Industrial - Industrial Worker																
Antimony	4.1E+01	4.1E+02	--	--	9.3E+02	9.3E+03	--	--	--	--	--	--	3.9E+01	3.9E+02	--	--
2,4,6-Trinitrotoluene	5.1E+01	5.1E+02	9.5E+01	9.5E+03	7.7E+01	7.7E+02	1.4E+02	1.4E+04	--	--	--	--	3.1E+01	3.1E+02	5.7E+01	5.7E+03
RDX	3.1E+02	3.1E+03	2.6E+01	2.6E+03	4.6E+02	4.6E+03	3.9E+01	3.9E+03	--	--	--	--	1.8E+02	1.8E+03	1.6E+01	1.6E+03
Open Residential - Resident Farmer (Adult)																
Antimony	2.9E+01	2.9E+02	--	--	1.9E+02	1.9E+03	--	--	--	--	--	--	2.5E+01	2.5E+02	--	--
2,4,6-Trinitrotoluene	3.7E+01	3.7E+02	5.7E+01	5.7E+03	1.6E+01	1.6E+02	2.5E+01	2.5E+03	--	--	--	--	1.1E+01	1.1E+02	1.7E+01	1.7E+03
RDX	2.2E+02	2.2E+03	1.5E+01	1.5E+03	9.6E+01	9.6E+02	6.8E+00	6.8E+02	--	--	--	--	6.7E+01	6.7E+02	4.7E+00	4.7E+02
Open Residential - Resident Farmer (Child)																
Antimony	3.1E+00	3.1E+01	--	--	2.1E+02	2.1E+03	--	--	--	--	--	--	3.1E+00	3.1E+01	--	--
2,4,6-Trinitrotoluene	3.9E+00	3.9E+01	3.0E+01	3.0E+03	1.8E+01	1.8E+02	1.4E+02	1.4E+04	--	--	--	--	3.2E+00	3.2E+01	2.5E+01	2.5E+03
RDX	2.3E+01	2.3E+02	8.3E+00	8.3E+02	1.1E+02	1.1E+03	3.8E+01	3.8E+03	--	--	--	--	1.9E+01	1.9E+02	6.8E+00	6.8E+02

COC = chemical of concern.
-- not applicable - no toxicity data are available for this exposure pathway or toxic endpoint.

could effect whether an analyte remains on or is removed from the COPC list for that aggregate (since the maximum detected concentration is used in the PRG screening process). Other summary statistics could be affected as well.

Representative exposure concentrations are calculated in this BHHRA based on the assumption that the samples collected from each EU are truly random samples. In fact, only the samples collected from the perimeter EU were collected randomly. Sample locations for all other EUs were biased to identify areas of highest contaminant concentrations. Seasonal variations in the data may also exist (especially with the groundwater and surface water data), which may not have been captured in the calculation of the EPCs.

In addition, in the evaluation of the various media, environmental concentrations are assumed to be constant (i.e., concentrations are not reduced by loss due to natural removal processes such as volatilization, leaching, and/or biodegradation). Since the source of contamination (i.e., production and demilitarization of munitions) no longer exists at LL 1, this assumption is a source of uncertainty.

Some unavoidable uncertainty is associated with the contaminant concentrations detected and reported by the analytical laboratory. The quality of the analytical data used in the risk assessment depends on the adequacy of the set of procedures that specify how samples are selected and handled and how strictly these procedures are followed. QA/QC procedures within the laboratories are used to minimize uncertainties; however, sampling errors, laboratory analysis errors, and data analysis errors can occur.

Some current analytical methods are limited in their ability to achieve detection limits at or below risk-based screening levels (i.e., PRG concentrations). Under these circumstances, it is uncertain whether the true concentration is above or below the PRGs, which are protective of human health. When analytes are on the SRC list and have a mixture of detected and non-detected concentrations, risk calculations may be affected by these detection limits. Risks may be overestimated as a result of some sample concentrations being reported as non-detected at the method detection limit, which may be greater than the PRG concentration (when the actual concentration may be much smaller than the method detection limit). Risks may also be underestimated because some analytes that are not detected in any sample are removed from the SRC list. If the concentrations of these analytes are below the minimum detectable level but are above the PRG, the risk from these analytes would not be included in the risk assessment results.

Common laboratory contaminants [e.g., bis(2-ethylhexyl)phthalate] appear on both the SRC list and the COPC list. In the data assessment process, elevated levels of these common laboratory contaminants can be evaluated to see if the detected concentrations are likely to be "false positives" (i.e., at high concentrations due to laboratory interference). This process involves a check against the concentrations detected in the associated laboratory method blank.

The selection of COPCs in this BHHRA relied primarily on analyte concentrations obtained as the result of field sampling of primary and secondary media assessed for the RI. The sources of SRCs are addressed in the selection of contaminants in exposure media for current environmental conditions. However, under future land use conditions, other contaminants not currently accounted for, particularly those that are either currently contained or that have slow transport velocities, may appear in secondary media at concentrations that could contribute to the calculated risk.

6.6.2 Uncertainties Associated with the Exposure Assessment

Uncertainty is also introduced through the data aggregation process of estimating representative exposure concentrations in the analyzed exposure media. Analytical results are used to calculate a mean concentration and the UCL95 on the mean concentration. The smaller of the maximum detected concentration and the

UCL95 concentration is used as the EPC for this BHHRA. This method may underestimate the EPC for small data sets from areas with a high degree of variability in contaminant concentrations.

As described previously, some uncertainty is associated with the contaminant concentrations detected and reported by the analytical laboratory. The quality of the analytical data used in the risk assessment depends on the adequacy of the set of procedures that specify how samples are to be selected and handled and how strictly these procedures are followed. QA/QC procedures are used to minimize uncertainties; however, sampling errors, laboratory analysis errors, and data analysis errors can and do occur. Moreover, some current analytical methods are limited in their ability to achieve detection limits appropriate for use in risk assessment. Therefore, risks may be overestimated as a result of analyte concentrations being reported at the method detection limit, which may be greater than the concentration at which adverse health effects could occur. Additional uncertainties are introduced by detection limits that differ among the various data sets; these uncertainties are especially noticeable in the historical (i.e., Phase I) data sets. In addition, risks may be underestimated if chemical concentrations are above risk criteria but below detection limits and reported as non-detects.

At best, quantification of exposure provides an estimate of the chemical intake for various exposure pathways identified at the site. Several uncertainties associated with the various components of the exposure assessment include uncertainties about the exposure pathway equations, exposure parameters, land use scenarios, representative exposure concentrations, and sampling and analysis of the media.

For each primary exposure pathway chosen for analysis in this BHHRA, assumptions are made concerning the exposure parameters (e.g., amount of contaminated media a receptor can be exposed to and intake rates for different routes of exposure) and the routes of exposure. In the absence of site-specific data, the assumptions used are consistent with EPA-approved default values, which are assumed to be representative of potentially exposed populations (EPA 1989a, 1989b, 1991a, 1991a, 1992, 1996). All contaminant exposures are assumed to be from site-related exposure media (i.e., no other sources contribute to the receptor's health risk).

Moderate uncertainty can be introduced in the data aggregation process for estimating a representative exposure concentration in the exposure media. A statistical test (the Shapiro-Wilk test) is performed to determine whether the concentration data is best described by a normal or lognormal distribution. Each COPCs mean and UCL95 on the mean concentrations are calculated using both detected values and one-half of the reported detection limit for samples without a detected concentration. The EPC is the smaller of the maximum detected concentration or the calculated UCL95. This method may moderately overestimate the exposure concentration. In addition, when the resulting individual contaminant risks are summed to provide a total ILCR or HI, the compounding conservativism of this method for estimating EPCs will likely result in an overestimate of the total risk.

Note that for the dermal contact with soil pathway, no exposure time is included in the equation. This is based on the assumption that the receptor may not bathe (i.e., remove the soil in contact with the skin surface) for 24 h following the initial exposure; therefore, the receptor is actually exposed to soil contaminants for 24-h per day. This may overestimate the risk associated with dermal contact with soil. This fact is especially important when the dermal pathway is the major contributor to the risks and/or hazards.

Most exposure parameters have been selected so that errors occur on the side of conservativism. When several of these upper-bound values are combined in estimating exposure for any one pathway, the resulting risks can be in excess of the 99th percentile and therefore outside of the range that may be reasonably expected. Therefore, the consistent conservativism employed in the estimation of these parameters generally leads to overestimation of the potential risks.

Uncertainties associated with the ingestion of foods (e.g., venison, beef, milk, vegetables) include assumptions made regarding frequency of exposure and quantity consumed, as well as added uncertainties in the bio-uptake factors used in these exposure models.

6.6.3 Uncertainties Associated with Toxicity Information

The methodology used to develop a noncarcinogenic toxicity value (RfD or RfC) involves identifying a threshold level below which adverse health effects are not expected to occur. The RfD and RfC values are generally based on studies of the most sensitive animal species tested (unless adequate human data are available) and the most sensitive endpoint measured. Uncertainties exist in the experimental data set for such animal studies. These studies are used to derive the experimental exposure representing the highest dose level tested at which no adverse effects are demonstrated [i.e., the no-observed-adverse-effect level (NOAEL)]; in some cases, however, only a lowest-observed-adverse-effect level (LOAEL) is available. The RfD and/or RfC is derived from the NOAEL (or LOAEL) for the critical toxic effect by dividing the NOAEL (or LOAEL) by uncertainty factors. These factors usually are in multipliers of 10, with each factor representing a specific area of uncertainty in the extrapolation of the data. For example, an uncertainty factor of 100 is typically used when extrapolating animal studies to humans. Additional uncertainty factors are sometimes necessary when other experimental data limitations are found. Because of the large uncertainties (10 – 10,000) associated with some RfD or RfC toxicity values, exact safe levels of exposure for humans are not known. For noncarcinogenic effects, the amount of human variability in physical characteristics is important in determining the risks that can be expected at low exposures and in determining the NOAEL (EPA 1989a).

The carcinogenic potential of a chemical can be increased through a two-part evaluation involving (1) a weight-of-evidence assessment to determine the likelihood that a chemical is a human carcinogen and (2) a slope factor assessment to determine the quantitative dose-response relationship. Uncertainties occur with both assessments. Chemicals fall into one of five groups on the basis of weight-of-evidence studies of humans and laboratory animals (EPA 1989a, 1996, 1997, 2001): (1) Group A – known human carcinogen; (2) Group B – probable human carcinogen based on limited human data or sufficient evidence in animals, but inadequate or no evidence in humans; (3) Group C – possible human carcinogens; (4) Group D – not classified as to human carcinogenicity; and (5) Group E – evidence of no carcinogenic effects in humans.

The CSF for a chemical is a plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime. It is used to estimate an upper-bound lifetime probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen. The slope factor is derived by applying a mathematical model to extrapolate from a relatively high administered dose to animals to the lower exposure levels expected for humans. The slope factor represents the UCL95 on the linear component of the slope (generally the low-dose region) of the tumorigenic dose-response curve. A number of low-dose extrapolation models have been developed, and IPA generally uses the linearized multistage model in the absence of adequate information to support other models; the linear equation is valid only at risk levels below 1E-02. For sites with very high chemical concentrations and risks above 1.0E-02, an alternative calculation is performed using the "one-hit" equation (EPA 1989a):

$$ILCR = 1 - \exp(-Intake \times CSF)$$

For several analytes, no toxicity information for either the noncarcinogenic or carcinogenic health effects to humans is available in EPA's IRIS (EPA 2001) or HEAST (EPA 1997). The carcinogenic potential has not been evaluated for some chemicals lacking EPA-approved toxicity values. In addition, some analytes have been assigned a weight-of-evidence classification for carcinogenicity (EPA 1989) but have not been

assigned a slope factor. Therefore, until and unless additional toxicity information allows the derivation of toxicity factors, potential risk from certain analytes cannot be quantified.

The uncertainty associated with the toxicity factors for noncarcinogens is measured by the uncertainty factor, the modifying factor, and the confidence level. The toxicological data (CSFs and RfDs) for dose response relationships of chemicals are frequently updated and revised, which can lead to overestimation or underestimation of risks. These values are often extrapolations from animals to humans, and this can also causes uncertainties in toxicity values because differences can exist in chemical absorption, metabolism, excretion, and toxic response between animals and humans.

EPA considers differences in body weight, surface area, and pharmacokinetic relationships between animals and humans to minimize the potential to underestimate the dose-response relationship; as a result, more conservativism is usually incorporated into these steps. In particular, toxicity factors that have high uncertainties may change as new information is evaluated. Therefore, a number of the COCs—particularly those with high uncertainties—may be subject to change. Finally, the toxicity of a contaminant may vary significantly with the chemical form present in the exposure medium. For example, risks from metals may be overestimated because they are conservatively assumed to be in their most toxic forms.

Uncertainties are associated with the GAF values used to modify the oral toxicity values to evaluate dermal toxicity. Similar uncertainties are associated with the toxicity equivalency factor values used to estimate risks from exposure to PAHs. Many potential uncertainties are associated with the toxicity data used in this BHHRA and can affect the risk, hazard, and COC determinations.

In the absence of EPA-approved toxicity values for arsenic and benzo(a)pyrene, withdrawn or provisional values have been used in the risk characterization for these COPCs. The toxicity values for these two chemicals have larger uncertainties than other approved values. If these COPCs are identified as COCs in this BHHRA, caution should be used, and a closer look at the withdrawn/provisional value(s) is appropriate when making remediation decisions for these COCs.

6.6.4 Uncertainties and Assumptions in the Risk Characterization

Risk assessment as a scientific activity is subject to uncertainty. This is true even though the methodology used in this BHHRA follows EPA guidelines. As noted previously, the risk evaluation in this report is subject to uncertainty pertaining to sampling and analysis, selection of COPCs, exposure estimates, and availability and quality of toxicity data.

The presence of naturally occurring metals in all media contributes to the uncertainty in evaluating site-related risks. Metals that are clearly present only due to background are eliminated in the SRC screening process. Metals retained as SRCs may have both a background component and/or a site-related component.

The potential impact of background concentrations of metals on risks estimated for groundwater and soil is discussed in detail below. Background concentrations of metals do not appear to have a noteworthy impact on surface water or sediment risks.

Arsenic is identified as a COC in groundwater for both the National Guard and the On-Site Resident Fanner (adult and child) scenarios for wells in the LL 1 building area with risks of 3E-05 (National Guard) and

1E-04 (On-Site Resident Farmer Adult and Child) and an HI of 2.5 (On-Site Resident Farmer Child). Arsenic is naturally present in groundwater in the Ravenna area with reported background concentrations as follows:

Aquifer	Background Criterion[a] (µg/L)
Unconsolidated (filtered)	11.7
Unconsolidated (unfiltered)	215
Bedrock(filtered)	NA
Bedrock (unfiltered)	19.1

[a]Background criterion is UCL_{95} on mean.
NA = not available.

The estimated risks from exposure of these receptors to background concentrations of arsenic in groundwater are 4E-05 (filtered) and 7E-05 to 8E-04 (unfiltered) for the National Guard scenario and 2E-04 (filtered) and 3E-04 to 4E-03 (unfiltered) for the On-Site Resident Farmer scenario. The estimated HIs from exposure of the On-Site Resident Farmer Child to background concentrations of arsenic are 4 (filtered) and 6 to 69 (unfiltered). The background risk and hazard for arsenic are similar to the estimated site-related risks and hazards.

Manganese is identified as a COC in groundwater for the On-Site Resident Farmer scenario for wells in the LL 1, building area with an HQ of 2 for the adult and 7 for the child. Manganese is naturally present in groundwater in the Ravenna area. The estimated HQs for an On-site Resident Farmer Adult exposed to the background concentrations of manganese in groundwater (1,020 to 2,868 µg/L for filtered and unfiltered samples, respectively) are 1 to 2. The estimated HQs for an On-Site Resident Farmer Child exposed to the background concentrations of manganese in groundwater are 2 to 6. The background hazards for manganese are similar to the estimated site-related hazards for this metal.

Manganese is identified as a COC for direct contact with surface soil for the National Guard scenario at Buildings CB-3 and CB-801; Buildings CB-4/4A and CA-6/6A; Buildings CB-13 and CB-10; Buildings CB-14, CB-17, and CA-15; Change Houses (CB-12, CB-23, CB-8, and CB-22); and the Perimeter Area with H,Qs of 3 to 6. Manganese is naturally present in soils in the Ravenna area. The estimated HQ for a National Guard receptor exposed to the background concentration of manganese in soil (1,450 mg/kg) is 6. The HI related to manganese at the LL 1 EPCs did not exceed that estimated for facility-wide background.

Arsenic is identified as a COC in soil, for the National Guard, Security Guard/Maintenance Worker, Industrial Worker, and On-Site Resident Farmer (adult and child) scenarios at Buildings CB-3 and CB-801; Buildings CB-4/4A and CA-6/6A; Buildings CB-13 and CB-10; Buildings CB-14, CB-17, and CA-15; Change Houses (CB-12, CB-23, CB-8, and CB-22); and the Perimeter Area. Arsenic is also naturally present in soils in the Ravenna area. The estimated risks from exposure of these receptors to the background concentration of arsenic (15.4 mg/kg) are

- National Guard 9E-06,
- Security Guard/Maintenance Worker 6E-06,
- Industrial Worker 1E-05,
- On-Site Resident Farmer (Adult) 2E-05, and
- On-Site Resident Farmer (Child) 3E-05.

Estimated risks to these receptors from arsenic in soil at Buildings CB-3 and CB-801; Buildings CB-4/4A and CA-6/6A; Buildings CB-13 and CB-10; Change Houses (CB-12, CB-23, CB-8, and CB-22); and the Perimeter Area are below the risks associated with the background concentration of this metal. Estimated risks to these receptors from arsenic at Buildings CB-14, CB-17, and CA-15 are also similar to the risks estimated for background [i.e., National Guard site risk = 1E-05, Security Guard/Maintenance Worker

site risk = 9E-06, Industrial Worker site risk = 1E-05, and On-Site Resident Farm. er site risk = 3E-05 (adult) and 4E-05 (child)].

Arsenic and manganese are identified as COCs in soil for ingestion of foodstuffs for the On-Site Resident Farmer scenarios at Buildings CB-3 and CB-801; Buildings CB-4/4A and CA-6/6A; Buildings CB-13 and CB-10; Buildings CB-14, CB-17, and CA-15; Change Houses (CB-12, CB-23, CB-8, and CB-22); and the Perimeter Area. Estimated HQs for ingestion of arsenic in foodstuffs range from 11 to 14 (adult) and 54 to 63 (child) at six of these EUs with HQs of 23 (adult) and 105 (child) at Buildings CB-14, CB-17, and CA-15. Estimated risks for ingestion of arsenic in foodstuffs range from 2E-03 to 4E-03 for both adult and child. Estimated HQs for ingestion of manganese in foodstuffs range from 2 to 4 (adult) and 9 to 18 (child). These metals are naturally present in soils in the Ravenna area. The estimated hazard and risk from exposure of these receptors to arsenic via ingestion of foodstuffs to the background concentration of arsenic in soil (15.4 mg/kg) are 16 and 76 (adult and child HQs) and 3E-03 (both adult and child ILCR). The estimated HQs for the adult and child On-Site Resident Farmer receptors exposed to the background concentration of manganese (1,450 mg/kg) via ingestion of foodstuffs are 4 and 18.

Vanadium is identified as a COC in soil for ingestion of foodstuffs for the On-Site Resident Farmer at Buildings CB-4/4A and CA-6/6A (child HQ = 4), and CB-14, CB-17, and CA-15 (adult HQ = 2, child HQ = 7). Vanadium is naturally present in soils in the Ravenna area. The estimated HQs for the On-Site Resident Farmer receptors exposed to the background concentration of vanadium (31.1 mg/kg) are 1 (adult) and 6 (child).

Nickel is identified as a COC in soil for ingestion of foodstuffs for the On-Site Resident Farmer scenario at Buildings CB-14, CB-17, and CA-15 with HQs of 1 (adult) and 7 (child). Nickel is also naturally present in soils in the Ravenna area. The estimated HQs for On-Site Resident Farmer receptors exposed to the background concentration of nickel (21.1 mg/kg) are 1 (adult) and 7 (child).

Antimony is identified as a COC in soil for ingestion of foodstuffs for the On-Site Resident Farmer scenario at Buildings CB-3 and CB-801 (adult HQ = 85, child HQ = 396), CB-13 and CB-10 (child HQ = 5), and Change Houses (adult HQ = 2, child HQ = 8). Antimony is naturally present in soils in the Ravenna area. The estimated HQs for On-Site Resident Farmer receptors exposed to the background concentration of antimony (0.96 mg/kg) are 1 (adult) and 3 (child).

Barium is identified as a COC in soil for ingestion of foodstuffs for the On-Site Resident Farmer child scenario at Buildings CB-4-4A and CA-6-6A (HQ = 3) and Buildings CB-14, CB-17, and CA-15 (HQ = 3). Barium is naturally present in soils in the Ravenna area. The estimated HQ for the On-Site Resident Farmer child exposed to the background concentration of barium (88.4 mg/kg) is 2.

Some organic chemicals are ubiquitous in the environment due to human activities. PAHs may be present in environmental media as a result of engine exhaust, burning of fossil fuels and wood, and petroleum products (e.g., asphalt). For this reason, an exemption is sometimes given for PAHs because they may not meet the definition of a release under CERCLA. This is especially true if PAHs are identified adjacent to roads. No attempt was made in this assessment to identify the source of the PAHs detected at LL 1.

Uncertainties related to the summation of HQs and ILCRs across chemicals and pathways are a primary uncertainty in the risk characterization. In the absence of information on the toxicity of specific chemical mixtures, it is assumed that ILCRs and HQs are additive (i.e., cumulative) (EPA 1989a). The limitations of this approach for noncarcinogens are (1) the effects of a mixture of chemicals are generally unknown; it is possible that the interactions could be synergistic, antagonistic, or additive; (2) the RfDs have different accuracy and precision and are not based on the same severity or effect; and (3) HQ or intake summation is most properly applied to compounds that induce the same effects by the same mechanism.

Therefore, the potential for occurrence of noncarcinogenic effects can be overestimated for chemicals that act by different mechanisms and on different target organs.

Limitations of the additive risk approach for multiple carcinogens are (1) the chemical-specific slope factors represent the upper 95th percentile estimate of potency; therefore, summing individual risks can result in an excessively conservative estimate of total lifetime cancer risk; and (2) the target organs of multiple carcinogens may be different, so the risks would not be additive. In the absence of data, additivity for ILCRs and HQs is assumed for this BHHRA. However, because total risks and HIs are usually driven by a few chemicals, segregation of risks and HIs by target organ would most likely not have resulted in significantly different outcomes.

Additional uncertainty can be associated with the method of selection of COCs. For this BHHRA, COCs are selected for a given medium/land use scenario as chemicals with individual ILCRs ≥ 1.0E-06 and/or individual HQs ≥ 1.0 for any medium/land use scenario.

Potential risks and hazards are not determined for the 10 COPCs (2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, 2-methylnaphthalene, benzo(ghi)perylene, nitrocellulose, nitroglycerin, phenanthrene, aluminoum, cobalt, and copper) that could not be evaluated quantitatively due to the lack of toxicity information and/or values. This results in uncertainty that could underestimate the total risk/hazard to human health.

6.7 SUMMARY AND CONCLUSIONS

This BHHRA was conducted to evaluate risks and hazards associated with contaminated media at the RVAAP LL 1 AOC for a number of potential future land use scenarios including National Guard use, open industrial, open recreational, and open residential. Results have been presented for all scenarios and exposure pathways. The size of the AOC and the quantity of data available require several layers of screening and analysis to focus on the significant contaminants, affected areas, and exposure pathways. The following screenings of data sets and risk characterization results were used to generate conclusions regarding human health risks and hazards associated with contaminated media at LL 1.

- background comparison,
- risk-based (PRG) screening,
- identification of COPCs,
- identification of COCs, and
- determination of most likely receptors.

Risks and hazards are evaluated for a number of exposure scenarios, for both current and future land use/receptors. Although it is possible for any of these scenarios to occur in the future, some are more likely than others based on the site setting and future plans. The most likely future receptors are the National Guardsmen as well as the Hunter/Trapper, Security Guard/Maintenance Worker, and Industrial Worker. The Child Trespasser is also considered a potential receptor. The Open Residential scenario was evaluated as an upper-bound (i.e., worst-case) scenario for this BHHRA.

6.7.1 Groundwater

Risks and hazards were estimated for the National Guard and On-Site Residential Farmer scenarios for potable use of groundwater. Groundwater results are summarized in Table 6-6 and below. These are hypothetical future scenarios; no receptors are currently using groundwater from the AOC for any

purpose. Risks and hazards estimated for monitoring wells north and south of Criggy's Pond are below levels of concern (i.e., no HI > 1 or risk $>10^{-6}$) for both receptors.

A total HI of 1 was estimated for monitoring wells in the LL 1 building area for the National Guard. This HI is associated primarily with natural background levels of manganese. The total risk for this receptor (5E-05) falls within the range of from 10^{-6} to 10^{-4}.

The estimated HI (4 adult, 14 child) and total risk (2E-04 adult and child) exceed the target ranges for the On-Site Resident Farmer scenario. The primary contributor to the total hazard is manganese, which is naturally present in groundwater. The exposure point concentration for manganese is 3047 µg/L, the background criterion for this metal is 1340 µ/L. The primary contributor to risk for both the National Guard and On-Site Resident Farmer scenarios are explosives; 4,4'-DDE and chloroform. Arsenic also contributes significantly to the total risk to these receptors, but is naturally present in groundwater. The background criteria for arsenic range from 19.1 to 215 µg/L for unfiltered samples from the bedrock and unconsolidated aquifers, and 11.7 µg/L for filtered samples from the unconsolidated aquifer. No background criterion is available for filtered samples from the bedrock aquifer. The exposure point concentration of arsenic in groundwater for the LL 1 building area is 7.8 µg/L. The residential RGOs calculated for arsenic (Table 6-23) are below the detection limits, the Ohio MCL of 50 µg/L, and the federal MCL of 10 µg/L (currently under review).

6.7.2 Surface Water and Sediment

Exposure to surface water and sediment was evaluated for six receptor scenarios: Child Trespasser, Hunter/Trapper, National Guard, Recreator, and On-Site Resident Farmer (adult and child). The Hunter/Trapper and On-Site Resident Farmer are assumed to ingest fish from the affected EUs in addition to direct contact with surface water and sediment. Surface water results are summarized in Tables 6-8 (direct contact) and 6-10 (fish ingestion) and below. Sediment results are summarized in Table 6-12 and below.

No hazards >1 or risks $>10^{-4}$ were identified for the Child Trespasser, National Guard, or Recreator, exposed to surface water or sediment at Outlet C and Charlie's Pond,; Outlets A and B, Off-AOC; or Outlets D, E, and F and Criggy's Pond.

No hazards >1 or risks $>10^{-4}$ were identified for the Hunter/Trapper directly exposed to surface water or sediment in these EUs. Ingestion of fish from Off-AOC results a risk of 2E-04. This risk is associated primarily with the common laboratory contaminant bis(2-ethylhexyl)phthalate. Hazards >1 and risks $>10^{-4}$ were identified for the On-Site Resident Farmer exposed to surface water at Outlet C and Charlie's Pond, Outlets D, E, and F and Criggy's Pond, and off-AOC; fish at Off-AOC; and to sediment at Outlet C and Charlie's Pond, Off-AOC, and Outlets D, E, and F and Criggy's Pond. Risks and hazards from surface water and fish were associated primarily with arsenic, manganese, and bis(2-ethylhexyl)phthalate. The sediment hazard/risk is associated primarily with antimony and benzo(a)pyrene. Exposure of the On-Site Resident Farmer to lead in sediment at Outlets D, E, and F and Criggy's Pond could result in a 29% probability for fetal blood lead concentrations to exceed acceptable levels and 66% probability of exceeding target blood lead levels in children.

No hazards >1 or risks $>10^{-4}$ were identified for the On-Site Resident Farmer for Outlet A channel. However, modeling indicates that exposure to lead in sediment at Outlets A and B could result in a 25% probability for fetal blood lead concentrations to exceed acceptable levels and 19% probability of exceeding target blood lead levels in children.

6.7.3 Soil

Potential human health risks/hazards were evaluated for exposure to COPCs in soil at seven EUs. Direct contact (ingestion, dermal contact, inhalation) with surface and subsurface soils was evaluated for eight receptors: Child Trespasser, Hunter/Trapper, National Guard, Security Guard/Maintenance Worker, Recreator, Industrial Worker, and On-Site Resident Farmer. Direct exposure results are summarized in Tables 6-14 (surface soil) and 6-18 (subsurface soil). In addition to these direct exposure pathways, indirect exposure via ingestion of venison by the Hunter/Trapper and ingestion of venison, beef, milk, and vegetables by the On-Site Resident Farmer was evaluated (Table 6-16).

With the exception of thallium in food, no hazards >1, risks $>10^{-4}$, or COCs were identified for exposure to soil (via direct or indirect exposure pathways) by any of the eight receptors at the Water Tower or Perimeter Area EUs. Modeling indicates that exposure to lead in surface soil at the Water Tower could result in a greater than 10% probability of exceeding acceptable fetal blood lead levels for the Hunter/Trapper (<12%), National Guard (<31%), Security Guard/Maintenance Worker (<46%), Industrial Worker (<46%), and On-Site Resident Farmer (<65%) and 93% probability of exceeding target blood lead levels in children.

No hazards >1 or risks $>10^{-4}$ were identified for direct exposure to soil by any of the seven receptor scenarios at the Change Houses. At Buildings CB-14, CB-17, and CA-15 and Buildings CB-13 and CB-10, no hazards >1 or risks $>10^{-4}$ were identified for six of the eight receptors (all but the On-Site Resident Farmer); however, PAHs, PCB-1254, and RDX were identified as COCs with risks between 10^{-6} and 10^{-4} for these EUs. Hazards >1 and risks $>10^{-4}$ were identified for both direct and indirect exposures to COPCs in surface soil by the On-Site Resident Farmer at Buildings CB-14, CB-17, and CA-15 and Buildings CB-13 and CB-10. COCs with risks between 10^{-6} and 10^{-4} for this receptor include PAHs, PCB-1254, and explosives. The only COC with a risk $>10^{-4}$ and hazard >1 for direct contact is PCB-1254. Ingestion of foodstuffs results in COCs with risk $>10^{-4}$ that include PAHs, PCB-1254, and explosives.

No hazards >1 or risks $>10^{-4}$ were identified for the Child Trespasser, Hunter/Trapper, or Recreator at Buildings CB-3 and CB-801; however, PAHs and PCB-1254 were identified as COCs with risks between 10^{-6} and 10^{-4} for these receptors. The estimated total cancer risk for the National Guard and Industrial Worker scenarios is 1E-04 at this EU, with PAHs and PCB-1254 identified as COCs with risks between 10^{-6} and 10^{-4}. Estimated risks to the Security Guard/Maintenance Worker and On-Site Resident Farmer are $>10^{-4}$. COCs with risks between 10^{-6} and 10^{-4} include PAHs, PCB-1254, and explosives (On-Site Resident Farmer only). Benzo(a)pyrene and PCB-1254 (On-Site Resident Farmer only) are the only COCs with a risk $>10^{-4}$ for direct contact with surface soil by these receptors. COCs with risks $>10^{-4}$ for ingestion of foodstuffs by the On-Site Resident Farmer include PAHs and PCB-1254. Exposure to lead in surface soil by the On-Site Resident Farmer at Buildings CB-3 and CB-801 could result in a $\leq$11% probability for fetal blood lead concentrations to exceed acceptable levels and 27% probability of exceeding target blood lead levels in children.

Hazards >1 and risks > 10^{-4} were identified for all receptors for direct exposure to surface soil at Buildings CB-4/4A and CA-6/6A. COCs with risks between 10^{-6} and 10^{-4} include PAHs, explosives, and dieldrin. The estimated hazard is >1 and risk is $>10^{-4}$ for direct contact PCB-1254 in surface soil for all eight receptors. Hazards >1 were also identified for direct contact with surface and/or subsurface soil for the National Guard, Industrial Worker, and On-Site Resident Farmer, primarily due to 2,4,6-trinitrotoluene. RDX was identified as a COC with a risk between 10^{-6} and 10^{-4} for the Industrial Worker and On-Site Resident Farmer. Hazards >1 and risks $>10^{-4}$ were also identified for ingestion of foodstuffs by the On-Site Resident Farmer. PAHs, explosives, PCB-1254, and dieldrin are COCs with hazards >1 and/or risks $>10^{-4}$ for this scenario.

6.8 TOXICITY PROFILES

6.8.1 Inorganics

Aluminum. Aluminum is a silvery, ductile metal with industrial hazards associated with its reactivity. Aluminum dust is moderately flammable/explosive by heat, flame, or chemical reaction with powerful oxidizers (Lewis 1991).

The following toxicity summary for aluminum is taken from Biomedical and Environmental Information Analysis System (BEIAS) 1995.

Aluminum is poorly absorbed and efficiently eliminated; however, when absorption does occur, aluminum is distributed mainly in bone, liver, testes, kidneys, and brain. Aluminum may be involved in Alzheimer's disease (dialysis dementia) and in Amyotrophic Lateral Sclerosis and Parkinsonism-Dementia Syndromes of Guam (Guam ALS-PD complex). Aluminum content of brain, muscle, and bone increases in Alzheimer's patients. Neurofibrillary tangles are found in patients suffering from aluminum encephalopathy and Alzheimer's disease. Symptoms of "dialysisdementia" include speech disorders, dementia, convulsions, and myoclonus. People of Guam and Rota have an unusually high incidence of neurodegenerative diseases. The volcanic soil in the region of Guam where the high incidence of ALS-PD occurs contains high levels of aluminum and manganese. Neurological effects have also been observed in rats orally exposed to aluminum compounds.

The respiratory system appears to be the primary target following inhalation exposure to aluminum. Alveolar preteinosis has been observed in guinea pigs, rats, and hamsters exposed to aluminum powders. Rats and guinea pigs exposed to aluminum chlorohydrate exhibited an increase in alveolar macrophages, increased relative lung weight, and multifocal granulomatous pneumonia.

No decrease in reproductive capacity, hormonal abnormalities, or testicular histopathology was observed in male rats exposed to aluminum in drinking water for 90 days. However, male rats exposed to aluminum (as aluminum chloride) via gavage for 6 months exhibited decreased spermatozoa counts and sperm motility and testicular histological and histochemical changes.

Subchronic and chronic reference doses and reference concentrations have not been derived for aluminum.

Male rats exposed to drinking water containing aluminum (as aluminum potassium sulfate) for a lifetime exhibited increases in unspecified malignant and nonmalignant tumors, and similarly exposed female mice exhibited an increased incidence of leukemia (Schroeder and Mitchener 1975a). Rats and guinea pigs exposed via inhalation to aluminum chlorohydrate developed lung granulomas, while granulomatous foci developed in similarly exposed male hamsters.

The EPA is currently reviewing aluminum for potential human health hazards. There is no weight-of-evidence carcinogenic classification currently assigned.

Antimony. Antimony is a naturally occurring metalloid element that displays both metallic and nonmetallic properties and exists in valence states of (III) and (V). Metallic antimony and a few trivalent antimony compounds are the most significant forms in terms of exposure potential and toxicity. Antimony is used in metallurgical processes, paints and enamels, various textiles, rubber, and fire retardation (antimony trioxide). A common urban air pollutant, antimony can be inhaled, and it can also be ingested in contaminated food (BEIAS 1995).

The primary target organ for acute oral exposure to antimony appears to be the gastrointestinal tract (irritation, diarrhea, vomiting), and targets for long-term exposure are blood (hematological disorders) and the liver (mild hepatotoxicity). Inhalation exposure to antimony affects the respiratory tract (pneumoconiosis, restrictive airway disorders), with secondary targets being the cardiovascular system (altered blood pressure and electrocardiograms) and kidneys (histological changes). Only limited evidence exists for reproductive disorders resulting from antimony exposure (BEIAS 1995).

EPA has calculated subchronic and chronic oral RfDs of 4E-4 mg/kg-d on the basis of decreased longevity and alteration of blood chemistry in rats that have been chronically exposed to potassium antimony tartrate in drinking water. Although some data indicate that long-term exposure of rats to antimony trioxide and trisulfide increased the incidence of lung tumors, EPA has not evaluated antimony or antimonials for carcinogenicity, and no weight-of-evidence classification is available (BEIAS 1995).

Arsenic. Arsenic is a metallic, steel-gray, crystalline, brittle, trivalent and pentavalent, solid, poisonous element that is commonly used in pesticides (BEIAS 1995).

Water-soluble inorganic arsenic compounds are absorbed through the gastrointestinal tract and lungs. Symptoms of acute inorganic arsenic poisoning in humans are nausea, anorexia, vomiting, epigastric and abdominal pain, and diarrhea. In addition, dermatitis, muscle cramps, cardiac abnormalities, hepatoxicity, bone marrow suppression and hematologic abnormalities, vascular lesions, and peripheral neuropathy have also been reported. Severe exposures can result in acute encephalopathy, congestive heart failure, stupor, convulsions, paralysis, coma, and death. Possible reproductive effects include a high frequency of spontaneous abortions and reduced birth weights. Occupational exposure studies show a clear correlation between exposure to arsenic and lung cancer mortality (BEIAS 1995).

The RfD for chronic and subchronic oral exposures (0.0003 mg/kg-d) is based on an NOAEL of 0.0008 mg/kg-d and an LOAEL of 0.014 mg/kg-d for hyperpigmentation, keratosis, and possible vascular complications in a human population consuming arsenic-contaminated drinking water. No subchronic and chronic RfCs have been derived for arsenic.

Studies indicate an increased lung cancer mortality observed in multiple human populations exposed primarily through inhalation. Also, increased mortality from multiple internal organ cancers (liver, kidney, lung, and bladder) and an increased incidence of skin cancer were observed in populations consuming drinking water high in inorganic arsenic (EPA 2001). EPA has placed inorganic arsenic in weight-of-evidence classification Group A, human carcinogen (BEIAS 1995).

Barium. Barium is a divalent alkaline-earth metal found only in combination with other elements in nature; the most important of these combinations are with peroxide, chloride, sulfate, carbonate, nitrate, and chlorate. The most likely source of barium in the atmosphere is industrial emissions. Because of the tendency of barium to form salts with limited solubility in soil and water, it is expected to have a residence time of hundreds of years and is not expected to be very mobile. Acidic conditions, however, will increase the solubility of some barium compounds, facilitating their movement from the soil to groundwater. Trace amounts of barium were found in >99% of the surface water and finished drinking water samples, with average values of 43 and 28.6 μg/L, respectively, across the United States (BEIAS 1995).

The soluble salts of barium are toxic to mammalian systems. They are absorbed rapidly from the gastrointestinal tract; deposited in the muscles, lungs, and bone; and excreted primarily in the feces. Low doses of barium act as a muscle stimulant, while higher doses affect the nervous system, eventually leading to paralysis. Acute and subchronic oral doses of barium cause vomiting and diarrhea, followed by decreased heart rate and elevated blood pressure. Higher doses result in cardiac irregularities, weakness,

tremors, anxiety, and depression. Acute doses of about 0.8 g can cause death in humans from cardiac and respiratory failure (BEIAS 1995).

EPA has calculated a chronic and subchronic oral RfD of 0.07 mg/kg-d based on an NOAEL of 0.21 mg/kg-d in humans. EPA calculated an inhalation RfC of 0.005 mg/m^3 for subchronic and 0.0005 mg/m^3 for chronic exposure on the basis of the NOAEL for developmental effects in humans. Barium has not been evaluated for evidence of human carcinogenic potential (BEIAS 1995).

Cadmium. Cadmium is a naturally occurring element found worldwide in soils and rocks. The primary sources of environmental cadmium contamination are smelters and the burning of fossil fuels in power plants.

Cadmium is absorbed more efficiently through the lungs than by the gastrointestinal tract. Acute oral exposures to cadmium can cause vomiting, diarrhea, and abdominal pain, while longer-term oral exposure to cadmium affects the kidneys and possibly the skeletal system (Young 1991). Inhalation exposure to cadmium may cause headache, chest pains, muscular weakness, pulmonary edema, and death (Young 1991), while longer-term inhalation exposure also results in kidney damage (ATSDR 1989a; EPA 1980a, 1984a).

Limited evidence shows possible adverse spermatogenic effects of cadmium in occupationally exposed workers (Barlow and Sullivan 1982). The results of genotoxicity and mutagenicity tests with cadmium are inconclusive. Some assays show positive results (certain mammalian cell culture assay systems), while other assays report negative findings (mouse bone marrow and mouse micronucleus assays) (ATSDR 1989a).

The IARC has found limited evidence indicating that cadmium and cadmium-containing compounds are carcinogenic in humans (IARC 1982). This determination was based on occupational epidemiology studies that have shown an increased risk of lung cancer in workers exposed to cadmium via inhalation. EPA has placed cadmium in weight-of-evidence Class B1, probable human carcinogen.

Chromium. Chromium is a metal that occurs in nature primarily as the mineral chromite. Although chromium exists in several valence states, the trivalent (III) and hexavalent (VI) valence states are the only two of any biological significance (Amdur, Doull, and Klassan 1991). Trivalent chromium is considered an essential element in man and animals.

Acute animal studies indicate that chromium (III) compounds are consistently less toxic than chromium (VI) (Friberg, Nordberg, and Vouk 1986), but neither oxidation state is very toxic by the oral route (Daugherty 1992). No adverse effects were observed in long-term drinking water studies in rats.

Chromium compounds (and particularly hexavalent compounds) are very strong skin irritants and sensitizers in humans, producing dermatitis, dermatosis, eczema, erythema, and skin ulceration. Exposure to chromium has caused respiratory effects such as nasal irritation, nasal ulcers, nasal perforation, asthmatic attacks, pneumoconiosis, bronchitis, and chronic lung congestion in humans under various occupational conditions (Daugherty 1992). Both hexavalent and trivalent chromium compounds are known to be nephrotoxic, with some reports indicating that they may also be hepatotoxic and neurotoxic (EPA 1984b).

Chromium compounds, both trivalent and hexavalent, have induced developmental effects in hamsters and mice (but only at maternally toxic doses) and testicular effects in rabbits after intraperitoneal, intravenous, or subcutaneous injections (EPA 1984b). Bacterial test systems have consistently demonstrated that chromium (VI) compounds are directly mutagenic while chromium (III) compounds are not (EPA 1984b). An increased frequency of chromosome aberrations in lymphocytes from workers exposed to chromates during production of such compounds has been reported (EPA 1984b), and several occupational epidemiology studies have shown that occupational exposure to chromium is associated with an increase in lung cancer deaths for workers. Evidence also suggests an increased risk of developing

nasal, pharyngeal, and gastrointestinal cancers (IARC 1980; Daugherty 1992). EPA has not given chromium (III) a weight-of-evidence classification; however, chromium (VI) has been placed in weight-of-evidence Group A, known human carcinogen (BEIAS 1995).

Cobalt. No toxicity profile could be found for cobalt.

Copper. Copper occurs naturally in elemental form and as a component of many minerals. Because of its high electrical and thermal conductivity, it is widely used in the manufacture of electrical equipment. Common copper salts, such as the sulfate, carbonate, cyanide, oxide, and sulfide, are used as fungicides, as components of ceramics and pyrotechnics, for electroplating, and for numerous other industrial applications (ACGIH 1986). Copper can be absorbed by the oral, inhalation, and dermal routes of exposure. It is an essential nutrient that is normally present in a wide variety of tissues (ATSDR 1990a; EPA 1987a).

In humans, ingestion of gram quantities of copper salts may cause gastrointestinal, hepatic, and renal effects with symptoms such as severe abdominal pain, vomiting, diarrhea, hemolysis, hepatic necrosis, hematuria, proteinuria, hypotension, tachycardia, convulsions, coma, and death (USAF 1990a). Gastrointestinal disturbances and liver toxicity have also resulted from long-term exposure to drinking water containing 2.2-7.8 mg Cu/L (Mueller-Hoecker et al. 1988; Spitalny et al. 1984). The chronic toxicity of copper has been characterized in patients with Wilson's disease, a genetic disorder causing copper accumulation in tissues. The clinical manifestations of Wilson's disease include cirrhosis of the liver, hemolytic anemia, neurologic abnormalities, and corneal opacities (Goyer 1991; ATSDR 1990a; EPA 1987a). In animal studies, oral exposure to copper caused hepatic and renal accumulation of copper, liver and kidney necrosis at doses of >100 mg/kg/day; and hematological effects at doses of 40 mg/kg/day (EPA 1986a; Haywood 1985, 1980; Rana and Kumar 1978; Gopinath, Hall, and McHowell 1974; Kline, Hays, and Cromwell 1971).

Acute inhalation exposure to copper dust or fumes at concentrations of 0.075-0.12 mg Cu/m^3 may cause metal fume fever with symptoms such as cough, chills, and muscle ache (USAF 1990a). Among the reported effects in workers exposed to copper dust are gastrointestinal disturbances, headache, vertigo, drowsiness, and hepatomegaly (Suciu et al. 1981). Vineyard workers chronically exposed to Bordeaux mixture (copper sulfate and lime) exhibit degenerative changes of the lungs and liver. Dermal exposure to copper may cause contact dermatitis in some individuals (ATSDR 1990a).

Oral or intravenous administration of copper sulfate increased fetal mortality and developmental abnormalities in experimental animals (Lecyk 1980; Ferm and Hanlon 1974). Evidence also indicates that copper compounds are spermicidal (ATSDR 1990a; Battersby, Chandler, and Morton 1982).

An RfD for elemental copper is not available. However, EPA established an action level of 1,300 µg/L for drinking water (EPA 1991d). Data were insufficient to derive an RfC for copper.

No suitable bioassays or epidemiological studies are available to assess the carcinogenicity of copper. Therefore, EPA (2001) has placed copper in weight-of-evidence Group D, not classifiable as to human carcinogenicity.

Cyanide. Cyanide most commonly occurs as hydrogen cyanide and its salts–sodium and potassium cyanide. Cyanides are both man-made and naturally occurring substances. They are found in several plant species as cyanogenic glycosides and are produced by certain bacteria, fungi, and algae. In very small amounts, cyanide is a necessary requirement in the human diet. Cyanides are released to the environment from industrial sources and car emissions (ATSDR 1998).

Cyanides are readily absorbed by the inhalation, oral, and dermal routes of exposure. The central nervous system (CNS) is the primary target organ for cyanide toxicity. Neurotoxicity has been observed in humans and animals following ingestion and inhalation of cyanides. Cardiac and respiratory effects, possibly CNS-mediated, have also been reported. Short-term exposure to high concentrations produces almost immediate collapse, respiratory arrest, and death (Hartung 1982; EPA 1985a). Symptoms resulting from occupational exposure to lower concentrations include breathing difficulties, nervousness, vertigo, headache, nausea, vomiting, precordial pain, and electrocardiogram (EKG) abnormalities (Carmelo 1955; El Ghawabi et al. 1975; Sandberg 1967). Thyroid toxicity has been observed in humans and animals following oral and inhalation exposure to cyanides (Philbrick et al. 1979; EPA 1984c). In animal studies, cyanides have produced fetotoxicity and teratogenic effects, including exencephaly, encephalocele, and rib abnormalities (Doherty et al. 1982; Frakes et al. 1986; Tewe and Maner 1981; Willhite 1982).

RfDs have been calculated for subchronic and chronic oral exposure to cyanide and several cyanide compounds (EPA 2001). The values, derived from a single study, are based on a no-observed-adverse-effect level (NOAEL) of 10.8 mg/kg/day for cyanide in a 2-year dietary study with rats. The subchronic and chronic oral RfDs are 0.02 mg/kg/day for cyanide; 0.04 mg/kg/day for sodium cyanide, calcium cyanide, and cyanogen; 0.05 mg/kg/day for potassium cyanide, chlorine cyanide, and zinc cyanide; 0.1 mg/kg/day for silver cyanide; and 0.2 mg/kg/day for potassium silver cyanide. Data were insufficient to derive a reference concentration (RfC) for cyanide.

No suitable cancer bioassays or epidemiological studies are available to assess the carcinogenicity of cyanide. Therefore, EPA (2001) has placed cyanide in weight-of-evidence group D, not classifiable as to human carcinogenicity.

Lead. Lead has been used by humans for thousands of years because of its malleability, resistance to corrosion, and abundance. This metal can be a component of solder, paint, and gasoline, but these uses have declined dramatically in recent years as awareness of the toxicity associated with lead exposure has increased. Currently in the United States, the predominant use of lead is in batteries. Lead occurs at an average concentration of 10 mg/kg in soil, but soil levels are substantially elevated in many areas exposed to emissions from smelters and automobiles or in areas where lead-containing paint chips have fallen onto the soil (BEIAS 1995).

Inhalation and oral RfD values for lead have not been derived by the EPA because it has not been possible to establish the NOAEL or LOAEL for this metal. Health effects have tentatively been associated with blood levels as low as 10 μg/dL (BEIAS 1995).

In the absence of an oral or inhalation RfD for lead, the EPA has developed an uptake/biokinetic model to estimate blood lead levels on the basis of total lead uptake from exposures via diet, drinking water, air, soil, and paint. Application of this model to potential exposures is not discussed in this report; however, further information can be obtained from EPA (BEIAS 1995).

At blood levels greater than 40 μg/dL, lead can cause miscarriage, sterility in males, anemia, and damage to the central nervous system and kidneys. Lead exposure resulting in these high blood levels is rare today. Blood levels of 30 μg/dL and higher have been associated with defects in vitamin D metabolism and with lowered intelligent quotient scores in children. At blood levels of 20 μg/dL and lower, the effects become more difficult to define. Some studies report a dose-related increase in blood pressure in adult males starting at blood levels of about 10 μg/dL. Additionally, the fetus and young children are particularly sensitive to lead toxicity; even low-level lead exposure during pregnancy and early childhood can cause reduced birth weight, premature birth, and delayed development (BEIAS 1995).

Lead can cause varied toxicological effects, depending on the level of exposure. From studies on rats and mice, the EPA has previously classified lead as a Group B2, probable human carcinogen. However, the doses that induce cancer are higher than those associated with other health effects of lead, such as reproductive toxicity, developmental toxicity, and increased blood pressure (BEIAS 1995).

Manganese. Manganese is an essential trace element in humans; however, prolonged exposure to elevated concentrations, either orally or by inhalation, can elicit serious toxic responses. The central nervous system is the primary target. Initial symptoms are headache, insomnia, disorientation, anxiety, lethargy, and memory loss; with continued exposure, these symptoms progress to motor disturbances, tremors, and difficulty in walking. Symptoms are similar to those seen with Parkinsonism that are often irreversible. Data from human epidemiological studies have been used to estimate LOAELs for central nervous system effects of 0.8 mg/kg-d for drinking water exposure and 0.34 mg/m^3 in air for inhalation exposure (BEIAS 1995).

Effects on reproduction (decreased fertility, impotence) have been observed in humans with inhalation exposure and in animals with oral exposure at the same or similar doses that produce the central nervous system effects. An increased incidence of coughs, colds, dyspnea during exercise, bronchitis, and altered lung ventilatory parameters have also been observed in humans and animals after inhalation exposure. A possible effect on the immune system may account for some of these respiratory symptoms (BEIAS 1995).

Because of the greater bioavailability of manganese from water, separate RfDs for water and diet were calculated. EPA calculated a chronic and subchronic RfD for drinking water of 0.005 mg/kg-d from a human NOAEL of 0.005 mg/kg-d, which was determined from an epidemiological study of human populations exposed for a lifetime to manganese concentrations in drinking water ranging from 3.6 to 2300 µg/L. EPA also calculated a chronic and subchronic RfD of 0.14 mg/kg-d for dietary exposure from a human NOAEL of 0.14 mg/kg-d, which was determined from a series of epidemiological studies. Although large populations with different concentrations of manganese in their diets were examined, no adverse effects attributable to manganese were seen in any of these groups. Both the drinking water and dietary RfDs were derived without uncertainty factors because manganese is essential in human nutrition and because exposure of the most sensitive groups was included in the populations examined. EPA indicates that the chronic RfD values are pending change (BEIAS 1995).

Although available data about possible carcinogenesis after injections of manganese chloride and manganese sulfate in mice are conflicting, the EPA weight-of-evidence classification is D, not classifiable as to human carcinogenicity (BEIAS 1995).

Mercury. Mercury is a naturally occurring element existing in multiple forms and in various oxidation states. It is used in a wide variety of products and processes. In the environment, mercury may undergo transformations among its various forms and among its oxidation states. Exposure to mercury may occur in both occupational and environmental settings, the latter primarily involving dietary exposure (ATSDR 1989c).

Absorption, distribution, metabolism, and excretion of mercury is dependent upon its form and oxidation state (ATSDR 1989c, Goyer 1991). Organic mercurials are more readily absorbed than are inorganic forms. An oxidation-reduction cycle is involved in the metabolism of mercury and mercury compounds by both animals and humans (ATSDR 1989c). The urine and feces are primary excretory routes. The elimination half-life is from 35 to 90 days for elemental mercury and mercury vapor and about 40 days for inorganic salts (Goyer 1991).

Ingestion of mercury metal is usually without effect (Goldwater 1972). Ingestion of inorganic salts may cause severe gastrointestinal irritation, renal failure, and death with acute lethal doses in humans ranging from 1 to 4 g (ATSDR 1989c). Mercuric (divalent) salts are usually more toxic than are mercurous

(monovalent) salts (Goyer 1991). Mercury is also known to induce hypersensitivity reactions such as contact dermatitis and acrodynia (pink disease) (Mathesson et al. 1980). Inhalation of mercury vapor may cause irritation of the respiratory tract, renal disorders, central nervous system effects characterized by neurobehavioral changes, peripheral nervous system toxicity, renal toxicity (immunologic glomerular disease), and death (ATSDR 1989c).

Toxicity resulting from subchronic and chronic exposure to mercury and mercury compounds usually involves the kidneys and/or nervous system, the specific target and effect being dependent on the form of mercury (ATSDR 1989c). Organic mercury, especially methyl mercury, rapidly enters the central nervous system, resulting in behavioral and neuromotor disorders (ATSDR 1989c, Goyer 1991). The developing central nervous system is especially sensitive to this effect, as documented by the epidemiologic studies in Japan and Iraq where ingestion of methyl mercury-contaminated food resulted in severe toxicity and death in adults and severe central nervous system effects in infants (Bakir et al. 1973, Amin-Zaki et al. 1974, Harada 1978, Marsh et al. 1987). Blood mercury levels of <10 μg/dL and 300 μg/dL corresponded to mild effects and death, respectively (Bakir et al. 1973). Teratogenic effects due to organic or inorganic mercury exposure do not appear to be well documented for humans or animals, although some evidence exists for mercury-induced menstrual cycle disturbances and spontaneous abortions (Derobert and Tara 1950, Amin-Zaki et al. 1974, ATSDR 1989c).

A subchronic and chronic oral RfD of 0.0001 mg/kg/day for methyl mercury is based on a benchmark dose of 1.1 μg/kg/day relative to neurologic developmental abnormalities in human infants (EPA 2001). A subchronic and chronic oral RfD of 0.0003 mg/kg/day for mercuric chloride is based on immunologic glomerulonephritis (EPA 2001). A LOAEL of 0.63 mg Hg/kg/day for mercuric chloride was identified (EPA 1987b). NOAELs were not available for oral exposure to inorganic mercury or methyl mercury. A subchronic and chronic inhalation RfC of 0.0003 mg Hg/m^3 for inorganic mercury (EPA 2001) is based on neurological disorders (increased frequency of intention tremors) following long-term occupational exposure to mercury vapor. The LOAELs for subchronic and chronic inhalation exposures to inorganic mercury are 0.32 and 0.03 mg Hg/m^3, respectively. NOAELs were unavailable. An inhalation RfC for methyl mercury has not been determined.

No data were available regarding the carcinogenicity of mercury in humans or animals. EPA has placed inorganic mercury in weight-of-evidence classification D, not classifiable as to human carcinogenicity (EPA 2001). Weight-of-evidence classifications of C (possible human carcinogen) have been assigned to mercuric chloride and methyl mercury by EPA (2001) based upon limited evidence of carcinogenicity in rodents. No slope factors have been calculated.

Nickel. Nickel is a naturally occurring element that may exist in various mineral forms. It is used in a wide variety of applications including metallurgical processes and electrical components, such as batteries (ATSDR 1988a, USAF 1990b). Some evidence suggests that nickel may be an essential trace element for mammals.

In large doses (>0.5 g), some forms of nickel may be acutely toxic to humans when taken orally (Daldrup et al. 1983, Sunderman et al. 1988). Toxic effects of oral exposure to nickel usually involve the kidneys with some evidence from animal studies showing a possible developmental/reproductive toxicity effect (ATSDR 1988a, Goyer 1991).

Inhalation exposure to some nickel compounds will cause toxic effects in the respiratory tract and immune system (Smialowicz et al. 1984, 1985, 1987; ATSDR 1988a; Goyer 1991). Acute inhalation exposure of humans to nickel may produce headache, nausea, respiratory disorders, and death (Goyer 1991, Rendall et al. 1994). Asthmatic conditions have also been documented for inhalation exposure to nickel (Goyer 1991). Soluble nickel compounds tend to be more toxic than insoluble

compounds (Goyer 1991). In addition, nickel carbonyl is known to be extremely toxic to humans upon acute inhalation exposure (Goyer 1991).

Data on nickel-induced reproductive/developmental effects in humans following inhalation exposure are equivocal. No clinical evidence of developmental or reproductive toxicity were reported for women working in a nickel refinery (Warner et al. 1979), but Chashschin et al. (1994) reported possible reproductive and developmental effects in humans of occupational exposure to nickel. Although not validated by quantitative epidemiologic data or statistical analyses, the authors reported an apparently abnormal increase in spontaneous and threatening abortions, and an increased incidence of non-specified structural malformations was reported also. Furthermore, sensitivity reactions to nickel are well documented and usually involve contact dermatitis reactions resulting from contact with nickel-containing items such as cooking utensils, jewelry, coins, etc. (ATSDR 1988a).

A chronic and subchronic oral RfD of 0.02 mg/kg/day for soluble nickel salts is based on changes in organ and body weights of rats receiving dietary nickel sulfate hexahydrate (5 mg/kg/day) for 2 years (EPA 2001). A NOAEL and LOAEL of 5 mg/kg/day and 50 mg/kg/day, respectively, were reported in the key study. An uncertainty factor of 300 reflects interspecies extrapolation uncertainty, protection of sensitive populations, and a modifying factor of 3 for a database deficient in reproductive/developmental studies.

The primary target organs for nickel-induced systemic toxicity are the lungs and upper respiratory tract for inhalation exposure and the kidneys for oral exposure (ATSDR 1988a, Goyer 1991). Other target organs include the cardiovascular system, immune system, and the blood.

Epidemiologic studies have shown that occupational inhalation exposure to nickel dust (primarily nickel subsulfate) at refineries has resulted in increased incidences of pulmonary and nasal cancer (Enterline and Marsh 1982, ATSDR 1988a). Inhalation studies using rats have also shown nickel subsulfate or nickel carbonyl to be carcinogenic (Sunderman et al. 1959, Sunderman and Donnelly 1965, Ottolenghi et al. 1974). Based on these data, the EPA has classified nickel subsulfate and nickel refinery dust in weight-of-evidence group A, human carcinogen. Carcinogenicity slope factors of 1.7E+0 and 8.4E-01 $(mg/kg/day)^{-1}$ and unit risks of 4.8E-04 $(\mu g/m^3)^{-1}$ and 2.4E-04 $(\mu g/m^3)^{-1}$ have been calculated for nickel subsulfide and nickel refinery dust, respectively (EPA 2001). Based on an increased incidence of pulmonary carcinomas and malignant tumors in animals exposed to nickel carbonyl by inhalation or by intravenous injection, this compound had been placed in weight-of-evidence group B2, probable human carcinogen (EPA 2001). No unit risk values were available for nickel carbonyl. Recent analyses of epidemiologic data, however, indicate that definitive identification of a specific nickel compound as the causative agent is not yet possible (Easton et al. 1994, Langård 1994, Roberts et al. 1994).

Thallium. Thallium, a naturally occurring elemental metal, is commonly found in minerals and as thallium salts. It can also be released into the environment from industrial sources such as coal-fired power plants, smelting operations, and cement factories. Atmospheric thallium contaminates surface soils by deposition allowing for the exposure of humans by oral, dermal, or inhalation routes. The most common nonoccupational sources of thallium exposure are contaminated food crops and tobacco. Although normally present in the urine of humans, elevated urine thallium concentrations have been associated with adverse health effects.

The primary targets of thallium toxicity are the nervous, integumentary, and reproductive systems. In humans, acute exposures produce paresthesia, retrobulbar neuritis, ataxia, delirium, tremors, and hallucinations. This implies central, peripheral, and autonomic nervous system involvement (Stokinger 1981; de Groot and Van Heijst 1988; Kazantzis 1986). Human and animal chronic exposures result in alterations of the brain, spinal cord, and peripheral nerves (Stokinger 1981; Manzo et al. 1983).

In both humans and animals, alopecia is the most common indicator of long-term thallium poisoning (Stokinger 1981; Manzo et al. 1983).

An increased incidence of congenital malformations was found in children of parents exposed to thallium through the consumption of home-grown fruits and vegetables. However, a causal relationship between these effects and thallium exposure could not be confirmed (Dolgner et al. 1983). In animal studies, thallium compounds produced testicular effects in male rats and slight fetotoxicity and significant impairment of learning ability in the offspring of treated female rats (Formigli et al. 1986; Roll and Matthiaschk 1981; Bornhausen and Hagen 1984).

RfDs have been calculated for subchronic and chronic oral exposure to several thallium compounds. The values, derived from a single study where thallium treatment increased AST and LDH activities in rats, are based on NOAELs ranging from 0.23 to 0.28 mg/kg/day. The subchronic RfDs are 8.00E-04 (thallium sulfate, chloride, and carbonate) or 9.00E-04 mg/kg/day (thallium nitrate and acetate), and the chronic RfDs are 8.00E-05 (thallium sulfate, chloride, and carbonate) or 9.00E-05 mg/kg/day (thallium nitrate and acetate) (EPA 2001).

Data suitable for evaluating the carcinogenicity of thallium to humans or animals by ingestion, inhalation, or other routes of exposure were not found. Thallium sulfate, selenite, nitrate, chloride, carbonate, and acetate have been placed in EPA's weight-of-evidence Group D, not classifiable as to human carcinogenicity based on inadequate human and animal data (EPA 2001).

Vanadium. Vanadium is a metallic element that occurs in six oxidation states and numerous inorganic compounds. Some of the more important compounds are vanadium pentoxide (V_2O_5), sodium metavanadate ($NaVO_3$), sodium orthovanadate (Na_3VO_4), vanadyl sulfate ($VOSO_4$), and ammonium vanadate (NH_4VO_3). Vanadium is used primarily as an alloying agent in steels and non-ferrous metals (ATSDR 1990b). Vanadium compounds are also used as catalysts and in chemical, ceramic, or specialty applications.

In animals, acutely toxic oral doses cause vasoconstriction, diffuse desquamative enteritis, congestion and fatty degeneration of the liver, and congestion and focal hemorrhages in the lungs and adrenal cortex (Gosselin et al. 1984). Minimal effects seen after subchronic oral exposures to animals include diarrhea, altered renal function, and decreases in erythrocyte counts, hemoglobin, and hematocrit (Domingo et al. 1985; Zaporowska and Wasilewski 1991). In humans, intestinal cramps and diarrhea may occur following subchronic oral exposures. These studies indicate that for subchronic and chronic oral exposures the primary targets are the digestive system, kidneys, and blood.

RfDs for chronic oral exposures are 0.007 mg/kg/day for vanadium; 0.009 mg/kg/day for vanadium pentoxide; 0.02 mg/kg/day for vanadyl sulfate; and 0.001 mg/kg/day for sodium metavanadate (EPA 2001). The subchronic RfDs for these compounds are the same as the chronic RfDs, except for sodium metavanadate, which is 0.01 mg/kg/day.

Inhalation exposures to vanadium and vanadium compounds result primarily in adverse effects to the respiratory system (Sax 1984; ATSDR 1990b). In laboratory studies, minimal effects (throat irritation and coughing) occurred after an 8-h exposure to 0.1 mg V/m^3 (Zenz and Berg 1967). In studies on workers occupationally exposed to vanadium, the most common reported symptoms were irritation of the respiratory tract, conjunctivitis, dermatitis, cough, bronchospasm, pulmonary congestion, and bronchitis (Symanski 1939; Sjoberg 1950, 1951, 1955, 1956; Vintinner et al. 1955; Lewis 1959; Tebrock and Machle 1968; Roshchin 1968; Kiviluoto et al. 1981). Quantitative data are, however, insufficient to derive a subchronic or chronic inhalation RfC for vanadium or vanadium compounds.

There is little evidence that vanadium or vanadium compounds are reproductive toxins or teratogens. There is also no evidence that any vanadium compound is carcinogenic; however, very few adequate studies are available for evaluation. Vanadium has not been classified as to carcinogenicity by EPA (2001).

Zinc. Zinc, a naturally occurring metal commonly found in air, soil, water, and various foodstuffs, is an essential element in the human diet. Zinc, in a variety of inorganic forms, is a component of a number of different industrial processes and products, including the plastics industry, batteries, wood preservatives, fire retardants, and rodenticides (Bertholf 1988). Exposures to airborne zinc can occur near galvanizing, smelting, or foundry operations.

The toxicity of zinc is considered to be relatively low. Ingestion of excessive levels of zinc in humans may lead to nausea, vomiting, epigastric distress, and anemia. Intestinal hemorrhage and pancreatic alterations have been observed in animals fed high levels of zinc compounds (ATSDR 1988). Chronic oral exposures to zinc have resulted in certain anemias in humans, and limited evidence also suggests that the human immune system may be impaired by subchronic oral exposure to zinc (including zinc taken as a dietary supplement) (Opresko 1992).

Inhalation of high concentrations of zinc can cause metal fume fever, characterized by rapid breathing, shivering, fever, sweating, generalized weakness, and temporary impairment of pulmonary functioning, which has been observed in workers exposed to certain zinc vapors (Bertholf 1988; ATSDR 1988b).

Oral exposure to high levels of zinc has been shown to reduce fetal growth rate and reduce reproductive success in exposed animals (ATSDR 1988b; Opresko 1992). No epidemiologic data are available to evaluate the carcinogenicity of zinc in humans. Although two studies of ingestion of zinc placed in the food or water of mice resulted in no excess cancers, another longer-term study in mice observed increased tumor frequencies after exposure to zinc in water (Opresko 1992).

6.8.2 Organics

2-Amino-4,6-dinitrotoluene and 4-Amino-2,6-dinitrotoluene. No toxicity profile could be found for 2-amino-4,6-dinitrotoluene or 4-Amino-2,6-dinitrotoluene.

Benz(a)anthracene (see toxicity profile for PAHs). Benz(a)anthracene is a PAH and exhibits many of the characteristics of other PAHs. Because no substantial information about the toxicity of benz(a)anthracene is available in the literature, the reader is referred to the toxicity profiles for the PAHs benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene as well as the profile containing general information for PAHs.

Benzo(a)pyrene (see also toxicity profile for PAHs). Benzo(a)pyrene is a PAH that can be derived from coal tar. It occurs ubiquitously in products of incomplete combustion of fossil fuels and has been identified in ambient air, surface water, drinking water, waste water, and charbroiled foods. Benzo(a)pyrene is primarily released to the air and removed from the atmosphere by photochemical oxidation and dry deposition to land or water. Biodegradation is the most important transformation process in soil or sediment (BEIAS 1995).

Benzo(a)pyrene is readily absorbed after inhalation, ingestion, and dermal contact. After inhalation exposure, benzo(a)pyrene is rapidly distributed to several tissues in rats. The metabolism of the compound is complex and includes the formation of a proposed ultimate carcinogen, benzo(a)pyrene 7,8 diol-9,10-epoxide. The major route of excretion is hepatobiliary followed by elimination in the feces (BEIAS 1995).

Numerous epidemiologic studies have shown a clear association between exposure to various mixtures of PAHs containing benzo(a)pyrene (e.g., coke oven emissions, roofing tar emissions, and cigarette smoke) and increased risk of lung cancer and other tumors. However, each of the mixtures also contained other potentially carcinogenic PAHs; therefore, distinguishing the contribution of benzo(a)pyrene to the carcinogenicity of these mixtures is not possible. An extensive database is available for the carcinogenicity of benzo(a)pyrene in experimental animals. Dietary administration of the compound has produced papillomas and carcinomas of the forestomach in mice, and treatment by gavage has produced mammary tumors in rats and pulmonary adenomas in mice. Exposure by inhalation and intratracheal instillation has resulted in benign and malignant tumors of the respiratory and upper digestive tracts of hamsters. Numerous topical application studies have shown that benzo(a)pyrene induces skin tumors in several species, although mice appear to be the most sensitive species. Benzo(a)pyrene is a complete carcinogen and also an initiator of skin tumors. It has been reported to induce tumors in animals when administered by other routes, such as intravenous, intraperitoneal, subcutaneous, intrapulmonary, and transplacental. EPA has assigned benzo(a)pyrene to weight-of-evidence Group B2, probable human carcinogen (BEIAS 1995).

Benzo(b)fluoranthene (see also toxicity profile for PAHs). Benzo(b)fluoranthene, a crystalline solid with a chemical formula of $C_{20}H_{12}$ and a molecular weight of 252.32, is a PAH with one five-membered ring and four six-membered rings. No commercial production or use of this compound is known. Benzo(b)fluoranthene is found in fossil fuels and occurs ubiquitously in products of incomplete combustion. It has been detected in cigarette smoke, urban air, gasoline engine exhaust, emissions from burning coal and from oil-fired heating, broiled and smoked food, oils and margarine, and in soil, groundwater, and surface water at hazardous waste sites (BEIAS 1995).

No absorption data were available for benzo(b)fluoranthene; however, by analogy to structurally related PAHs, primarily benzo(a)pyrene, it would be expected to be absorbed from the gastrointestinal tract, lungs, and skin. Major metabolites of benzo(b)fluoranthene formed in vitro in rat liver include dihydrodiols and monohydroxy derivatives and monohydroxy derivatives in mouse epidermis (BEIAS 1995).

No data about the acute, subchronic, chronic, developmental, or reproductive toxicity of benzo(b)fluoranthene were found, and no data for the derivation of an oral RfD or inhalation RfC were available. Because of the lack of human data and sufficient evidence for carcinogenicity in animals, EPA has assigned a weight-of-evidence classification of B2, probable human carcinogen, to benzo(b)fluoranthene (BEIAS 1995).

Benzo(k)fluoranthene (see also toxicity profile for PAHs). Benzo(k)fluoranthene is a PAH with one five-membered and four six-membered rings. There is no commercial production or known use of this compound (IARC 1983). Benzo(k)fluoranthene is found in fossil fuels and occurs ubiquitously in products of incomplete combustion (IARC 1983) and in soil, groundwater, and surface water at hazardous waste sites (ATSDR 1990).

No data were found concerning the acute, subchronic, chronic, developmental, or reproductive toxicity of benzo(k)fluoranthene. Because of a lack of toxicity data, an oral RfD or RfC have not been derived (EPA 2001).

No long-term oral or inhalation bioassays were available to assess the carcinogenicity of benzo(k)fluoranthene. Benzo(k)fluoranthene was tested for carcinogenicity in dermal application, subcutaneous (s.c.) injection, lung implantation, and intraperitoneal (i.p.) injection studies. Dermal applications of 0.5% solutions of benzo(k)fluoranthene for life produced only a few skin papillomas in mice (Wynder and Hoffmann 1959), but in initiation-promotion assays, benzo(k)fluoranthene was active as an initiator of skin carcinogenesis (LaVoie et al. 1982; Amin et al. 1985). Injection site sarcomas

developed in mice given three s.c. injections of 0.6 mg benzo(k)fluoranthene (Lacassagne et al. 1963), and dose-related increases of epidermoid carcinomas of the lungs were reported in rats receiving single lung implants of 0.16-4.15 mg benzo(k)fluoranthene (Deutsch-Wenzel et al. 1983). In a short-term assay, hepatic and lung tumors occurred in newborn mice receiving 2.1 umol benzo(k)fluoranthene via i.p. injection (LaVoie et al. 1987).

Based on no human data and sufficient evidence for carcinogenicity in animals, EPA has assigned a weight-of-evidence classification of B2, probable human carcinogen, to benzo(k)fluoranthene (EPA 2001).

Benzo(g,h,i)perylene. See toxicity profile for PAHs.

beta-BHC. beta-Hexachlorocyclohexane is reported to cause hepatic nodules and hepatocellular carcinomas in mice chronically exposed in diet. EPA has placed beta-BHC in weight-of-evidence classification Group C, possible human carcinogen, and has assigned an oral slope factor of 1.8E+0 $(mg/kg\text{-}day)^{-1}$ and an inhalation Unit Risk derived from oral studies of 5.3E-4 $(\mu g/m^3)^{-1}$ (EPA 2001).

Bis(2-ethylhexyl)phthalate. Bis(2-ethylhexyl)phthalate is a colorless, oily liquid used extensively as a plasticizer in a wide variety of industrial, domestic, and medical products. An environmental contaminant, it has been detected in groundwater, surface water, drinking water, air, soil, plants, fish, and animals. It is rapidly absorbed from the gastrointestinal tract primarily as mono(2-ethylhexyl)phthalate. The diester can be absorbed through the skin and from the lungs. It is rapidly metabolized in the blood and tissues to the monoester, which can be excreted as a glucuronide conjugate or further hydrolyzed to phthalic acid and excreted (BEIAS 1995).

Animal studies have indicated that the primary target organs are the liver and kidneys; however, higher doses are reported to result in testicular effects and decreased hemoglobin and packed cell volume. The primary intracellular effects of bis(2-ethylhexyl)phthalate in the liver and kidneys are an increase in the smooth endoplasmic reticulum and a proliferation in the number and size of peroxisomes. An epidemiologic study reported no toxic effects from occupational exposure to air concentrations of bis(2-ethylhexyl)phthalate up to 0.16 mg/m^3. Other studies on occupational exposures to mixtures of phthalate esters containing bis(2-ethylhexyl)phthalate have reported polyneuritis and sensory-motor polyneuropathy with decreased thrombocytes, leukocytes, and hemoglobin in some exposed workers. Developmental toxicity studies with rats and mice have shown that bis(2-ethylhexyl)phthalate is fetotoxic and teratogenic when given orally during gestation. Oral exposure has also been shown to result in decreased sperm count in rats (BEIAS 1995).

Alpha-Chlordane and Gamma-Chlordane. Technical-grade chlordane is a mixture of structurally related compounds including trans-chlordane, cis-chlordane, -chlordene, heptachlor, and trans-nonachlor (ATSDR 1994). Chlordane was used extensively as a pesticide in the United States from 1948 to 1988. Because the chemical is persistent in the environment, exposure can still occur from breathing the air of treated homes, consuming shellfish caught in contaminated waters, or eating food produced on contaminated farmlands (ATSDR 1994). Chlordane is readily absorbed after oral, inhalation, or dermal exposure and is stored in adipose tissue. The chemical is excreted in the feces from the bile (Ewing et al. 1985), but metabolite residues have been detected in 46% of human milk samples from Arkansas/Mississippi, in 68% of samples from Mississippi, and in 100% of samples from Hawaii (ATSDR 1994).

Death in humans from ingestion of chlordane was accompanied by vomiting, dry cough, agitation and restlessness, hemorrhagic gastritis, bronchopneumonia, muscle twitching, and convulsions (IARC 1991). Nonlethal, accidental poisoning of children has resulted in convulsions, excitability, loss of coordination,

dyspnea, and tachycardia; however, recovery was complete (IARC 1991). When a municipal water supply was contaminated with chlordane in concentrations of up to 1.2 g/L, 13 persons had symptoms of gastrointestinal and neurological disorders (WHO 1984). Signs of toxicity from chronic inhalation exposure in chlordane-treated homes include sinusitis, bronchitis, dermatitis, neuritis, migraine (Menconi et al. 1988), gastrointestinal distress, fatigue, memory deficits, personality changes, decreased attention span, numbness or paresthesias, disorientation, loss of coordination, dry eyes, and seizures (Spyker et al. 1990). Blood dyscrasias, including production defects and thrombocytopenic purpura, have been described for both professional applicators and for home owners and their families following home termite treatment (Epstein and Ozonoff 1987). An inhalation RfC for chlordane is under review by EPA.

Exposure of humans from chlordane-treated homes has been associated with leukemia (Epstein and Ozonoff 1987), skin neoplasms (Menconi et al. 1988), and neuroblastoma in children (IARC 1991). An increased risk of non-Hodgkin's lymphoma has been found among farmers exposed to chlordane 20 or more days per year (Hoar Zahm et al. 1988). Hepatic carcinomas and hepatocellular adenomas have been described for several strains of male and female mice and male rats given chlordane in the diet (NCI 1977; EPA 2001). EPA (2001) has classified chlordane as group B2, probable human carcinogen. The carcinogenicity slope factor (q_1*) for oral exposure is 1.3E+0 $(mg/kg/day)^{-1}$ based on an increase of hepatocellular carcinomas in mice and hepatocellular adenomas in rats. A drinking water unit risk of 3.7E-5 $(g/L)^{-1}$ was calculated based on the q_1*. The q_1* for inhalation exposure is 1.3E+0 $(mg/kg/day)^{-1}$, and the inhalation unit risk value is 3.7E-4 $(g/m^3)^{-1}$. The inhalation risk estimates were calculated from the oral data (EPA 2001).

Chloroform. Chloroform, or trichloromethane, is a colorless, pleasant-smelling chemical that is widely used in the production of pharmaceuticals, plastics, fluorocarbons, refrigerants, pesticides, dyes, and other solvents. Its past use as a general anesthetic has been discontinued because of its toxic effects.

Chloroform is rapidly absorbed from the lungs, gastrointestinal tract, and, to some extent, skin. Cases of occupational, accidental, and intentional exposure in humans and experimental studies in several animal species indicate that chloroform depresses the central nervous system, causes heart and liver effects, and may result in death (ATSDR 1989b; Torkelson and Rowe 1981). At lower concentrations, chloroform may cause irritability, gastrointestinal symptoms, and frequent, burning urination (Faust 1992). Kidney effects have been reported in rats and mice after oral and inhalation exposures, but the evidence in humans for these effects is sparse (EPA 1985b; Faust 1992). Potential reproductive and developmental toxicity and possible teratogenic effects are indicated in rodents exposed to chloroform by inhalation and ingestion, but no data on these effects in humans are available (ATSDR 1989b; Torkelson and Rowe 1981).

Epidemiological studies indicate a possible relationship between exposure to chloroform in chlorinated drinking water and cancers of the bladder, large intestine, and rectum (ATSDR 1989b; EPA 1985b; Faust 1992); however, because chloroform was not the only contaminant in the drinking water, the excess cancer rate cannot be clearly attributed to chloroform. Orally administered chloroform has produced cancer of the liver and kidneys in mice and rats (IARC 1979; Faust 1992). The EPA has classified chloroform in Group B, probable human carcinogen (Faust 1992).

Chrysene. (see also toxicity profile for PAHs). Chrysene, a PAH, is a ubiquitous environmental contaminant formed primarily by the incomplete combustion of organic compounds. Although present in coal and oil, the presence of chrysene in the environment is the result of anthropogenic activities such as coal combustion and gasification; gasoline exhaust; diesel and aircraft exhaust; and emissions from coke ovens, wood burning stoves, and waste incineration (IARC 1983; ATSDR 1990d). Chrysene is not produced or used commercially, and its use is limited strictly to research applications.

Human or animal systemic, developmental, and reproductive health effects following exposure to chrysene were not identified. Because of the lack of systemic toxicity data, the RfD and the RfC for chrysene have not been derived. Target organs have not been described, although chrysene may induce immuno-suppression similar to certain other PAHs. Oral and inhalation carcinogenic bioassays were not identified. In mouse skin painting studies, chrysene was an initiator of papillomas and carcinomas. In addition, intraperitoneal injections of chrysene have induced liver adenomas and carcinomas in male CD-1 and BLU/Ha Swiss mice. Although oral and inhalation slope factors have not been derived, EPA (2001) has classified chrysene in weight-of-evidence Group B2, probable human carcinogen, based on the induction of liver tumors and skin papillomas and carcinomas following treatment and the mutagenicity and chromosomal abnormalities induced in in vitro tests (EPA 2001).

***Cyclotrimethylenetrinitramine (RDX*).** This is a solid explosive chemical that is insoluble in water. Environmental studies and evaluation of the physicochemical properties of this compound conclude that when RDX is released to the environment, it is likely to reside in the subsurface soil (Layton et al. 1987). This chemical is used in the manufacturing of munitions.

RDX powder acts as an irritant when applied to the skin. Munitions workers have reported mild dermatitis; however, it is unknown if this was associated with exposure to RDX or trinitrotoluene (Layton et al. 1987). Acute RDX toxicity in humans is primarily manifested in the central nervous system. Specific neurotoxic symptoms in humans include hyperirritability, muscle twitching, generalized epileptiform seizures, and prolonged confusion and amnesia. Laboratory animals have shown similar symptoms (Layton et al. 1987). Exposure to RDX has been implicated in the increased incidence of systemic lupus erythematosus (SLE) at a munitions plant. However, epidemiological studies conducted at five munitions plants did not show a statistically significant difference in the number of individuals tested for indicators of lupus (Layton et al. 1987).

Chronic toxicity studies with rodents have identified reproductive and developmental toxicity as the most sensitive toxicity endpoints. RDX has been classified as a Class C carcinogen for oral exposure (EPA 2001).

***4,4'DDE*.** DDE was found to increase the incidence of liver tumors including carcinomas in two strains of mice and in hamsters and of thyroid tumors in female rats by diet. EPA has placed 4,4'DDE in weight-of-evidence classification Group B2, probable human carcinogen, and has assigned an oral slope factor of 3.4E-1 $(mg/kg\text{-}day)^{-1}$ (EPA 2001).

Dibenzo(a,h)anthracene (see also toxicity profile for PAHs). Dibenzo(a,h)anthracene is a PAH with five aromatic rings that occurs as a component of coal tars, shale oils, and soots. It has been detected in gasoline engine exhaust, coke oven emissions, cigarette smoke, charcoal-broiled meats, vegetation near heavily traveled roads, and surface water and soil near hazardous waste sites. No commercial production or use of dibenzo(a,h)anthracene is known (BEIAS 1995).

Dibenzo(a,h)anthracene is poorly absorbed from the gastrointestinal tract and is primarily excreted via feces. After absorption, it is distributed to various tissues, with highest accumulation in the liver and kidneys. Dibenzo(a,h)anthracene is metabolized by mixed-function oxidases to dihydrodiols. Epoxidation of the 3,4-dihydrodiol may lead to the formation of a diolepoxide, the putative ultimate carcinogenic metabolite of dibenzo(a,h)anthracene (BEIAS 1995).

The EPA has derived no oral RfD or inhalation RfC for dibenzo(a,h)anthracene. In addition, no epidemiologic studies or case reports of the carcinogenicity of the compound in humans are available. In animals, dibenzo(a,h)anthracene administered by different routes has produced tumors, showing both local and systemic carcinogenic effects (BEIAS 1995).

1,2-Dichloroethene. 1,2-Dichloroethene exists in two isomeric forms, cis-1,2-dichloroethene and trans-1,2-dichloroethene, that are colorless, volatile liquids with a slightly acrid odor. Although not used extensively in industry, 1,2-dichloroethene is used in the production of other chlorinated solvents and as a solvent for dyes, perfumes, and lacquers (Sax and Lewis 1989, Budavari et al. 1989). Humans are exposed to 1,2-dichloroethene primarily by inhalation, but exposure can also occur by oral and dermal routes.

Information on the toxicity of 1,2-dichloroethene in humans and animals is limited. Workers exposed to 1,2-dichloroethene have suffered from drowsiness, dizziness, nausea, fatigue, and eye irritation (ATSDR 1990e). Acute and subchronic oral and inhalation animal studies of trans-1,2-dichloroethene and acute inhalation animal studies of cis-1,2-dichloroethene suggest that the liver is the primary target organ. The toxicity is expressed in increased activities of liver associated enzymes, fatty degeneration, and necrosis (McCauley et al. n.d., Barnes et al. 1985, Freundt et al. 1977). Secondary target organs include the central nervous system and lungs.

Based on an unpublished study describing decreased hemoglobin and hematocrits in rats treated by gavage for 90 days, EPA (2001) assigned a subchronic and chronic oral reference dose (RfD) for cis-1,2-dichloroethene of 1.00E-01 mg/kg/day and 1.00E-02 mg/kg/day, respectively. The RfDs were derived from a NOAEL/LOAEL of 32 mg/kg/day. An inhalation RfC for cis-1,2-dichloroethene has not been derived.

Subchronic and chronic RfDs of 2.00E-01 mg/kg/day and 2.00E-02 mg/kg/day, respectively, for trans-1,2-dichloroethene have been calculated. The RfDs were derived from a LOAEL of 175 mg/kg/day that was based on increased serum alkaline phosphatase activity in mice that received trans-1,2-dichloroethene in their drinking water. A RfC for trans-1,2-dichloroethene has not been derived (EPA 2001).

No information was available concerning the chronic, developmental, or reproductive toxicity of cis-1,2-dichloroethene or trans-1,2-dichloroethene. No cancer bioassays or epidemiological studies were available to assess the carcinogenicity of 1,2-dichloroethene. EPA (2001) has placed both cis-1,2-dichloroethene and trans-1,2-dichloroethene in weight-of-evidence group D, not classifiable as to human carcinogenicity, based on the lack of human or animal carcinogenicity data and on essentially negative mutagenicity data. Oral and inhalation slope factors have not been calculated for these isomers.

Dieldrin. EPA has calculated a chronic oral RfD of 5E-5 mg/kg-d on the basis of liver lesions in rats that have been chronically exposed to dieldrin in food. Reproductive studies are lacking. The RfD is given a medium confidence rating because of the support for the critical effect from other dieldrin studies and from studies on organochlorine insecticides in general (EPA 2001).

Dieldrin has been shown to be carcinogenic in various strains of mice of both sexes. At different dose levels, the effects range from benign liver tumors, to hepatocarcinomas with transplantation confirmation, to pulmonary metastases. EPA has placed Dieldrin in weight-of-evidence classification Group B2, probable human carcinogen, and has assigned an oral slope factor of 1.6E+1 $(mg/kg\text{-}day)^{-1}$ and an Inhalation Unit Risk derived from oral studies of 4.6E-3 $(\mu g/m3)^{-1}$ (EPA 2001).

1,3-Dinitrobenzene. EPA has calculated a chronic oral RfD of 1E-4 mg/kg-d on the basis of increased splean weight in rats that have been subchronically exposed to 1,3-dinitrobenzene in drinking water. Reproductive studies are lacking (EPA 2001).

2,4-Dinitrotoluene. 2,4-Dinitrotoluene (2,4-DNT; 1-methyl-2,4-dinitrobenzene) is a yellow, crystalline solid and one of six possible chemical forms of dinitrotoluene (DNT).

The initial acute toxic effects of 2,4-DNT in humans include methemoglobinemia, cyanosis, and headache. Symptoms indicative of neurotoxicity are impaired reflexes, tremors, nystagmus, dizziness, and

sleepiness (EPA 1980b). Subchronic and chronic oral toxicity studies with experimental animals indicate that the blood, liver, nervous system, and reproductive system are targets affected by 2,4-DNT. These effects were generally observed at doses of 5 mg/kg/day in rats and at 10 mg/kg/day in dogs. The most common hematological findings were methemoglobinemia, anemia, reticulocytosis, and an increase in Heinz bodies. Hepatotoxic effects included liver discoloration, and proliferative alterations of hepatocytes and bile duct epithelium. Neuromuscular effects, ranging from tremors and ataxia to convulsions, were more severe in dogs than in rodents. Reproductive effects consisted of decreased spermatogenesis, testicular atrophy, and ovarian dysfunction (Lee et al. 1985; Ellis et al. 1985, 1979; Lee et al. 1978).

The major route of exposure to DNT in the occupational setting is by inhalation. Effects reported in workers exposed to t-DNT and/or 2,4-DNT included ischemic heart disease, hematological effects characterized by cyanosis, anemia, and leukocytosis, and neurological effects such as dizziness, insomnia, nausea, and tingling pains in extremities (Levine et al. 1986, McGee et al. 1942). The evidence for potential reproductive effects (reduction of sperm counts) in male workers exposed to a mixture of DNT isomers and diaminotoluene is equivocal (Hamill et al. 1982, Ahrenholz 1980).

An oral RfD of 2.00E-03 mg/kg/day has been calculated for chronic and subchronic exposure to 2,4-DNT (EPA 2001), based on a NOAEL of 0.2 mg/kg/day derived from a chronic oral study with dogs. Data are inadequate for the calculation of an inhalation RfC.

An association between DNT exposure and increased risk of hepatobiliary cancer was found in a retrospective mortality study involving 4,989 workers exposed to DNT (isomer composition not specified) and 7,436 unexposed controls at an U.S. Army munitions facility (Stayner et al. 1993). The carcinogenic activity of 2,4-DNT and t-DNT has been studied in several chronic bioassays and in less than lifetime studies (Leonard et al. 1987, CIIT 1982, Ellis et al. 1979, NCI 1978). 2,4-DNT (containing small amounts of 2,6-DNT) induced an increased incidence of hepatocellular carcinomas and subcutaneous tumors in rats and renal tumors in male mice (Ellis et al. 1979). In two rat studies t-DNT induced hepatocellular carcinomas (Leonard et al. 1987, CIIT 1982). However, conclusions drawn from the isomer-specific carcinogenicity study by Leonard et al. (1987) and tumor-initiation/promotion essays by Popp and Leonard (1983) suggest that 2,6- rather than 2,4-DNT is the primary hepatocarcinogen in t-DNT. Although EPA has not evaluated pure 2,4-DNT for evidence of human carcinogenic potential, the dinitrotoluene mixture (containing 2,4-DNT and 2,6-DNT) was classified as a B2 chemical carcinogen, probable human carcinogen. A slope factor of 6.8E-1 $(mg/kg/day)^{-1}$ was calculated for oral exposure to the dinitrotoluene mixture. The drinking water unit risk is 1.9E-5 $(\mu g/L)^{-1}$ (EPA 2001).

2,6-Dinitrotoluene. 2,6-Dinitrotoluene (2,6-DNT; 2-methyl-1,3-dinitrobenzene) is a pale yellow crystalline solid and one of six possible chemical forms of dinitrotoluene (DNT).

Human data regarding potential health effects of 2,6-DNT are very limited. A significant increase in the death rate due to ischemic heart disease has been associated with occupational exposure to t-DNT (Levine et al. 1986). The evidence for potential reproductive effects (reduction of sperm counts) in male workers exposed to a mixture of DNT isomers is equivocal (Hamill et al. 1982, Ahrenholz 1980).

Oral subchronic toxicity studies with rats, mice, and dogs indicate that the blood, liver, and reproductive system are targets affected by 2,6-DNT in all three species (Lee et al. 1976). These effects were generally observed at doses of 35 mg/kg/day in rats, 51 mg/kg/day in mice, and 20 mg/kg/day in dogs. The primary hematologic effect in all three species was methemoglobinemia with sequelae such as Heinz bodies, reticulocytosis, anemia, and extramedullary hematopoiesis. Also seen in all three species was bile duct hyperplasia, decreased spermatogenesis, and testicular atrophy. In addition, dogs exhibited neurotoxic effects (incoordination, weakness, tremors, and paralysis) as well as inflammatory and degenerative kidney changes.

According to EPA (2001), available data are inadequate for the calculation of a RfD or RfC for 2,6-DNT.

In a 1-year carcinogenesis bioassay, 2,6-DNT at oral doses of 7 and 14 mg/kg/day, respectively, produced hepatocellular carcinomas in 85 and 100% of male rats. t-DNT, containing about 76% 2,4-DNT and 19% 2,6-DNT, also yielded a positive hepatocarcinogenic response (Leonard et al. 1987). In another study on the effects of t-DNT, dietary doses of 14 mg/kg/day induced hepatocellular carcinomas in rats (CIIT 1982). Initiating and promoting activities of 2,6-DNT in rat liver have been reported (Popp and Leonard 1982). Although EPA has not evaluated 2,6-DNT for evidence of human carcinogenic potential, the dinitrotoluene mixture (containing 2,4- and 2,6-DNT) has been classified as a B2 carcinogen, probable human carcinogen. A slope factor of 6.8E-1 $(mg/kg/day)^{-1}$ was calculated for oral exposure to dinitrotoluene mixture. The drinking water unit risk is 1.9E-5 $(\mu g/L)^{-1}$ (EPA 2001).

Endrin aldehyde. Evaluated as endrin. EPA has calculated a chronic oral RfD of 3E-4 g/kg-d for endrin on the basis of mild histological lesions in liver and occasional convulsions in dogs that have been chronically exposed to endrin in food. Conflicting evidence exists as to the developmental toxicity of endrin. Developmental effects have been observed to occur at dose levels much greater than those associated with chronic toxicity. Oral administration of endrin did not produce carcinogenic effects in either sex of two strains of rats and three strains of mice (EPA 2001).

Heptachlor. Heptachlor, a cyclodiene insecticide, was extensively used until the 1970s for the control of a variety of insects. At the present time, its only permitted commercial use in the United States is fire ant control in power transformers. Heptachlor is converted to heptachlor epoxide and other degradation products in the environment.

The primary adverse health effects associated with heptachlor are central nervous system and liver effects. For humans, acute oral exposure has resulted in abnormal behavior, hyperirritability, tremors, and convulsions (Leber and Benya 1994). Various central nervous system effects such as hyperexcitability, incoordination, tremors, muscle spasms, and seizures have also been reported in animals following acute and subchronic oral exposure (Akay and Alp 1981, Buck et al. 1959, EPA 1985c). Although hepatic effects have not been reported in humans, chronic dietary exposure of rodents to heptachlor or a 25:75 mixture of heptachlor/heptachlor epoxide has produced increased liver weights, liver lesions, and decreased body weight gains (EPA 2001).

Other effects reported in humans include blood dyscrasias as a result of exposure to heptachlor during home termite treatment (Epstein and Ozonoff 1987) and increased mortality from cerebrovascular disease in workers manufacturing pesticides. However, cardiovascular effects were not seen in a cohort of pesticide applicators with potentially high exposures to heptachlor (Wang and MacMahon 1979a, 1979b). Reduced fertility, increased resorptions, and decreased survival of offspring was noted in rats fed diets containing 0.25 mg/kg/day for 60 days prior to mating, with treatment continuing through gestation for the females (Green 1970). Reduced fertility and an increased incidence of cataracts, particularly in offspring, was reported in rats fed 6 mg/kg/day over an 18-month period (Mestitzova 1967).

An oral RfD of 5E-4 mg/kg/day for subchronic and chronic exposure to heptachlor was calculated based on a NOAEL of 0.15 mg/kg/day and a LOAEL of 0.25 mg/kg/day from a 2-year dietary study with rats. Increased relative liver weight was identified as the critical effect. An inhalation RfC for heptachlor has not been derived (EPA 2001).

Existing epidemiological studies on heptachlor are inadequate to establish a clear assessment of heptachlor exposure and human risk of developing cancer. Large-scale occupational cohort studies on workers engaged in the manufacture of heptachlor and pesticide applicators have not identified significantly increased cancer deaths (Wang and McMahon 1979a, 1979b). Several bioassays have shown

that heptachlor can cause liver cancer in mice. Bioassays with rats were generally negative. Benign liver tumors and hepatocellular carcinomas developed in both sexes of C3H mice fed 10 ppm heptachlor for 2 years; hepatocellular carcinomas developed in both sexes of $B6C3F_1$ mice fed 6-18 ppm technical grade heptachlor for 80 weeks; and nodular hyperplasia benign hepatomas and hepatocellular carcinomas developed in CD-1 mice fed 5 ppm (both sexes) or 10 ppm (males) of a 25:75 heptachlor/heptachlor epoxide mixture for 18 months (Epstein 1976, NCI 1977).

Based on EPA guidelines, heptachlor was assigned to weight-of-evidence group B2, probable human carcinogen. For oral exposure, the slope factor is 4.5 $(mg/kg/day)^{-1}$ and the unit risk is 1.3E-4 $(g/L)^{-1}$ (EPA 2001). The inhalation slope factor and unit risk are 4.5 $(mg/kg/day)^{-1}$ and 1.3E-3 $(\mu g/m^3)^{-1}$ (EPA 2001), respectively.

Heptachlor epoxide. Heptachlor epoxide, an oxidation product of the cyclodiene insecticide heptachlor, is not produced commercially in the United States and is not known to occur naturally (ATSDR 1993, IARC 1979). In the environment, heptachlor is converted to the epoxide, a chemical that degrades more slowly and, as a result, is more persistent than heptachlor.

Heptachlor epoxide has been found in human fat, milk, and also in blood and fat of stillborn infants, indicating transplacental transfer to the fetus (IARC 1979, EPA 1986b).

No studies were available regarding the toxic effects in humans after exposure to heptachlor epoxide. In laboratory animals, the liver and central nervous system are the primary target organs for heptachlor epoxide toxicity.

An oral RfD of 1.3E-5 mg/kg/day for subchronic and chronic exposure to heptachlor epoxide was calculated based on a LOAEL of 0.0125 mg/kg/day from a 60-week dietary study with dogs. Increased relative liver weight was identified as the critical effect. An inhalation RfC for heptachlor epoxide has not been derived (EPA 2001).

No epidemiological studies or case reports addressing the carcinogenicity of heptachlor epoxide in humans were available. Studies with laboratory animals demonstrated that heptachlor epoxide causes liver cancer in mice and rats. Liver carcinomas developed in C3H mice fed 10 ppm heptachlor epoxide for 2 years (Davis 1965). Hepatic hyperplasia, hyperplastic nodules, and liver carcinomas developed in CD-1 mice fed 0.1 to 10 ppm of a 25:75 heptachlor:heptachlor epoxide mixture for 18 months (IRDC 1973) and in CFN rats fed 0.5 to 10 ppm heptachlor epoxide for 108 weeks (Epstein 1976).

Based on EPA guidelines, heptachlor epoxide was assigned to weight-of-evidence group B2, probable human carcinogen (EPA 2001). For oral and inhalation exposure, the slope factor is 9.1 $(mg/kg/day)^{-1}$. The unit risk is 2.6E-4 $(\mu/L)^{-1}$ for oral exposure and 2.6E-3 $(\mu/m^3)^{-1}$ for inhalation exposure.

Indeno(1,2,3-cd)pyrene (see also toxicity profile for PAHs). Indeno(1,2,3-*cd*)pyrene, a crystalline solid with a chemical formula of $C_{22}H_{12}$ and a molecular weight of 276.3, is a PAH. It is found in fossil fuels, occurs ubiquitously, in products of incomplete combustion, and has been identified in soil, groundwater, and surface water at hazardous waste sites. No commercial production or use of this compound is known.

No absorption data for indeno(1,2,3-cd)pyrene were available; however, analogy to structurally related PAHs, primarily benzo(a)pyrene, suggests that it would be absorbed from the gastrointestinal tract, lungs, and skin. In vivo metabolites identified in mouse skin include the trans-1,2-dihydrodiol and 8- and 9-hydroxy forms of indeno(1,2,3-cd)pyrene. Similar metabolites were formed in vitro in rat liver microsomes.

No data on the acute, subchronic, chronic, developmental, or reproductive toxicity of indeno(1,2,3-*cd*)pyrene were found. Because of a lack of toxicity data, no oral RfD or inhalation RfC has been derived. EPA has assigned indeno(1,2,3-*cd*)pyrene to a weight-of-evidence classification of B2, probable human carcinogen (EPA 2001).

Methylene chloride. Methylene chloride (CH_2Cl_2, CAS No. 75-09-2), also known as dichloromethane, is a colorless volatile liquid with a penetrating ether-like odor. In industry, methylene chloride is widely used as a solvent in paint removers, degreasing agents, and aerosol propellants; as a polyurethane foam-blowing agent; and as a process solvent in the pharmaceutical industry. The compound is also used as an extraction solvent for spice oleoresins, hops, and caffeine (ATSDR 1989d; IARC 1986).

The primary adverse health effects associated with methylene chloride exposure are CNS depression and mild liver effects. Neurological symptoms described in individuals occupationally exposed to methylene chloride included headaches, dizziness, nausea, memory loss, paresthesia, tingling hands and feet, and loss of consciousness (Welch 1987). Major effects following acute inhalation exposure include fatigue, irritability, analgesia, narcosis, and death (ATSDR 1989d). CNS effects have also been demonstrated in animals following acute exposure to methylene chloride (Weinstein et al. 1972; Berger and Fodor 1968).

Impaired liver function has been associated with occupational exposure to methylene chloride (Welch 1987). Liver effects have also been documented in a number of inhalation studies with laboratory animals. Subchronic exposure of rats, mice, dogs, and monkeys caused mild hepatic effects such as cytoplasmic vacuolization and fatty changes (EPA 1983; Haun et al. 1972; Weinstein and Diamond 1972; Heppel 1944). Hepatocellular foci, fatty changes, and necrosis were reported following chronic inhalation exposure of rats and mice (NTP 1986). Chronic oral exposure to methylene chloride via drinking water resulted in histopathological alterations of the liver in rats and mice (NCA 1982, 1983). In addition, inhalation exposure of rats caused nonspecific degenerative and regenerative changes in the kidneys (EPA 1983; Haun et al. 1972).

A subchronic and chronic oral RfD of 6E-2 mg/kg/day for methylene chloride has been calculated by EPA. This value is based on a NOAEL of 5.85 mg/kg/day derived from a chronic drinking water study with rats (NCA 1982). This same study was adapted for the derivation of the subchronic and chronic reference concentration (RfC) of 3E+0 mg/m^3 (NOAEL, 694.8 mg/m^3) (EPA 2001).

Studies of workers exposed to methylene chloride have not recorded a significant increase in cancer cases above the number of cases expected for nonexposed workers (Hearne et al. 1987; Ott et al. 1983; Friedlander et al. 1978). However, long-term inhalation studies with rats and mice demonstrated that methylene chloride causes cancer in laboratory animals. Mice exposed via inhalation to high concentrations of methylene chloride exhibited a significant increase of malignant liver and lung tumors compared with nonexposed controls (NTP 1986). Rats of both sexes exposed to methylene chloride showed increases of benign mammary tumors (Nitschke et al. 1988; NTP 1986; Burek et al. 1984). An inhalation study with rats and hamsters revealed sarcomas of the salivary gland in male rats, but not in female rats or hamsters (Burek et al. 1984). Liver tumors observed in rats and mice that ingested methylene chloride in drinking water for 2 years provided suggestive evidence of carcinogenicity (NCA 1982, 1983). Based on inadequate evidence of carcinogenicity in humans and on sufficient evidence in animals, U.S. EPA (2001) has placed methylene chloride in weight-of-evidence group B2, probable human carcinogen. A slope factor and unit risk of 7.5E-3 $(mg/kg/day)^{-1}$ and 2.1E-7 $(\mu g/L)^{-1}$, respectively, were derived for oral exposure to methylene chloride. The inhalation unit risk is 4.7E-7 $(\mu g/m^3)^{-1}$ (EPA 2001).

2-Methylnaphthalene. See toxicity profile for PAHs.

Nitrocellulose. No toxicity profile could be found for nitrocellulose.

Nitroglycerin. Nitroglycerin is a pale yellow liquid or crystalline solid. It is used in making dynamite, other explosives, rocket propellants and medicine. It may enter the environment from industrial discharges, dynamite operations, or spills (EPA 1998c).

Nitroglycerin is extremely soluble in water. If nitroglycerin is released to the environment, approximately 99.8% will eventually end up in water; the rest will end up in about equal amounts in terrestrial soil and in aquatic sediment (EPA 1998c).

Acute exposures to nitroglycerin can cause severe throbbing headache, nausea, and a fall in blood pressure resulting in dizzy spells. Higher exposure can cause vomiting, abdominal pain, methemoglobinemial (red blood cell hemolysis), and possible coma or death (EPA 1998c). The primary target organ system is the circulatory system where it may cause vasodilatation leading to a fall in blood pressure and methemoglobinemial (EPA 1998c).

PCB-1254. Aroclor® 1254 is a PCB mixture containing approximately 21% $C_{12}H_6Cl_4$, 48% $C_{12}H_5Cl_5$, 23% $C_{12}H_4Cl_6$, and 6% $C_{12}H_3Cl_7$ with an average chlorine content of 54% (USAF 1989). PCBs are inert, thermally and physically stable, and have dielectric properties. In the environment, the behavior of PCB mixtures is directly correlated to the degree of chlorination. Aroclor® is strongly sorbed to soil and remains immobile when leached with water; however, the mixture is highly mobile in the presence of organic solvents (USAF 1989). PCBs are resistant to chemical degradation by oxidation or hydrolysis. However, biodegradation, especially of lower chlorinated PCBs, can occur (USAF 1989). PCBs have high bioconcentration factors, and due to lipophilicity, especially of highly chlorinated congeners, tend to accumulate in the fat of fish, birds, mammals, and humans (ATSDR 1995).

Accidental human poisonings and data from occupational exposure to PCBs suggest initial dermal and mucosal disturbances followed by systemic effects that may manifest themselves several years post-exposure. Initial effects are enlargement and hypersecretion of the Meibomian gland of the eye, swelling of the eyelids, pigmentation of the fingernails and mucous membranes, fatigue, and nausea. These effects were followed by hyperkeratosis, darkening of the skin, acneform eruptions, edema of the arms and legs, neurological symptoms, such as headache and limb numbness, and liver disturbance (USAF 1989).

Hepatotoxicity is a prominent effect of Aroclor® 1254 that has been well characterized. Effects included hepatic microsomal enzyme induction, increased serum levels of liver-related enzymes indicative of hepatocellular damage, liver enlargement, lipid deposition, fibrosis, and necrosis. Groups of 16 adult female rhesus monkeys ingested gelatin capsules containing Aroclor® 1254 daily for more than 5 years. Increases in the incidence of inflamed and/or prominent Meibomian glands; increased incidences of ocular exudate; changes in finger and/or toenails; decreases in IgG and IgM antibody levels; decreases in the percent of helper T-lymphocytes; increases in suppressor T-lymphocyte count; a decrease in helper/suppressor ratio; and decreases in reticulocyte count, serum cholesterol, total bilirubin, and alpha-1+ alpha-2-globulins were observed in treated monkeys. A chronic oral RfD of 2E-05 mg/kg/day for Aroclor-1254 was calculated from a LOAEL of 0.0005 mg/kg/day derived from the above study. The subchronic oral RfD is 5E-05 mg/kg/day (EPA 2001).

Data are suggestive but not conclusive concerning the carcinogenicity of PCBs in humans. The EPA has not determined a weight-of-evidence classification or slope factor for Aroclor® 1254 specifically. However, hepatocellular carcinomas in three strains of rats and two strains of mice have led the EPA (2001) to classify PCBs as group B2, probable human carcinogen. The carcinogenicity slope factor (q_1*) for oral exposure to PCBs is 7.7 $(mg/kg/day)^{-1}$ based on an increase of hepatocellular tumors in female

Sprague-Dawley rats treated with Aroclor® 1260. A drinking water unit risk of 2.2E-4 $(g/L)^{-1}$ for PCBs was calculated based on the q_1* (EPA 2001).

Phenanthrene. See toxicity profile for noncarcinogenic PAHs.

Polycyclic aromatic hydrocarbons. The PAHs are a group of chemicals that are formed during the incomplete burning of wood and fuel, including coal, oil, gas, and other organic substances (ATSDR 1989e). Exposure to PAHs may occur via inhalation, ingestion, and dermal contact. In any medium, PAHs most often exist as complex mixtures of compounds, and these compounds have been divided into (1) carcinogenic PAHs and (2) noncarcinogenic PAHs.

Carcinogenic polycyclic aromatic hydrocarbons. Available data indicate that benzo(a)pyrene is one of the most potent of the carcinogenic PAHs. Other PAHs considered to be carcinogenic are benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

The arrangement of aromatic rings in the benzo(*a*)pyrene molecule and other PAHs gives it a bay-region that is often correlated with carcinogenic properties. In general, bay-region PAHs and some of their metabolites are known to react with cellular macromolecules, including DNA, which may account for the toxicity and carcinogenicity of these compounds (Francis 1992). The primary toxicological concern about exposure to this group of PAHs is carcinogenicity. No case reports or epidemiological studies on the significance of human exposure to individual PAHs are available. Coal tar and other materials known to be carcinogenic to humans, however, contain PAHs (Francis 1992). Lung and skin cancers in humans have been associated with chronic exposure by inhalation and dermal contact, respectively, to mixtures of compounds that include carcinogenic PAHs (ATSDR 1989d). Several individual PAHs administered to different animal species by various routes have been found to be carcinogenic at both local and systemic sites. Long-term experimental studies resulted in tumors in the liver, mammary gland, respiratory and gastrointestinal tracts, and skin (ATSDR 1989e). Carcinogenic PAHs are also reported to be mutagenic in a variety of test systems.

Although reproductive effects in mice fed benzo(*a*)pyrene and adverse effects in their offspring, including birth defects and decreased body weight, have been reported, no reproductive toxicity from PAH exposure has been demonstrated in humans (ATSDR 1989e). Toxic effects have also been observed in rapidly dividing cells of the intestinal epithelium, testes, and ovaries (oocytes). Animal studies also indicate that exposure to bay-region PAHs can damage the hematopoietic system, leading to progressive anemia as well as agranulocytosis. The lymphoid system can also be affected, resulting in lymphopenia.

Not all of the carcinogenic PAHs appear to be as potent as benzo(*a*)pyrene (ICF-Clement 1988; EPA 1993a). Recent guidance published by EPA (1993a) recommended that a series of relative potency values (orders of magnitude) be used for the risk assessment of oral exposure to PAHs, with carcinogenic potency being compared to that of benzo(*a*)pyrene.

Noncarcinogenic polycyclic aromatic hydrocarbons. PAHs not considered to be carcinogenic include acenaphthene, benzo(g,h,i)perylene, naphthalene, and phenanthrene.

PAHs are toxic to the skin. For example, naphthalene is a primary skin irritant and causes erythema and dermatitis on repeated contact (Sittig 1981), and acenaphthene is irritating to the skin and mucous membranes of humans and animals (Faust 1994). Other noncarcinogenic effects of PAHs have been observed in animals; however, of these, only effects of the blood and blood-forming system and of the skin have also been reported in humans (ATSDR 1989e). Animal studies indicate that PAHs may adversely affect the gastrointestinal tract, liver, kidneys, lungs, and hematopoietic system and may

suppress the immune system after both short- and long-term exposure. Oral exposure of animals to acenaphthene caused reproductive effects, including decreased ovary weights, decreased ovarian and uterine activity, and fewer and smaller corpora lutea (Faust 1991, 1994). No mutagenic or carcinogenic effects of the noncarcinogenic PAHs have been reported.

***RDX*.** See toxicity profile for Cyclotrimethylenetrinitramine.

***2, 4, 6-Trinitrotoluene*.** TNT is a yellow to colorless crystalline sold. It is used to make explosives and as a chemical intermediate in the manufacture of dyestuffs and photographic chemicals. TNT is likely to enter the environment in wastewater effluents from production facilities and from leachates at waste disposal sites. Mobility in soil may be limited by strong adsorption to soil particles (BEIAS 1995).

Occupational exposure studies indicate that the major effects of chronic exposure to TNT include anemia (decreases in Hgb, Hct, and RBC count), liver dysfunction (increases in serum lactic dehdrogenase, glutamic oxaloacetic transaminase, and bilirubin), and cataracts (equatorial lens opacities). Other reported effects of TNT exposure include dermatitis, leukocytosis, neurological disorders, and nephrotoxicity (BEIAS 1995).

The primary target organs for TNT toxicity in laboratory animals are (1) liver (hepatocytomegaly and cirrhosis), (2) blood (hemolytic anemia with secondary alterations in the spleen), and (3) testes (degeneration of the germinal epithelium lining the seminiferous tubules) (BEAIS 1995). The liver has been identified as the most sensitive organ system (EPA 2001).

EPA has classified TNT as a Class C carcinogen (EPA 2001).